MINTEK

Your Partner in Unlocking Mineral Wealth

2018 | ANNUAL INTEGRATED REPORT

MINTEK

Your Partner in Unlocking Mineral Wealth

It's been 84 years since Mintek was formed. With our rich history and strive for improvement, we are proud to be a global leader in minerals and metallurgical innovation.

Mintek boosts an extensive range of products and services, which include world-class Research and Development (R&D) expertise, testwork, and process optimisation for all mineral sectors at local and international level.

We have world-class equipment and the best human capital to continue to grow and serve the mining industry.

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Aerial view of Mintek with the AMD, HMD, MPD and PDD Pilot Bays.

INTRODUCTION 1

Aerial view of Mintek with the Corporate Administration Block 9000 featured in front.

1.1

Common Vision, Shared Values and Culture

Mintek's **mandate** is to serve the national interest through research, development, technology transfer, to promote mineral technology, as well as foster the establishment and expansion of industries in the field of minerals and products derived therefrom.

Mintek's **vision** is to be a global leader in mineral and metallurgical innovation.

The **mission** is to serve our stakeholders by adding value to the mineral sector through research, development and technology transfer, in support of national priorities and sustainable growth.

In order to obtain its strategic intent Mintek shall strive to:

- Enhance its visibility and credibility to all stakeholders;
- Research and develop efficient mineral processing technologies and value added products and services;
- Promote the mineral-based economies of rural and marginalised communities;
- Uphold good governance practices; and
- Develop human capital and organisational skills to build world class R&D excellence.

Our shared **values** define what we stand for as an organisation and determine the way in which we interpret and respond to business opportunities and challenges. It also establishes expectations about how we work with our fellow colleagues, clients, suppliers, government departments and the communities we serve. See the values Illustrated below:

The Mintek Values

1.2 Corporate Profile and Organisational Structure

Mintek is located in Randburg, Johannesburg and was founded in 1934 to assist the mining industry to operate more effectively and profitably. Mintek has achieved international recognition for its contributions to the global mining sector. The local mining and minerals industry has been very innovative and many notable advances in extraction, refining, and manufacturing technology that originated in South Africa have impacted on the minerals industry worldwide.

The Mintek Organisational Structure

1.3 Mintek's Integrated Value Chain

Mintek's scope of work is illustrated in the integrated value chain outlined below. The bulk of the work is in the parts of

Mintek's Integrated Value Chain

EXPLORATION

Mintek's work in the area of exploration includes:

- Geochemical sample analysis;
- Mineral/ore characterisation;
- Certified Reference Materials (CRMs); and
- Artisanal and Small-Scale Mining (ASSM).

MINING

In the mining space, Mintek focuses on:

- ASSM Technology;
- ASSM training assistance;
- Mining inputs economic studies; and
- Urban mining.

CONCENTRATION

In the comminution, flotation and physical separation parts of the value chain, Mintek's work includes:

- Flowsheet design and optimisation and piloting;
- Plant audits;
- Control and optimisation strategies;
- Bulk sample preparation; and
- Gravity, magnetic, electrostatic, flotation and mineral density separation.

the chain that start with concentration through to refinement and value addition, as indicated below.

PYROMETALLURGY

With respect to pyrometallurgy, Mintek's work includes:

- Pelletisation and briquetting; Preheating and pre-reduction;
- DC arc process development and piloting;
- Modelling and simulation;
- Submerged-arc furnace (SAF) control strategy;
- Fluidised bed and controller technologies;
- Refractories performance investigations;
- High temperature solid state and phase equilibrium investigations; and
- Ore, slag, matte and alloy characterisation.

HYDROMETALLURGY & BIOTECHNOLOGY

In hydrometallurgy and biotechnology, Mintek's work includes:

- Atmospheric and pressure leaching;
- Bioleaching (refractory gold and base metals);
- Solvent extraction and ion exchange;
- Electrowinning;
- Process simulation;
- Reagent development and evaluation;
- Gold recovery by CIP/RIP;
- Activated carbon regeneration;
- Uranium processing expertise U_3O_8 recovery;
- Leach circuit control; and
- Rare Earths Element (REE).

REFINING & VALUE ADDITION

In the latter part of the value chain, Mintek's scope includes:

- Gold refining and value-added products/ chemicals; New industrial applications for gold: catalysis, nanotechnology & biomedical;
- Pyrometallurgical refining of inc (PWG to SHG) and off-grade ferro-alloy fines;
- Titanium chlorination technology;
- "Smart" materials and sensors;
- PGM-based superalloys;
- Low-nickel stainless alloys;
- Jewellery fabrication; Gold and platinum jewellery alloys; and
- Identification of downstream metal-based industries.

GENERAL

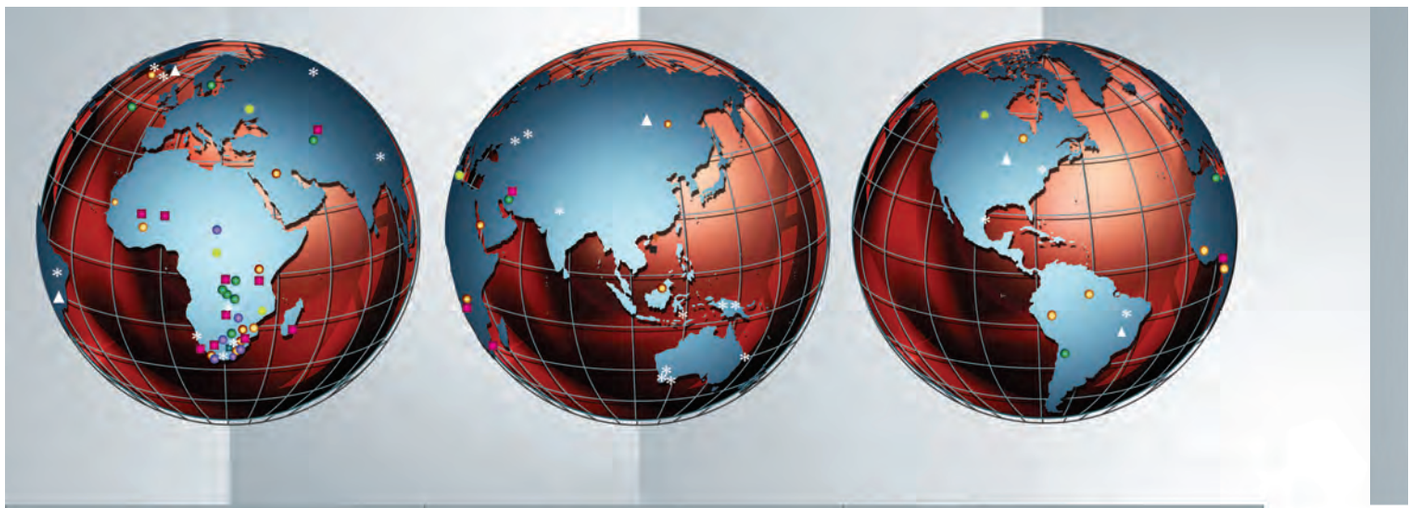
Mintek also has resident expertise in the following:

- Engineering, design, manufacturing, installation and commissioning; and
- Project management services and Regional mineral-based studies.

1.4 Mintek's Global Presence

Mintek operates in an open, global environment, servicing a multi-national industry. Customers include state enterprises, conglomerates, junior resource companies, engineering contractors and small-scale enterprises – operating both locally and internationally. In such an environment, the imperatives of remaining competitive

Geographic Spread of Mintek's Operation by Type of Metal/Mineral



Gold

- Evaluation and design of recovery circuits for refractory and non-refractory mineralisation.
- Diagnostic leaching and comparative testwork on various comminution, concentration and recovery options.
- Cyanide speciation monitoring, online cyanide measurement and control, cyanide destruction. Assistance with ICMI gap or full certification audits.
- Minfurn™ technology for granular activated carbon regeneration.
- Minataur™ all-hydrometallurgical gold refining process.
- New industrial uses for gold - catalysis, biomedicine, and nanotechnology.

PGMs

- Design and optimisation of integrated comminution, flotation and smelting circuits.
- Design and optimisation of base metal recovery and PGM refining circuits.
- ConRoast smelting technology for high-chromium low-sulphur PGM materials.
- Catalyst development for automotive, fuel cell, and industrial applications.
- Novel PGM-containing alloys, and powder metallurgical processes.

Ferrous Metals

- Iron ore beneficiation.
- DC arc smelting processes for chromite, ilmenite, nickel laterites, magnetite, magnesium metal production, and metal recovery from slags and dusts.
- Materials characterisation (physical, mechanical and corrosion properties), and failure investigations.

Base Metals

- Bioleaching of copper, nickel, cobalt, zinc and polymetallic concentrates.
- Heap bioleaching of low-grade chalcopyrite-bearing materials.
- Integrated circuit design for metal recovery and purification by leaching/heap leaching, precipitation, ion exchange, and SX/EW.

and credible in terms of reputation and facilities is widely acknowledged and appreciated. As such, Mintek remains committed to ensuring the long-term financial health performance and credibility of the organisation through the effective management of revenue and on-going compliance to governance structures.

Industrial Minerals & Diamonds

- Physical beneficiation - comminution, flotation, gravity, dense media, electrostatic and magnetic separation, and optical sorting.
- Kimberlite indicator mineral investigations. Alluvial diamond provenance studies.

Process Control Strategies

- Advanced process control and optimisation strategies for milling, flotation, and leaching circuits, and submerged-arc furnaces.
- Online cyanide measurement and control.
- Heap leach operator guidance software and in-heap instrumentation.

Equipment & Technology

- Minfurn™ regeneration furnace for activated carbon in the gold processing, water treatment, and food industries.
- MINATAUR™ gold refining process.
- DC arc furnaces.
- Atomijet™ atomiser for base and precious metals.
- SAVMIN™ process for acid mine drainage purification.

Uranium

- Ambient, pressure and heap leaching, solvent extraction, fixed bed and countercurrent (NIMCIX) ion exchange, resin-in-pulp, and ADU precipitation.
- Mintek is registered as a uranium testwork facility with South Africa's National Nuclear Regulator (NNR) and the Department of Mineral Resources.

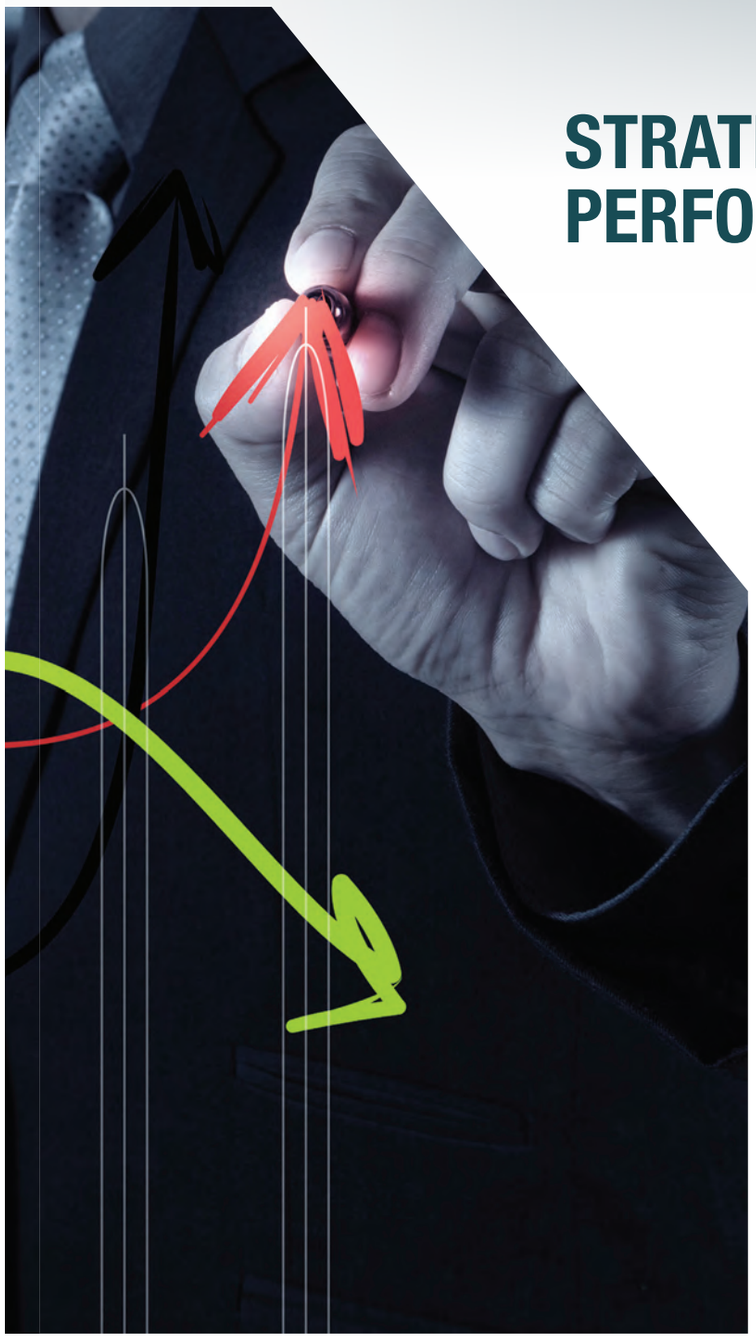
Rare Earth Elements

- Physical beneficiation – comminution, flotation, gravity, and magnetic separation, sensor based sorting.
- Concentrate cracking and refining flowsheet development and optimisation.

Economic & Regional Studies

- Regional commodity-based mineral economic studies.
- Resource-based technology strategies.
- Sustainable mineral development studies.

Graphic Representation of Mintek's internal "Rethinking the Future" campaign.



STRATEGIC PERFORMANCE

2

The recently acquired Mintek Electron Microprobe. The Electron Microprobe is a state-of-the-art microscope designed primarily to measure mineral compositions of polished surfaces of such samples as rocks, concentrates, metals, alloys and waste.

2.1 Chairperson's Overview

On behalf of the Board of Mintek, it gives me great pleasure to present the 2017/18 annual integrated report to Mintek's esteemed stakeholders, who entrusted us with governance oversight over this national asset. The entity is emerging from a tough economic environment in 2016, largely due to the industry witnessing an industry-wide decline in production that year, which was the biggest annual decline in production since the 2009 financial crisis. We are pleased to note that the mining industry fared much better in 2017 than the previous year, recording an overall 4% increase in production during the period, according to Statistics South Africa. A well-performing mining industry is extremely critical in South Africa, given the industry's contribution to the economy in general and employment creation in particular. All indications are that the lacklustre performance of the industry will be firmly behind, and Mintek will start seeing the positive impact of the upturn in the next year. For the first time in a number of years, our financial performance reflects this positive outlook in the attainment of an increase in commercial revenue, which is a shift away from years of consistent decline.

Board Chairperson: Namane Masemola

Corporate Governance

The Board is proud to oversee the governance of an entity that received two special awards during 2017/18. The Auditor-General's award for clean audits was received for the year, which was for the fourth consecutive year. We also won the Top Performing Public Sector Award at the 15th Annual National Business Awards. The award recognises and applauds National, Provincial and Local government departments, parastatals and/or agencies that have achieved outstanding results in the last year. These awards confirm that Mintek is indeed a beacon of success on corporate governance matters.

National and Community Development

We are closing the year on a good note, having welcomed the Minister of Mineral Resources, Honourable Gwede Mantashe, back into the industry and his key messages of clean and corruption-free governance; transformation of the mining sector; job creation and beneficiation resonated very well with the Board of Mintek as it formulates the long term strategy for the organisation. We also welcomed President Cyril Ramaphosa's emphasis on the importance of having well-governed state-owned entities as one of the most important success factors that will lead to the realisation of the objectives of the National Development Plan. Our medium to long-term strategy is informed by these national imperatives, and Mintek's contribution is mainly to scale up our beneficiation programme, in a way that seeks to maximise impact. Mintek's mandate includes playing a key role in research, development of technologies and beneficiation of South Africa's mineral resources. Throughout the year, we remained mindful that we discharged this mandate in a way that makes a difference to the lives of ordinary South Africans. As a result, Mintek facilitated the creation of four new economically sustainable businesses and 42 new jobs during the reporting period. These are community members that would otherwise have remained unemployed. The principle that we use is to assist where communities, in order to create sustainable incomes, have organised themselves to exploit resources available in their environment. We provided guidance and support in projects specialising in the manufacturing of glass beads and created job opportunities for previously unemployed youth within the community. We have also assisted cooperatives that were established by like-minded members of a community to mine and beneficiate clay so that they could create saleable products. The small businesses are supported

Nosiphiwo Mzamo receives the Top Performing Public Sector Award on behalf of Mintek at the 15th Annual National Business Awards held in November 2017.

and assisted not only with training but also access to raw materials, product development and marketing. It is these types of interventions that Mintek intends to scale up its reach and impact. We intend to increase our technical support to artisanal, small and medium scale operations in the treatment of various ferrous metals, so that they can increase their productivity and generate more revenue.

Sustainable Development

Sustainable development remained a critical focus area for Mintek during the year. We ran a successful demonstration in Randfontein where we showcased the efficacy of a cocktail of our home-grown technologies in the treatment of highly polluted waste water. The site was selected because of the high uranium content in the waste water that presents a major health and environmental hazard if left untreated. The last financial year saw Mintek's research programme get into the final phase of optimising the recycling of reagents, with an intention to improve the economic viability of our technologies. We pilot tested a different method at a coal mine in Mpumalanga, and continued the development of another method that uses nanotechnology to remove metals and bacteria in drinking water. Further, we also continued to operate as an implementing agent for the Department of Mineral Resources' Derelict and Ownerless Mine Rehabilitation programme to reduce the potential hazards for the communities that live around these mines.

Strategic Partnerships

Mintek owes much of its success to the strategic partnerships that we form both locally and internationally. The Department of Science and Technology (DST) and its entities continued to support the work that we do. The beginning of 2018 marked the 10th year anniversary for the DST/Mintek Nanotechnology Innovation Centre (NIC) that was established to promote nanotechnology-based science programmes that would enrich the lives of South African citizens through cutting edge research. We also held a joint conference with our German strategic partner, AMREP, with whom we host Centre of Excellence for Integrated Mineral and Energy Resource Analysis. Through the programme, a number of South Africans have been sponsored to pursue their doctoral and masters' degrees in Germany. We also continued to contribute to a wide range of government multilateral agreements, mainly through capacity building and training in areas of mineral processing and beneficiation. These include The Non-Aligned Movement Mineral Beneficiation internships, capacity development training for Nigeria and the Central African Republic amongst others. It is the strategic intent of the Board and management of Mintek to increase our visibility in the continent and explore mutually beneficial opportunities for Africa's development.

Conclusion

As our Country continues relentlessly to build a future for our youth, we will continue with our oversight role and efforts to ensure that the many achievable milestones set out by the National Development Plan come to fruition. As the Board, we therefore look forward to the Executive expanding Mintek's employee and pipeline development programmes. Key to these, will be the artisan learnership programme targeting unemployed female learners, the full and part time bursary programmes, graduate development programme, various internship programmes as well as the suite of MQA work integrated learning programmes.

The Board would like to thank the shareholder and other key stakeholders that have worked with us in ensuring that the year ends with notable achievements that are outlined in the rest of this report. We thank the previous Minister of Mineral Resources, Honourable Mosebenzi Zwane, his deputy, Honourable Godfrey Oliphant, and their entire team for having entrusted us with this responsibility. We are grateful for their leadership and their political guidance whenever we needed it during the year. We particularly thank the Acting CEO, David Msiza who has been with Mintek only for the second half of the year, and the previous CEO, Abiel Mngomezulu who ensured a smooth handover process. We are confident that with the current leadership, Mintek will maintain its corporate governance standing while continuing to implement programmes that move this country forward.

2.2 Chief Executive Officer's Review

The year 2017/18 witnessed a number of critical changes in Mintek, not least of which is my joining the organization almost halfway through the financial year. A five-year historical trend was revealing a consistent downward spiral in the revenues generated from Mintek commercial activities, which was a major concern for the entity. In the five years from 2012 to 2017, commercial income declined from R308 million to R156 million in nominal terms, which was mainly a reflection of the tough economic climate faced by the industry.

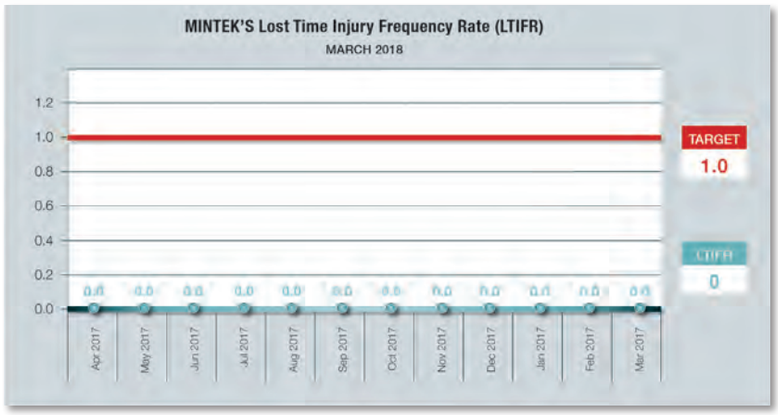
Acting CEO: David Msiza

The situation needed to change, and it required that Executive Management moved with haste. The brief from the Board was to ensure that there was a concerted effort on the part of Management to turn the situation around. Management launched a proactive campaign to engage top executives of mining companies to explore opportunities and collaborative partnerships for Mintek. This was because they were the immediate users of Mintek's products and services. Similar engagements of executives in other industries in the proximal space of manufacturing that uses minerals such as platinum followed soon. These engagements have started bearing fruit. Further efforts to source more commercial funding also included excursions that have been conducted in areas outside South Africa where there is potential for business, such as excursions to Zambia and the DRC where there are copper and other base metal deposits including cobalt that are being exploited.

In an effort to enhance collaboration with sister SOE's, MOU's have been signed with the Council for Geoscience, the Mine Qualification Authority (MQA) and the Mine Health and Safety Council. The scope of the MOU's include bringing existing activities under umbrella agreements and identifying additional activities. The increased cooperation has already borne fruit in facilitating payments from the MQA that were owed to Mintek but were tied up in administrative processes. Another example of the improved coordination is the project in the Boekenhouthoek area, where the various entities have combined forces with the Department to address the illegal mining activities that are currently occurring and to assist the community regularise their activities.

Notably, for the first time in a number of years the trend in declining commercial revenue was reversed during the 2018 financial year. The results indicate a commercial revenue of nearly R171 million compared to just over R156 million for the previous financial year. This equates to about 9% increase and is believed to reflect the changing sentiment and outlook for the mining sector. Mintek Group's overall income increased by 7% from R441 million in 2016/17 to R474 million in 2017/18. It is also encouraging to note that there has been a significant increase in the number of proposals requested by clients and there are also significantly more orders in hand than at this time last financial year.

For the first time since the global financial crisis, we are seeing an upturn in GDP growth rates in all the major regions of the world including back home. This is seemingly a moment for celebration, but we need to proceed with caution as we have also seen a slowdown in investment growth over the past few years, although there has been a recent pickup. This means that the growth of the economy if all factors were fully employed, will be limited in the near future, casting doubt on the sustainability of the current



resurgence. With this in mind, Mintek remains vigilant of the global challenges. As the requests for operational efficiencies and innovativeness increase, Mintek continues to respond in a way that will see it continuing with its mission to serve its stakeholders by adding value to the mineral sector, through high-calibre research and technology development and transfer, in support of our country's national priorities and sustainable growth.

Strategy Review

Against this backdrop, we went on a major strategy review so that we could design and implement strategies that would have a medium to longer term view and impact. The strategy review session resolved that, in order to ensure that Mintek's mandate as a Science Council remain sustainable into the future, we would focus on the four key pillars:

(i) development of a Mintek integrated business strategy;

(ii) identification and exploitation of mineral beneficiation opportunities, mainly regarding the platinum group metals (PGMs);

(iii) improving our system of innovation in response to the fourth industrial revolution; and

(iv) facilitating the ongoing transformation of Mintek as an organization, whilst also contributing to the government's transformation mandate through our respective programmes.

Meanwhile, in the period ending March 2018, a number of 'low hanging fruit' have been identified to demonstrate commitment to the process, including the engagement with the industry as highlighted above.

People Development

During the period under review, a total of 82 students participated in different programmes funded and supported by Mintek, the MQA, the National Research Foundation (NRF) and the South African Agency for Science and Technology Advancement (SAASTA). The MQA programmes are largely work integrated learning programmes and form a critical requirement for National Diploma students who normally require practical learning experience in order to qualify.

We are also pleased that a number of our staff obtained post-graduate qualifications during the year, most notably the four staff members who submitted their doctoral theses for examination and they are eagerly awaiting the examiners' reviews. In the year ending March 2018, two employees completed their Doctoral degrees, and three their Masters' degrees in technical studies. We are continuing with technical skills development programmes, and have twelve learner artisans that were under training during the year, half of whom were female. Three completed the programme during the year, and qualified as artisans.

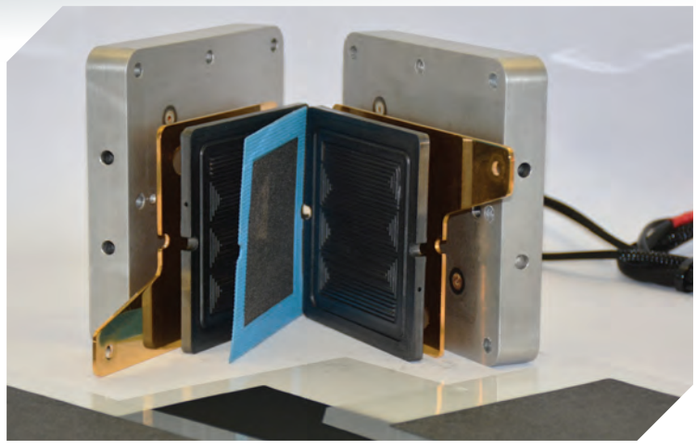
Safety, Health, Environment and Quality (SHEQ)

Key Safety, Health, Environment and Quality (SHEQ) indicators show that the good work that has been undertaken in the SHEQ arena has continued. The Lost Time Injury Frequency rate (LTIFR) remained at 0, the last injury of this nature occurred over 2 years ago. The external Client Satisfaction Frequency Rate (CSFR) was at 93% and above the target of 90%. The Health Incident Frequency Rate (HIFR), Public Dissatisfaction Incidents (PDI) and the Environmental Incidents (EI) all remained at 0.

Technical Highlights

Although the global commercial climate is improving, it remains very challenging. Mintek was able to record some notable achievements in the technical divisions. We concluded the development of an integrated financial model for the SACREF REE concept. This model incorporates capital and operational financial provisions, off-take as well as feed supply models and can be used to evaluate different concept configurations for a centralized REE refinery in South Africa.

We continued our work in the fuel cell space under the HySA programme. During the year, a second catalyst, namely HySA-V40, was successfully scaled to 1kg/batch



Fuel cell assembly used for catalyst and MEA development in the HySA Catalysis project

and the material validated. In addition, the preparation of graphatised Vulcan carbon support was scaled to 1.2kg/batch and a development batch of HySA-GV40 catalyst has been prepared to validate the support at this scale of production. These are major developments that will have a significant impact in South Africa's HySA programme.

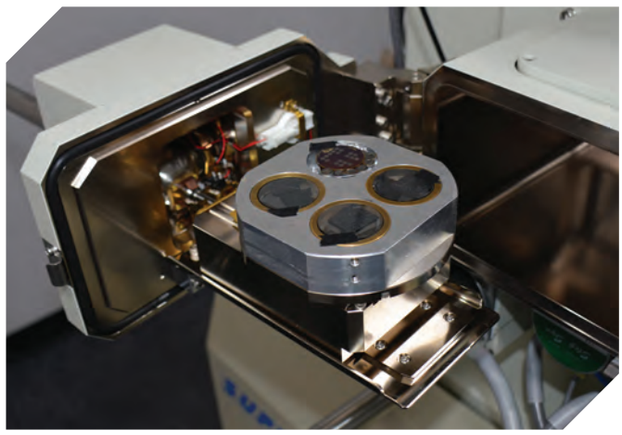
A new discovery that was patented was the production of M_gCO_3 from the beneficiation of mining related waste. This patent creates a potential opportunity for Mintek to fill a niche gap in the market with the potential added advantage of being able to reuse waste CO_2 and produce cleaner waste effluent due to the concomitant removal of contaminants through precipitation.

During the year, Mintek launched the Electron Microprobe that has been recently acquired. The Electron Microprobe is a state-of-the-art microscope designed primarily to measure mineral compositions of polished surfaces of such samples as rocks, concentrates, metals, alloys and waste. The technology allows Mintek to determine the distribution of both valuable and penalty elements that are crucial in mineral beneficiation. This new instrument will therefore assist Mintek in addressing challenges that lead to the inefficient use of natural resources, as well as environmental waste.

Looking Ahead

In support of the DMR, as well as to undertake marketing activities, Mintek attended and exhibited at the Mining Indaba in Cape Town and the Prospectors and Developers Association Conference in Toronto. Both are large international investor events and the mood at both was far more upbeat than in the past few years. The general consensus is that the industry is turning and more investment is entering the market. There is a strong focus on battery materials to support the anticipated demand for electric vehicles. There is also a growing global trend where communities are demanding more benefit from mining activities and mining companies are having to address their 'social license to operate'. It is interesting to note that this trend is not limited to developing countries, the citizens of developed countries are also demanding equitable benefit from mining activities.

In conclusion, I would like to express my heartfelt thanks to our Board of Directors led by Mr Namane Masemola and ably assisted by Mr Maroale Rachidi. I wish to thank the Board for their commitment and hard work in ensuring that Mintek continues to live by its vision and fulfil its very important mandate and responsibility towards the country's minerals industry. I also wish to thank all staff, partners and other members of the Mintek community for their hard work, dedication, sacrifice and allegiance to Mintek's organisational values.



A view of the inside tray of the recently acquired Mintek Electron Microprobe, launched at Mintek's Mineralogy Division.

2.3 Mintek's Key Performance Indicators

A summary of Mintek's Key Performance Indicators

STRATEGIC OBJECTIVE 1 Enhance Mintek's Visibility and Credibility to all Stakeholders

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Integrated marketing and communication functions	Updating and implementing the marketing and communications plan	Annually updated marketing and communications plan approved and implemented	1	1	Annual target achieved.
Enhancing the visibility and credibility of Mintek	Mintek promotion	# of technical articles in credible publications	50	57	Annual targets exceeded.
		# of conference presentations and posters	97	135	
	IP creation and transfer	# of Patents filed	6	2	Some patents planned for 2017/18 materialised towards the end of 2016/17. Furthermore, some technologies will be refined for patent registration.
		# of IP license agreements	3	1	The processes of finalising the two outstanding license agreements have been rolled over to the new financial year.
		# of discoveries (IPR-PFRD Act)	17	15	Actual achievement reached is almost 90% of the target. The balance will be carried over to the new financial year.
	Attained annual customer satisfaction target	% Annual Customer Satisfaction Rating Index	> 90	93	Annual target achieved.
	Enhanced media exposure	Advertising Value Equivalent (AVE) in R million	25.0	29.3	Annual target exceeded.
	Enhanced relations with oversight bodies	# of requests for technical assistance to the DMR (upon request)	1	1	Annual targets achieved.
		# of presentations to Parliament on impact of Mintek's work and role	2	2	

STRATEGIC OBJECTIVE 1 Enhance Mintek's Visibility and Credibility to all Stakeholders

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Enhancing the visibility and credibility of Mintek	Enhanced relations with oversight bodies	Timely submission of Shareholder's Compact	1	1	Annual targets achieved.
		Timely submission of quarterly reports on the attainment of targets in the scorecard	4	4	
	Integration of staff exchange	# of visits and # of instances of staff exchange	4	5	Annual target exceeded.

STRATEGIC OBJECTIVE 2 Research and Develop Efficient Mineral Processing Technologies and Value Added Products and Services

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Competitive technologies, products and services for optimal mineral resource utilisation.	Develop analytical methods and supply of services	# of methods	6	7	Annual target exceeded.
		Rand value (Rm)	41.0	26.2	Annual target not achieved as lower than anticipated samples were received throughout the year. The poor economic conditions in the industry prevailed throughout the year.
	Develop mineralogical methods and supply of services.	# of methods	2	2	Annual target achieved.
		# of internal reports	20	18	Annual target not achieved. Due to a lack of commercial work to the core technical divisions, less work was channelled to the Mineralogy division resulting in the annual target not being achieved.
		# of external reports	20	51	Due to competing laboratories closing down, Mintek continued to secure more commercial projects and therefore exceeded the annual target.
	Develop new technologies under state grant	# of internal reports	77	148	Annual target exceeded. Due to the lack of commercial projects this led to more focus on research and development related projects (more internal reports were produced under science vote projects resulting in the annual target being exceeded).

STRATEGIC OBJECTIVE 2 Research and Develop Efficient Mineral Processing Technologies and Value Added Products and Services

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Competitive technologies, products and services for optimal mineral resource utilisation.	Develop new technologies under state grant	# of new technologies	4	6	Annual target exceeded.
		# of prototypes evidenced by reports	3	6	Annual target exceeded – The Pyrometallurgy division accelerated outputs in research and successfully delivered functional prototypes in advance of the planned outcomes for current research projects.
Competitive technologies, products and services for optimal mineral resource utilisation.	Sales of products, plant and equipment	# of reports	18	18	Annual target achieved.
		Rand value of control system sales (Rm)	25.0	29.7	Annual target exceeded. The Measurement and Control division received an unanticipated number of large foreign orders.
		Rand value of Certified Reference Materials (CRM) sales (Rm)	3.0	3.46	Annual target achieved.
	Commercial investigations and feasibility studies	# of external reports	83	108	Annual target exceeded. Planning is based on historic demand. Requests of this nature are submitted on short notice.
	Provision of Mineral Economics and Strategy advice	# of internal reports	8	13	Annual target exceeded. The Mineral Economics and Strategy Unit received additional requests for work from internal divisions over the course of the year, which accounted for the unplanned increase in outputs.
Beneficiation to value added products and services	Develop applications for precious-, ferrous- and base metals in the areas of:- Environment & Health (HIV, Water, Toxicology and Food Security) - Catalysis (chemical processing, fuel cells, environmental) - Nanotechnology (water, health) - Physical metallurgy R&D and metallurgical industry support	# of internal reports	15	20	Annual target exceeded.
		# of external reports	15	14	Annual target not achieved. Crucial results to conclude one report was received late from a service provider.
		# of reports from the Metals Technology Centre (MTC)	150	169	Annual target exceeded. The Advanced Materials division received an unanticipated high number of enquiries from various industries as part of commercial work and this led to the division exceeding the annual target.

STRATEGIC OBJECTIVE 2 Research and Develop Efficient Mineral Processing Technologies and Value Added Products and Services

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Green technologies	Develop water efficient processes and flow sheets to optimise water consumption and enable processing of ore bodies in water stricken areas	# of internal reports	11	19	Annual target exceeded. Additional reporting from the Pyrometallurgy division due to an MTEF allocation under the water research programme.
		# of external reports	5	6	Annual target exceeded.
	Develop energy efficient processes, flow sheets and control technologies that minimise energy consumption and carbon emissions	# of internal reports	7	9	Annual target exceeded. The Minerals Processing division executed more project work on energy-Science Vote funding to compensate for the less commercial work that was signed up in the year.
		# of external reports	4	6	Annual target exceeded. The Minerals Processing division received a few more than anticipated external energy projects from clients. These were small in value (revenue-wise) and therefore could be executed faster.
	Develop waste management and recycling technologies for treating and recycling waste in order to extend mineral resources	# of internal reports	3	9	Annual target exceeded. During the 2017/18 FY Mintek received additional money on MTEF projects to support the Biotechnology division on Electronic Waste study and Mining Tailings Inventory study.
		# of external reports	1	0	Annual target not achieved due to external funding that never materialised as anticipated and hence a report could not be compiled.
	Rehabilitate derelict & ownerless mine sites	Money spent and/ or committed on rehabilitation projects (Rm)	60.0	71.4	Annual target exceeded – The spending on D&O was exceeded due to additional activities that were undertaken on the Streatham project in Burgersfort.

STRATEGIC OBJECTIVE 3 Promote the Mineral-Based Economies of Rural and Marginalised Communities

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Development of technologies and strategies relevant to rural and marginalised communities	Establish technologies and strategies relevant to small scale operators, for transfer to rural and marginalised communities	# of technologies adapted or developed	2	2	Annual targets achieved.
		# of feasibility reports	11	11	
Economically sustainable businesses created in rural and marginalised communities	Develop and support economically sustainable rural and marginalised communities	# of new businesses created	4	4	Annual targets achieved.
		# of jobs created from new businesses	40	42	
		% of businesses still in existence after 1 year	95	100	All (5/5) businesses created still in existence after 1 year (100%).
		% of businesses still in existence after 2 years	71	73	(51/70) business still in existence after 2 years (73%).
Training and skills development interventions in rural and marginalised communities	Provide value-added beneficiation training relevant to rural and marginalised communities.	# of people trained	100	100	Target achieved
		Maintain accreditation in jewellery manufacturing / design and small scale mining as evidenced in certificate or report	Main-tained	Main-tained	Mintek Accreditation has been extended to 10 August 2018 - see attached letter.

STRATEGIC OBJECTIVE 4 Uphold Good Governance Practices

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Enhanced fiscal discipline and the effective management of resources	BEE procurement as a % of total discretionary spend	% BEE Spend of total discretionary spend	85	100	Annual target achieved. More suppliers obtaining BEE certification and change to use only discretional funds.
	Strengthened Internal Financial Controls	Unqualified audit as evidenced in audit report	Unqua-lified	Unquali-fied	Annual target achieved in Q2.
	Sound Debtor Management	% Debtors write off of commercial revenue	<0.25	0	No debtors write-off (preliminary).
		Average Debtors Days	<65	45	Annual target achieved.
	Total Income	Rand Value (R'000)	539 548	509 704	Annual target not achieved due to low volume commercial projects experienced throughout the year.
	Net Result (surplus)	Rand Value (R'000)	6 516	2 146	Target not achieved due to low volume commercial work obtained throughout the year.
	Optimal Yield on Investment	% Return on investment	4.5	7.4	Annual target achieved.
	Total Capital Expenditure	Rand Value (Including Funding) (R'000)	46 060	52 040	Annual target exceeded due to assets under construction which started in the previous year but has now been completed and subsequently capitalised.
Enhanced fiscal discipline and the effective management of resources	Maintained balance between R&D and Commercial Revenue streams	Ratio of Research / Total Revenue expressed as a %	≥60	74	Annual target not achieved due to low volume commercial projects obtained throughout the year.
	Maintained balance between TCTC Salary Bill/Total Expenditure	Ratio of TCTC Salary Bill / Total Expenditure expressed as a %	58	58	Annual target achieved.
	Enhanced Liquidity Ratio	Liquidity Ratio	≥2	1.8	Annual target not achieved due to higher than anticipated deferred income.

STRATEGIC OBJECTIVE 4 Uphold Good Governance Practices

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Enhanced fiscal discipline and the effective management of resources	Improved cash flows from operations	Cash generated from operations after working capital (excluding movements in deferred income) (R'000)	>2 000	-18 835	Annual target not achieved due to low inflow of commercial funds.
Enhanced organisational efficiencies	Productivity Ratio	Recoverability %	90	81	Annual target not achieved due to lack of sufficient projects.
	Energy Efficiency	Power factor correction (target was changed to 0.9-1)	Target achie-ved	0.98	Annual targets achieved.
		Efficiency monitoring	Reduced energy utilisa-tion = 5%	100	
	ICT Security	Intrusions/virus breakouts on system	<3	0	
Enhanced organisational efficiencies	Monitoring of critical facility availability	Upside/ availability of ICT facilities (%)	≥98	98.3	Jan - 100%, Feb - 100%, March - 95% (caused by failure on a host server) an - 100%, Feb - 100%, March - 95% (caused by failure on a host server).
		Upside/ availability of critical facilities (%)	≥85	0.99	Annual target achieved.
Compliance with national and international regulatory frameworks, and applicable standards	Compliance with appropriate standards, regulations and legislation	% achievement of compliance checklist	100	100	Annual targets achieved.
	Internal Audits conducted	No. of audits	18	18	
	Review of applicable Audit Charters	No. of reviews	2	2	
	Fraud Awareness Campaigns	No. of campaigns	8	12	Annual target exceeded.

STRATEGIC OBJECTIVE 4 Uphold Good Governance Practices

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Enhanced Safety, Health, Environment and Quality	SHEQ standards maintained and enhanced	Maintain Mintek Accreditation status	Main-tained	Main-tained	All annual targets achieved.
		Achieved target for Fatalities	0	0	
		Achieved target for Lost Time Injury Frequency Rate (LTIFR)	<1	0	

STRATEGIC OBJECTIVE 5 Develop Human Capital and Organisational Skills to Build World Class R&D Excellence

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Training and Skills Development	Enhanced Skills Development	WSP Compliance Report	1	1	Annual targets achieved.
		Total spend on training expressed as a % of payroll	2	2.1	
	Enhanced relationships with Institutions of Higher Education and other similar organisations.	Number of partnerships maintained	6	12	Annual targets exceeded due to additional partnerships that were identified.
		# of partnerships maintained with previously disadvantaged Higher Education Institutions	2	4	
		# of Graduate Recruitment Programmes and other Science Events	10	14	
	Science, Technology, Engineering and Maths (STEM) Promotion	Annual Minquiz competition	1	1	Annual target achieved
	Effective Full-time Bursary Programme	# of under-graduate bursars	18	18	Annual target achieved.

STRATEGIC OBJECTIVE 5 Develop Human Capital and Organisational Skills to Build World Class R&D Excellence

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Training and Skills Development	Effective Full-time Bursary Programme	% Under-graduates Absorption Rate	100	100	Annual target achieved
		# of post graduate bursars	9	13	Annual target exceeded. Students continued into post graduate studies.
		% Postgraduate Absorption Rate	100	100	Masters students converted to PhD studies.
	Effective Part–time Bursary Programme	# of under-graduate bursars	40	78	Annual targets exceeded due to additional uptake in applications.
		# of post-graduate bursars	50	100	
Training and Skills Development	Work-Integrated Learning, Studentships and Internship Programmes	# of Candidates enrolled	60	78	Annual target exceeded due to additional MQA allocations.
	Artisan Learnership Programme	# of Persons enrolled	6	14	Annual target exceeded due to additional MQA allocations.
		% Retention of internal and absorption of external learners	100	100	Annual target achieved.
	Development Programmes for recent graduate scientists & engineers	Graduate Development Programme review report	1	1	Annual target achieved.
	Development Programme for researchers, scientists, engineers and technicians	An approved programme	0	0	Due in 2018/2019.
Organisational Development	Transformation of the Mintek Organisation	Report on compliance with DoL regulations	1	1	Annual target achieved. Report was submitted to DoL.
		% of women at Mintek (towards achievement of Employment Equity targets)	46	41.3	Stretched target not achieved. Vacancies are prioritised for women candidates.
		% employees with disability (towards achievement of Employment Equity targets)	3	3	Annual targets achieved.

STRATEGIC OBJECTIVE 5 Develop Human Capital and Organisational Skills to Build World Class R&D Excellence

PROGRAMMES	MEASURES / OUTCOMES	PERFORMANCE INDICATOR	TARGET	ACTUAL	COMMENTS
Organisational Development	Transformation of the Mintek Organisation	Interventions to increase women representation in Mintek	1	1	Annual targets achieved.
		Overall % of designated groups (towards achievement of Employment Equity targets)	90	90	
	Structured mentorship programme to transfer skills and knowledge from specialists to mid-level professionals	% of employees participating in structured interactions between specialists and mid-level professionals	10	21	Annual target exceeded. Additional employee uptake.
	Compliance with Performance Management Policy	% Performance Contracts and Assessment done and signed (for qualifying employees)	100	100	Target achieved.
Organisational Development	Enhanced Experience Profile of Researchers	Average years of Mintek experience of researchers	6	9	Annual target achieved.
		Average age of researchers at Mintek	33.0	37.6	
	Proportion of Researchers to Total Staff	Proportion expressed as a %	33	37	Annual target exceeded. Improved retention.
	Proportion of staff with Masters degree	Proportion of staff with Master's degree expressed as a %	10	13	Annual target exceeded.
	Proportion of staff with Doctoral degree	Proportion of staff with Doctoral degree expressed as a %	5	6	Annual target exceeded.
	Enhanced staff Retention & Succession	Staff Turnover rate	9	8	Annual targets achieved.
		% Staff Turnover of Professionals in Mintek core Divisions	10	9	
		% of Core to Support employees	75	75	

STRATEGIC OBJECTIVE 5 Develop Human Capital and Organisational Skills to Build World Class R&D Excellence					
PROGRAMMES	**MEASURES / OUTCOMES**	**PERFORMANCE INDICATOR**	**TARGET**	**ACTUAL**	**COMMENTS**
Organisational Development	Effective Leadership Development Programme	# Leadership Development Programmes	1	0	Annual target not achieved and programme will be offered in 2018/19.
Employee Health and Wellness	Enhanced Employee Health and Wellness Programme	# of Employee Wellness Programme interventions	5	11	Annual targets achieved and exceeded.
		% of Working days lost to absenteeism	3.5	3	
		% compliance with obligatory annual medical assessment	100	100	
Effective human resource systems	Enhanced administrative efficiency	Average time (in months) to fill vacancies	2.5	2.3	Annual targets achieved and exceeded.
		Vacancy rate	5	1.8	

Risk Management

Mintek recognises that proactive risk management is both a critical element of sound corporate governance and a crucial enabler in realising opportunities. Mintek has a well-developed management system that includes safety, health, environment and quality (SHEQ).

The Board, with the assistance from the Audit and Risk Committee (ARC) and the Risk Management Committee (RMC), is responsible for the governance of risk by ensuring that management maintains a sound system of risk management and internal controls to safeguard Mintek's assets, and determines the extent and nature of the significant risks which the Board is willing to take in achieving Mintek's strategic objectives.

The Risk Steering Committee (RSC) is a management committee that continually reviews the risk management process, internal controls, and significant risks facing the organisation and reports to ARC. The RSC provides the ARC with a risk assessment report at appropriately scheduled intervals. The ARC ensures that management has implemented a process for risk management, including an annual risk management plan to identify, manage and report on the risks that might prevent Mintek from achieving its strategic objectives.

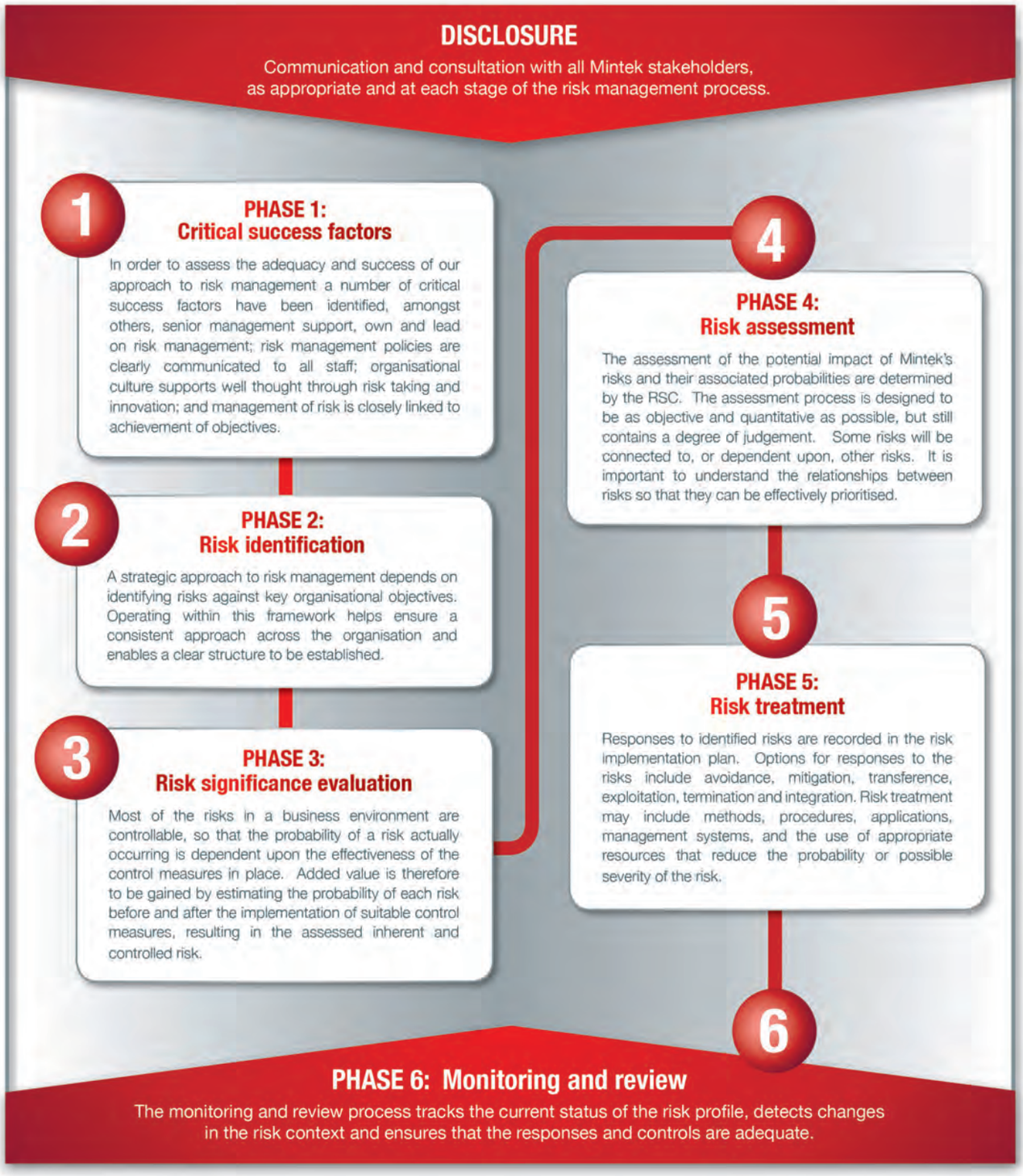
In particular the Audit and Risk Committee:

- reviews and recommends amendments to the risk management policy;
- ensures appropriate review of identified risks, together with the assessment of probability and impact;
- ensures appropriate review of risk action plans for identified risks;

- reviews significant transactions that are not a normal part of Mintek's business; and
- reviews and monitors related party transactions and assesses their propriety.

Meetings are held on a quarterly basis or as required. Mintek utilises the services of insurance brokers on an annual basis to analyse and assess the risks associated with its assets, which are insured, together with public liability and professional indemnity, for the risk assessed.

The Risk Management Process



Mitigating the Organisation's Top Risks

Mintek's top risks are determined by the Risk Steering Committee. The top risks include these risks and opportunities that have a direct potential on income, expenditure and capital as these are the key drivers of the financial risk appetite and tolerance metrics, negatively impact Mintek's value chain, cause a deviation from expected outcomes and/or negatively influence reputation.

Top Risk		Key Risk Reduction Measures
1	Loss of commercial revenue. **Potential impact** **Critical[1]**	• Ensure top quality control of all products and services. • Timely delivery of all products and services. • Ensure competitive pricing. • Good maintenance backup and/or after sale customer care. • Maximize alternative revenue streams. • Ensuring adequate marketing e.g. visits by EXM to various company CEOs, technology showcases, exhibition stands at identified conferences/events, place greater emphasis on Western African events in future. • Improving productivity without compromising quality.
2	Operational incident causes injuries, destruction of building and equipment or loss of license to operate scheduled processes. **Potential impact** **Critical[1]**	• Procedures for storing, maintaining and handling of flammable and explosive substances. • Regular training of staff. • Monitoring of interlocks and emergency shutdown devices,evacuation procedures and airline breathing system. • Safety related inspections conducted. • Totally enclosed chlorine plant. • Emergency response and evacuation procedures (including site evacuation) are in place. • Firefighting equipment is serviced once a year and checked once a month.
3	Failure to attract and retain skilled personnel. **Potential impact** **Critical[1]**	• Constant monitoring of best practice strategies for attraction and retention of skilled personnel. • Annual performance appraisals conducted on all employees to identify necessary skills for accelerated development. • Coaching and mentoring program. • Succession planning. • Benchmark salary scales against industry and comparable entities. • Continuous benchmarking and market analysis to inform internal strategies.
4	Changing Government policies and priorities. **Potential impact** **Critical[1]**	• Continuous monitoring of opportunities for funding. • Increased visibility of Mintek at National Treasury and DMR specifically focusing on funding issues. • Continuous monitoring of departmental strategic plans and other notifications. • Participation in departmental task teams and strategy sessions to remain abreast of policy changes and emerging priorities.
5	Surge in operational costs. **Potential impact** **Serious[2]**	• Comply to accurate and realistic budgeting and implementation thereof to prevent/ minimize loss of profitability. • Designed ability to pass through increased costs to customers via change in rates/ tariffs. • Pro-active management accounting and variance/trend analysis thereon. • Regular reviews of pricing policy for Mintek's products and services undertaken.

[1] Critical event which can be endured but which may have a prolonged negative impact and extensive consequences.

[2] Major events which can be managed but requires additional resources and management effort.

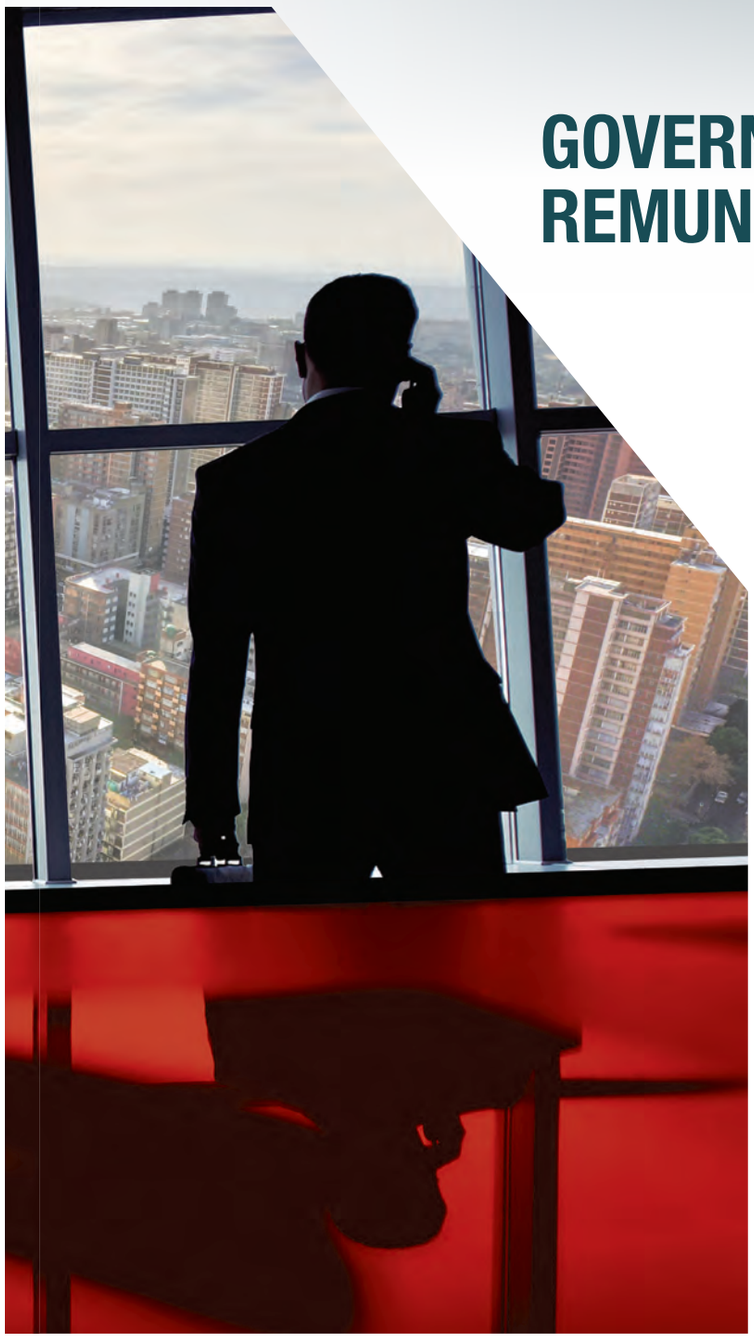
Attendance at Corporate Risk Steering Committee Meetings

Name	Category	Possible no. of meetings	Attended
D Powell (Chair)	GM: Business Development	4	4
A Mngomezulu*	Chief Executive Officer	2	1
D Msiza**	Acting CEO	2	1
A McKenzie	GM: Technology	4	3
M Makhafola	GM: Research & Development	4	4
S Simelane	GM: Finance	4	4
G Nyanda	GM: Corporate Services	4	2
N Mthalane	Head: Internal Audit	4	3
H Pretorius	Manager: Finance	4	4
H Marobane	Manager: Human Resources	4	4
H Venter	Head: Information Technology Services	4	4
M Ginindza	Head: SHEQ	4	2
B Hewu	Manager: Engineering & Maintenance Services	4	4
G Ndebele	Head: Campus Support (Security)	4	2

*A Mngomezulu – Retired - 3 September 2017

**D Msiza – Joined Mintek on 14 September 2017 as Acting CEO

The Safety, Health, Environment and Quality (SHEQ) committee is a management committee that oversees the policies relating to SHEQ and their implementation across Mintek.



GOVERNANCE & REMUNERATION

3

The determination of Mintek's remuneration strategy and policy is among the duties of the Human Resources Committee (HRC).

3.1 Governing Body Matters

The role of the Governing body (herein after, the Board) is to organise and direct the affairs of Mintek and its subsidiaries in a manner that seeks to maximise the value of Mintek for the benefit of its shareholders as a whole, while complying with relevant regulatory requirements, the Mintek Act, and relevant corporate governance standards.

The Board has overall responsibility for reviewing Mintek's strategic plans and performance objectives, financials, operations, funding and investment proposals and legislative and corporate governance in terms of the Mintek Act, the Public Finance Management Act and other relevant requirements of reports on Corporate Governance matters for South Africa. In essence, the Board plays a fundamental role in corporate stewardship and performance.

3.2 The Mintek Board

The Board currently comprises the Chairperson, the Deputy Chairperson, the Chief Executive and eight non-executive directors. The Mineral Technology Act prescribes the minimum and maximum number of Board members. There are also two independent non-executive directors, appointed by the Board, who serve only on the Audit and Risk Committee. The broad range of skills and experience Board members bring to Mintek are set out further below. The ultimate control as to the composition of the Board rests with the Minister of the DMR, who can appoint and dismiss a Board member. The current Board has been appointed effective 01 June 2016 and their three year term will end on 31 May 2019. The members of the Mintek Board and Committees and their roles are listed below.

Combined graphic representation of the duties of the various Board Comittees.

Name	Board Appointments			Board & Committees			
	Executive	Non-Executive	Independent	Board	Audit & Risk	Human Resources	Technical
Mr Namane Masemola		√		Chair			
Mr Maroale Rachidi		√		Deputy Chair	Member	Chair	
Mr David Msiza	√			Member	Member	Member	Member
Mr Dumisani Dlamini		√		Member	Chair		
Mr Daan du Toit		√		Member			Member
Ms Khetiwe McClain		√		Member		Member	
Mr Rantsadi Moatshe		√		Member		Member	Member
Dr Sarah Mohlala		√		Member			Chair
Ms Samke Ngwenya		√		Member	Member		
Mr Phahlani Mkhombo		√		Member		Member	
Dr Siyabonga Simayi		√		Member			Member
Ms Tumi Hlongwane			√		Member		
Mr Mpoti Moalusi			√		Member		

Non-Executive Directors

Mr Namane Dickson Masemola

Non-executive Director

Masters in Public Management, BA, BBA, Certificate Programme in Municipal Development. (WITS), Certificate in Leadership for Management and Transformation. (WITS) Certificate in Advanced Governance and Public Leadership. (WITS)

Appointed to the Board as Chairperson on 01 June 2017.

SKILLS AND EXPERIENCE

Dickson Masemola is a graduate of Regenesys Business School, Wits Business School and Unisa. He is a qualified Public Administrator, Leader and Manager. For almost 30 years he has had roles serving the ANC at different levels, including Executive Mayor of Sekhukhune District Municipality, Education MEC, MEC in the Premiers Office, MEC of Public Works and Acted as Premier several times.

CURRENT EXTERNAL APPOINTMENTS

None

Non-Executive Directors

Mr Maroale Jacob Rachidi

Non-executive Director
PTC; MDP; COP

Appointed to the Board as Deputy Chairperson on 01 June 2016. Member of the ARC and Chairperson of the HRC.

SKILLS AND EXPERIENCE

Maroale is an ICT expert and entrepreneur currently serving as CEO of Tetelo Computer Services. He is well esteemed in corporate governance, administration, ICT governance and programming.

CURRENT EXTERNAL APPOINTMENTS

Director in Boards of SAFCOL, Industrias Florestais de Manica, SA; IFLOMA; MTO Forestry (Pty) Ltd; Siyaqhubeka Forests (Pty) Ltd and Council member at the University of Limpopo and Chairperson of the Audit and Risk Committee. EduPark.

Mr Dumisani Dlamini

Non-executive Director
MCom; PGD in Bus Mngt; BTech Taxation; N Dip Accounting; Prof Accountant SA

Appointed to the Board on 01 June 2016. Chairperson of the ARC.

SKILLS AND EXPERIENCE

Dumisani has experience in the finance and auditing fields having worked for the National Arts Council of South Africa, Engen Petroleum, Ithala Development Finance Corporation and SARS.

CURRENT EXTERNAL APPOINTMENTS

Served as Chairperson of Audit committees for various municipalities.

Mr Daan du Toit

Non-executive Director
LLM; LLB; BA

Appointed to the Board on 01 June 2016. Member of the TC.

SKILLS AND EXPERIENCE

Deputy Director-General: International Cooperation and Resources at the Department of Science and Technology. He has served the country in various roles in international relations, including DST's representative to the EU at the rank of Minister-Counsellor, and as a diplomat in Brussels.

CURRENT EXTERNAL APPOINTMENTS

None

Non-Executive Directors

Ms Khetiwe McClain

Non-executive Director
BA in Fine Arts

Appointed to the Board on 01 June 2016. Member of the HRC.

SKILLS AND EXPERIENCE

Khetiwe has served in various executive roles in both public and private sector, including Harmony Gold Limited, Alexkor Limited, DMR and at the SA Embassy in Italy.

CURRENT EXTERNAL APPOINTMENTS

CEO of Closure & Rehabilitation Solutions. She has also served in various non-executive roles that include Chairperson of the MPRDB of South Africa, Member of the Boards of MELCO South Africa, AECI, Manganese Metal Company and Village Main Reef.

Mr Phahlani Mkhombo

Non-executive Director
LLM; LLB; BProc

Appointed to the Board on 01 June 2016. Member of the ARC and HRC.

SKILLS AND EXPERIENCE

Phahlani is a Senior Business Rescue Practitioner, qualified lawyer and a seasoned transaction advisor with more than 15 years' experience especially in Corporate Law, Corporate Governance, Mergers & Acquisitions, Corporate Finance, Project Finance, Public Private Partnerships (PPP), Deal Structuring and Business Restructuring in both the private and public sector. He is a former Chief Director: Legal Counsel at the Department of Public Enterprises, a position he held from 2006 – 2016.

CURRENT EXTERNAL APPOINTMENTS

He is a member of the South African Restructuring and Insolvency Practitioners Association (SARIPA).

Mr Rantsadi Andries Moatshe

Non-executive Director
Masters in Environmental Management

Appointed to the Board on 01 June 2016. Member of the HRC and TC.

SKILLS AND EXPERIENCE

Rantsadi is an experienced environmental management specialist. Currently working as Chief Director: Mine Environmental Management at the DMR. His entire career has been on management of the environment, from waste management to environmental health and industrial ecology. He has worked for Lafarge, UNISA and various government departments.

CURRENT EXTERNAL APPOINTMENTS

None

Non-Executive Directors

Dr Sarah Mohlala

Non-executive Director
PhD in Chemistry; MSc; BSc Hon

Appointed to the Board on 01 June 2016. Chairperson of the TC.

SKILLS AND EXPERIENCE

Dr Mohlala is a professional scientist with more than 10 years' work experience. She recently worked temporarily as researcher at Research Directorate office, Vaal University of Technology. She previously worked as strategy business analyst at Sasol International Energy; as a senior scientist at Sasol Technology and as scientific researcher at CSIR. She also offered chemistry lectures part-time at University of Johannesburg, while studying PhD. Her overall experience is in science & technology, academic, research & development, chemistry, strategy and business analysis/intelligence environments.

CURRENT EXTERNAL APPOINTMENTS

None

Ms Samke Ngwenya

Non-executive Director
MBA; PGD in Management; BCom

Appointed to the Board on 01 June 2016. Member of the ARC.

SKILLS AND EXPERIENCE

Samke began her banking career in 2010 in the Investec Plc UK treasury division. In August 2010 she moved within the Group to the South African private banking division, where she has since remained. Prior to that she was at Mazars Registered Auditors where she performed statutory audits for a diverse range of companies including property holding, manufacturing and retail, both medium-sized and listed. Samke's areas of expertise are business development, banking and finance.

CURRENT EXTERNAL APPOINTMENTS

None

Dr Siyabonga Simayi

Non-executive Director
PhD in Ops Mngt; MBA; BTech; N Dip

Appointed to the Board on 01 June 2016. Member of the TC.

SKILLS AND EXPERIENCE

Siyabonga, a metallurgist by profession, is Programme Director: Shared Services–Coega Development Corporation. Previously he worked for Luk Africa Limited; Highveld Steel & Vanadium Corporation and De Beers: Kimberley Mines as a metallurgist and process engineer.

CURRENT EXTERNAL APPOINTMENTS

Serves as academic research supervisor/promoter at NMMU and Professor of Mining and Environmental Geology – University of Venda on a part-time basis.

3.3 Executive Management

The Executive Management Team comprises the Chief Executive and five general managers responsible for corporate services, finance, business development, technology development and research and development. The main responsibilities of the Chief Executive include: executive leadership, formulation and implementation of Group strategy as agreed by the Board; approval and monitoring of business plans, organizational structure; business development; and stakeholder relations. The Executive team prepares and guides the development of Mintek's processes and business operations as well as the common functions. The team handles, in particular, Mintek's strategy, budget, major procurements and projects, as well as major policies of administration.

The executive management team consists of:

Mr David Msiza

Acting Chief Executive Officer.

BSc. Mining Engineering, Executive Development Programme (EDP), a Mine Manager's Certificate of Competency (MMC).

David Msiza has been with the mining sector prior to joining the Department of Mineral Resources (DMR) in 1998. He was also the Chief Inspector of Mines at the DMR from 2010 being responsible for the promotion of health and safety in the sector. He was the Board Chairperson of the Mine Health and Safety Council (MHSC) and the Mining Qualification Authority (MQA). He was also a Chairperson of the Risk Committee at the Department of Health. Prior to joining Mintek, David served as the Acting Director General at the DMR for more than a year from 2016.

Mr Sakhi Simelane

General Manager: Finance, specializing in Finance, Auditing and General Management.

MBA, BCom Hons (Auditing), BCom

Ms Gugulethu Nyanda

General Manager: Corporate Services, specializing in Corporate Governance, Human Resources Management, Strategic Planning, Communications, Integrity & Compliance Management.

MBA, BA Hons, BPaed, Dip. HRM

Dr Makhapa Makhafola

General Manager: Research and Development, specializing in Analytical Chemistry, Advanced Materials, Quality Assurance and General Management.

PhD (Analytical Chemistry), MSc, PGD in Project Management, BSc Hons

Mr Alan McKenzie

General Manager: Technology, specializing in Analytical Services, Pyrometallurgy, Minerals Processing and General Management.

MSc, BSc Hons

Dr David Powell

General Manager: Business Development, specializing in Minerals Processing, Coal Processing, Management of Commercial Operations, General Management.

PhD (Chem Eng), MSc (Eng)(Metallurgy), BSc (Hons) (Metallurgy), Professional Engineer, FSAIMM, FMES

3.4 Corporate Governance Report

Statement

The Board hereby considers Mintek's annual financial statements to be a fair representation of its financial position at year-end in terms of the South African Statements of Generally Accepted Accounting Practice (GAAP) and as required by the Public Finance Management Act.

Governance Framework

Being a global leader in its field also means that Mintek's business practice has to be world class. As such, Mintek endeavours to ensure that business processes, systems and controls are governance compliant while ensuring efficiency in business. As a science council, Mintek plays a critical role within the South African landscape in respect of research, innovation, service delivery, development and growth.

There are a few legislation frameworks that Mintek operates within, they are:

- The Mineral Technology Act No. 30 of 1989;
- The Public Finance Management Act, Act no. 1 of 1999 (PFMA), which also governs Mintek and finance management related matters perspective as a Schedule 3B Company;
- The King IV Report which aims at promoting best practice in corporate governance across organisations and applies to public entities and public enterprises that fall under the PFMA;
- The Governance Protocol which provides guidance to the public sector and its entities operating within the political-economic sphere. While the Protocol applies to Mintek, it does not seek to supersede the King Code, but rather amplify the requirements; and
- According to The Protocol, Boards constitute a fundamental base of corporate governance, and as such, Mintek must be headed and controlled by an effective and efficient Board appointed in terms of the Mineral Technology Act.

The Board

The Board provides leadership to the Mintek Group and is collectively responsible for promoting and safeguarding the long-term success of the business. The Board believes that strong corporate governance is fundamental for the achievement of business success and sustainable value for all stakeholders. Accordingly, Mintek is committed to the principles of openness, integrity and accountability in all its dealings with its stakeholders. Mintek endorses the Code of Corporate Practices and Conduct as set out in the King IV Reports and subscribes to the PFMA. The Board as an oversight body firmly believes that the primary objective of the corporate governance system is to ensure that both the Board and Management carry out their responsibilities ethically and effectively.

The Board is supported by a number of committees to which it has delegated certain powers. These committees are the Audit and Risk Committee (ARC), the Human Resources Committee (HRC) and the Technical Committee (TC). Each of the three committees has its own Terms of Reference (ToR) and or Charter and their roles are summarised further below.

Members of the Board are appointed based on their business acumen, experience and knowledge, as well as other relevant skills. The Board is accountable to the Minister of Mineral Resources and as a result a shareholder performance agreement (the Compact) has been concluded between the Board and the Executive Authority. The Compact entails strategic objectives to be achieved and forms the basis for quarterly performance reporting to the Executive Authority on these objectives. Mintek has a Board secretariat that is responsible for ensuring Board support to enhance maximum Board functioning.

The Board meets at least four times a year. As warranted by particular circumstances, ad hoc meetings are also convened to deliberate on urgent, substantive matters. The Board reserves at least one day per year to discuss the strategic long-term plan of the organisation and its subsidiaries. Board meetings, with the exception of certain in-camera sessions, are attended by all members of executive management. Furthermore, selected members of executive management and senior management participate in certain committee meetings.

Board Performance and Evaluation

An annual assessment is conducted on the effectiveness of the Board as a whole, effectiveness of the committees

and individual contributions. The Board evaluates its own performance.

Areas of focus for the evaluations in 2016 and 2017 included the role, size, composition and independence of the Board; orientation and development; teamwork and management relations; meetings, compensation, succession planning and ethics.

From the 2016/17 exercise, the top priorities for the Board in 2017/2018 were identified by the respondents as:

- The need for workshops and training interventions relating to business and environmental ethics as well as team-building exercises;
- Increased participation by Board members in conferences and indabas associated with Mintek's core business;
- Training through the Institute of Directors in Southern Africa (IoDSA) would be of good benefit to Board members, especially since many of the members have not been exposed to Board environments before. There is also a belief that continuous development and training especially around legislation governing SOEs would greatly improve the Board's competency in this regard;
- More meeting time to be devoted to the discussion of Mintek's performance and review of strategic issues;
- Better alignment of compensation and performance; and
- Clear succession planning for the CEO and top management.

Board Committees and Their Functions

Three committees, the ARC, the HRC and TC assist the Board in discharging its duties and responsibilities. The functioning of these committees is guided by Board approved Charters and/or ToRs which are reviewed annually, and are summarised in the following tables.

Aerial view of Mintek with the Corporate Administration Block 9000 featured in front.

Committee Objectives	Highlights of activities for the year
The Audit and Risk Committee (ARC)	
The ARC is established to assist the Board in discharging its duties relating to:	
• effectiveness and efficiency of operations; • safeguarding of the company's tangible and intangible assets (including information); • compliance with applicable laws, regulations and supervisory requirements; • supporting business sustainability under normal as well as adverse operating conditions; • reliability of reporting; • behaving responsibly towards all stakeholders; • the operation of adequate systems and control processes; and • the preparation of accurate financial reporting and statements in compliance with all applicable legal requirements and accounting standards.	• Approved the revised ARC & internal audit charters, the internal audit strategic plan for 2018/19 to 2020/21 and the Shareholder Agreement sections dealing with the group financials and risk management. • Approved the Mintek audit strategy for 2018/19. • Interrogated the ICT steering committee activities, internal audit quarterly reports, tip-offs and theft and fraud quarterly reports. • Approved the ARC report as a component of the Mintek annual integrated report. • Discussed and monitored risk steering committee activities. • Approved the audited financial statements for 2017. • Approved the revised fraud risk and whistle blowing policy. • Through consultation and agreement with the AGSA, approved the Mintek group management and audit reports for 2017. • Tracked AGSA findings.
The Human Resources Committee (HRC)	
The HRC is established to assist the Board, amongst others, in:	
• Reviewing and determining human resource-related policies, including conditions of employment, reward, remuneration and retention policies; • Reviewing aspects of the shareholder's compact that relate to human resource development, and reviewing performance against targets; and • Consideration of the annual review of remuneration packages.	• Approved the following revised policies: o recruitment and selection; o leave and leave administration; o employee relations; o acting allowance; and o conditions of service. • Approved the 2017/18 annual salary increases and incentive bonuses for qualifying staff. • Tracked Mintek's CSI activities.

Committee Objectives	Highlights of activities for the year
The Human Resources Committee (HRC) *(continued)*	
	• Tracked reports on employee relations, staff appointments and terminations, employee wellness, employment equity and human capital development.
The Technical Committee (TC)	
The TC assists the Board in discharging its duties relating to the legal mandate of Mintek regarding its core business.	
• It provides a forum for discussing technical issues for consideration by the Board in informing strategy development and implementation in Mintek; and • Advises on utilisation of expertise, project proposals and financing thereof, looking into various co-operatives and related strategies and the possible expansion of Mintek business within the said mandate.	• Approved the planned international visits for 2018/19. • Approved the technical sections of the 2018 Shareholder Agreement. • Monitored the visits of Mintek Executives to CEOs of mining companies, in an effort to better sell Mintek's technologies and establish collaborative partnerships. • Reviewed MTEF projects, Science Vote projects, corporate SHEQ activities and safety statistics. • Tracked Mintek's collaborations with tertiary institutions globally.

As highlighted in the table above, during the year under review, the Board's activities focused on building on Mintek's strengths. This included promoting the economic sustainability of the business and on delivering on Mintek's mandate. To this end, the work of the Board and Committees ensured that Mintek's operations were conducted with due regard to the expectations and needs of all its stakeholders, the safety and health of employees and the communities that Mintek serve, and the development of effective systems which ensure proper access to and dissemination of credible information.

Both the Board and Committee meetings are held in an environment of intellectual honesty of purpose, truthfulness and mutual respect. These meetings require reporting of the highest standard by management and robust and constructive challenge and debate among all Board and Committee members.

Board and Committee Meeting Attendance				
Name of Board and/or Committee Member	Scheduled			
	Board	ARC	HRC	TC
Total number of meetings	4	4	4	3
Namane Masemola *(Board Chairperson)*	3/3	n/a	n/a	n/a
Maroale Rachidi *(Board Deputy Chairperson)*	4/4	4/4	4/4	4/4
David Msiza *(Ex-officio & Acting CEO)*	1/2	2/2	2/2	2/2
Dumisani Dlamini	3/3	4/4	n/a	4/4
Daan du Toit	3/4	N/A	n/a	N/A
Khetiwe McClain	3/4	N/A	3/4	N/A
Rantsadi Moatshe	3/4	N/A	4/4	N/A
Dr Sarah Mohlala	4/4	N/A	n/a	N/A
Samke Ngwenya	4/4	3/4	n/a	3/4
Phahlani Mkhombo	4/4	4/4	n/a	4/4
Dr Siyabonga Simayi	3/4	N/A	n/a	3/3*
Tumi Hlongwane	N/A	2/4	n/a	N/A
Mpoti Moalusi	N/A	2/4	n/a	N/A

* Attended one meeting via a teleconference call

Internal Audit

Mintek's Internal Audit (IA) is an in-house function in terms of 51(a)(ii) of the PFMA Act No. 1 of 1999 as amended. IA is governed in terms of the Standards for the Professional Practice of Internal Auditing (SPPIA) as prescribed by the Institute of Internal Auditors. The Head of Internal Audit reports directly to the CEO administratively and to the ARC functionally.

The IA function is an independent, impartial and consulting activity designed to add value and improve Mintek's operations. It helps Mintek accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of governance, risk management and control processes. The ARC approves the charter, audit plan and budget of IA to ensure it operates independently. The IA function has direct access to the ARC and regular meetings are held with the chairperson

of ARC. Comprehensive reports on internal audit findings are presented to the executive committee and the ARC quarterly. Follow-up audits are conducted in areas where major internal control weaknesses are found.

Internal Control

Mintek maintains internal controls and systems, designed to provide reasonable assurance regarding the integrity and reliability of its financial statements, to safeguard, verify and maintain the accountability of assets, and to comply with applicable laws and regulations. The directors are ultimately responsible for the company's system of internal control, designed to identify, evaluate, manage and provide reasonable assurance against material misstatement and loss.

The effectiveness of these controls is monitored by the internal auditors, who report to the ARC frequently. The ARC requested management to review and evaluate Mintek's existing internal controls to further identify areas that can continually be improved upon. The Board considered reports on controls from internal audit, the external auditor and the compliance and risk management units.

For the period 1 April 2017 to 31 March 2018, nothing came to the attention of internal audit to suggest any issues. Thus, internal audit is of the opinion that, overall, the internal controls including financial controls of Mintek are adequate and effective.

Fraud Prevention

Mintek takes fraud very seriously. Mintek is committed to a high standard of ethical conduct and adopts a zero tolerance approach to fraud. Mintek has adopted a fraud prevention plan that incorporates principles contained in the Public Sector Anti-Corruption Strategy and aligned to the Protected Disclosure Act, 2000 (Act no. 26 of 2000) and seeks to focus particularly on creating awareness and promoting ethical business conduct.

The Fraud Prevention Committee consists of standing members with roles in finance, security and employee relations. The committee also includes a chairperson who is normally a divisional manager, appointed by the CEO on recommendation by Mintek's executive committee. In addition, the CEO forms part of the committee and the Head of Internal Audit serves as an advisor.

The Committee ensures that cases of fraud, corruption and theft reported through various channels are investigated. It also monitors progress of investigations and ensures that recommendations made by investigators are implemented by responsible people. Mintek ensures that there is a service for all stakeholders to report anonymously any unethical behaviour. This includes reports of suspected fraud, corruption, dishonest practices or other similar matters. The service is run totally independently of Mintek and all anonymous disclosures are accepted and anonymity honoured.

The ARC is responsible for the development of policies and practices for detecting, reporting and preventing fraud and corruption, serious breaches of business conduct, and whistle-blowing procedures that support reporting to the ARC.

Regular reports are submitted to the ARC by management, along with any further documentation and information requested on Mintek and the Fraud Prevention Committee's fraud and corruption prevention activities.

Code of Conduct and Business Ethics

Mintek's Code of Conduct and Business Ethics (the Code) serves to ensure a consistent and fair approach to ethics and management of conduct by advising employees on the required standard of conduct and behaviour in the workplace. This Code clarifies Mintek's expectations of its employees' conduct and behaviour at all times in line with Mintek policies and procedures.

The Code's guiding principles include:

- Conduct of Mintek's business with honesty and integrity by all employees and contractors;
- Display of acceptable and/or satisfactory behaviour of employees at all times;
- Voluntary compliance with all applicable laws and good business ethics practices;
- Fair dealings for mutual benefit in Mintek's relationships with customers, partners, contractors, suppliers and other stakeholders; and
- Commitment of employees to adhere to the principles in this Code.

Mintek's Executive Management is responsible for ensuring that this Code is enforced and adhered to by all employees and will investigate in the appropriate manner any breach of the Code irrespective of the seniority of the offenders. It is therefore obligatory for employees to report all actual or suspected contraventions of any section of this Code of Conduct to their immediate superiors.

Operational Performance

Mintek reports to the Department of Mineral Resources and is also accountable to the Department of Science & Technology and some other government departments for its technology-related R&D activities. Various key performance indicators (KPIs), encompassing financial, organisational, innovation and learning, human resources and transformation perspectives, provide Mintek with a basis for evaluating its activities in the identified key performance areas. Each KPI is supported by a set of identified measures, that provides a more specific and consistent base from which to assess progress.

Mintek's Management Committee convenes on a monthly basis where business plans, financial results and policy updates are presented. The budget for the current year is usually reviewed in September by executive management in order to keep track of and ensure overall sound financial management.

Going Concern

The Mintek Board reviewed the Entity's financial budgets for the period 01 April 2018 to 31 March 2019 and is satisfied that adequate resources exist to continue business for the foreseeable future.

Safety, Health, Environment and Quality (SHEQ)

The Safety, Health, Environment and Quality (SHEQ) committee is a management committee that oversees the policies relating to safety, health, environment and quality and their implementation across Mintek.

The SHEQ committee reviews operational performance, anticipates potential issues and provides support in setting direction for improvements. A functional safety, health, environment and quality unit provides a coordinated and effective specialist advisory support to the SHEQ committee.

Mintek has been certified by accredited independent external auditors to meet the requirements of safety and health (OHSAS 18001), environmental management (ISO 14001), and quality (ISO 9001).

The following SHEQ scores were achieved at the end of the financial year:

- The Lost Time Injury Frequency Rate (LTIFR) started at 0 on 01 April 2017 and ended on 0 on 31 March 2018 against a target of 1.0.
- The Health Incident Frequency Rate (HIFR) started on 0.3 on 01 April 2017 and ended on 0 on 31 March 2018, well below the target of 1.0.
- There were no major environmental incidents reported during the financial year, resulting in the Environmental Incidents (EI), remaining at 0 throughout, against a target of 1.
- The external Client Satisfaction Frequency Rate (CSFR) started on 97% at the beginning of the financial year and although dipping to 93% at the end of the financial year, was still above the target of 90%.

Remuneration Report

Mintek's remuneration strategy and practice is informed by a rigorous analysis of remuneration trends in the environment. Despite the tough competition created by mining industry remuneration practices, Mintek continues to strive to maintain a fair, robust and appropriate remuneration and rewards practice for its employees, which is augmented by other interventions that are aimed at improving staff motivation and retention.

The determination of Mintek's remuneration strategy and policy is among the duties of the Human Resources Committee. The Committee ensures that a remuneration policy framework supports the strategic aims of its business and enables the recruitment, motivation and retention of employees at all levels, while complying with all relevant regulatory and legal requirements.

The members of the HRC for the year under review were:

Mr MJ Rachidi (Chairperson and Non-executive Board Deputy Chairperson)

Mr RA Moatshe (Non-executive Board member)

Mr P Mkhombo (Non-executive Board member)

Ms K McClain (Non-executive Board member)

Mr D Msiza (Acting CEO and Ex-Officio)

Ms G Nyanda (Executive member – GM: Corporate Services and Company Secretary)

Remuneration Policy

Mintek's Remuneration Policy applies to all Mintek employees appointed on a permanent, contract, casual and vacational basis. The policy shall provide the basis on which to determine an appropriate rate of pay for each job in Mintek; a rate of pay that is fair, consistently applied across all jobs, and that is competitive with market trends.

This policy applies in line with Section 10(1)(b) of the 1989 Mineral Technology Act which requires the Board to determine conditions of employment including the payment of remuneration, allowances, subsidies and other benefits in accordance with a system approved by the Minister. This function has been further delegated by the Board to the GM Corporate Services in line with delegation of authority.

There were no changes to the Remuneration Policy during the period under review. The policy objectives remain that of implementing a fair and just rewards and benefits scheme that does not discriminate on race, gender, creed or in any other form of discrimination. It also advances the principles of fairness and equity in pay by promoting internal parity.

The internal disparity that was found to be existing in 2013, was first addressed during the 2013/14 financial year, with an aim of normalizing the pay curve for a small proportion of levels on the job grading system after Board approval. The year 2017/18 marked the fifth year of implementation of the normalization process.

The quest to contain Mintek's salary bill also continued during the year under review. While Mintek ensures that employees are fairly rewarded, it also ensures that there is a healthy balance between revenue and total employee costs. As a consequence, the remuneration mix that has been adopted included a performance-based, once-off bonus that does not have a long-term impact on the size of the salary bill. The growth rate of the salary bill is kept within the inflation target range.

Other Financial Benefits

The basket of other employee benefits is a deliberate strategy adopted by Mintek to mitigate the risk associated with its inability to compete with industry, in term of salary packages. The intention is to improve the quality of work life for the employees of Mintek, while also improving organisational performance. This basket includes a generous study package comprising a comprehensive bursary scheme that includes transfer payments to academic institutions, purchasing of study materials and books as well as leave provision for attending classes, preparation for exams and consultation with supervisors for Masters' and Doctoral students.

The determination of Mintek's remuneration strategy and policy is among the duties of the Human Resources Committee (HRC).

Attendees hear about Mintek's Biological Sulfate Reduction Process at the Technology Showcase Day at the Mintek Technology Demonstration Site, held on the 16th of March 2018.

OPERATIONAL PERFORMANCE

4

Inquisitive Learners who attended the Technology Showcase Day at the Mintek Technology Demonstration Site.

4.1 Energy Minerals

Graphite Work

The increased growth in the electric vehicle industry has resulted in more scoping studies being conducted at Mintek for graphite ores from Southern Africa. Based on laboratory scale testwork conducted on weathered graphite more focus is now being placed on fresh (un-weathered) ores with increased sulphur content. In addition, the need to produce bulk concentrates at pre-determined target specifications for marketing purposes has become more prominent over the last year. The challenges in upscaling from laboratory phase to pilot phase on an intermediate sized plant which feeds approximately 2-3 tons have been experienced along with process requirement challenges in catering for coarse flotation grinds. Mintek has conducted three projects of this nature with competency and capabilities being developed along the way.

Solar Sintering

During 2018, Mintek's Pyrometallurgy Division tried a highly focused solar reactor to replace the fossil energy used as part of the steelmaking process. The Division proposed that solar thermal reactors, able to reach temperatures up to 1200°C, could virtually eliminate emissions from processing manganese ore fines, by using solar sintering.

Manganese is the fourth-most used metal in the world, at 6 million tons a year, needed for everything from cars to skyscrapers, used in iron to make steel strong. South Africa mines 80% of manganese ores globally. But the fossil energy used to sinter manganese ores makes it very carbon-intensive. It is believed that by 2020, South Africa alone will produce 3.4 million tons of sinter, emitting nearly a million and a half tons of CO_2 annually.

The Division questioned whether solar can be used to replace fossil fuel combustion. They therefore tried to prove this concept on a small scale, and then describe it well enough to claim that it will work on a large scale. This is also the subject of a PhD study of one of the Pyrometallurgy engineers at the University of Stellenbosch. What makes this unique is that other scientists around the world are investigating solar heat for other mining processes, but not to use solar to sinter manganese ore fines.

Solar sinters make sense in South Africa with abundant space and sun. Most of the remaining 20% of global manganese comes from Australia, China, India and Brazil, also countries with abundant space and good solar resources for thermal solar processes.

4.2 Base Metals

Energy Efficiency Projects

The HIGmill is a vertical stirred media milling technology that was launched in 2012 by Outotec. During this financial year the Minerals Processing Division conducted an investigation on 5 liter and 200 liter pilot scale HIGmill units. The programme focused on improving the energy efficiency of Platreef PGM ore processing. Results have shown a potential for energy saving by using the HIGmill in a secondary grinding application. Testing is also ongoing on UG2 and Merensky ores from various South African PGM producers.

The Reflux Classifier

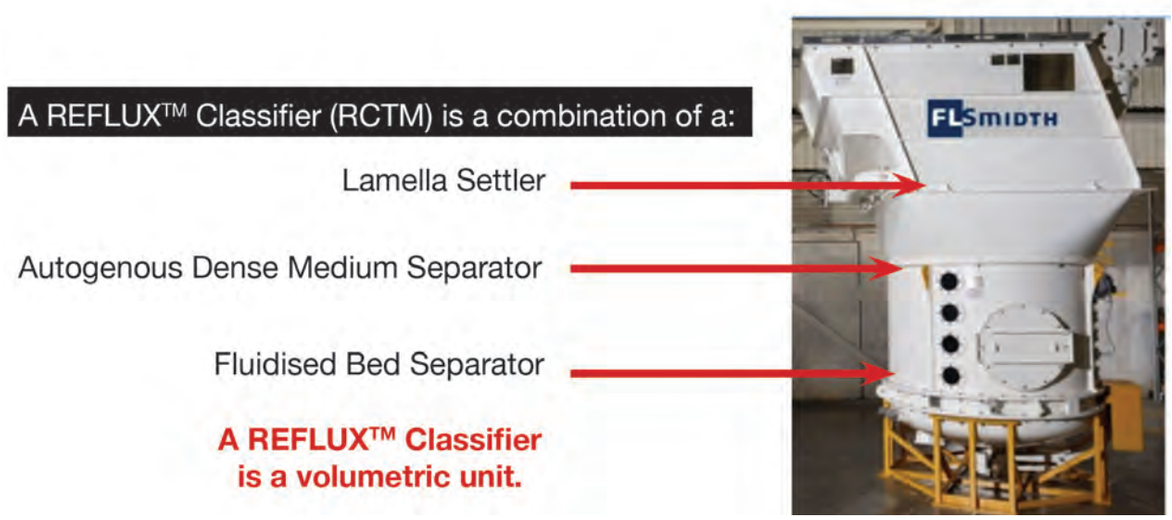
The Reflux Classifier (RCTM) depicted below is an

The Reflux Classifier

innovative fine ore (typically <1mm top size) separation device offering advantages in both gravity separation and particle size classification. The device combines a conventional fluidized bed with sets of parallel inclined plates in the overflow stream called lamellae for secondary separation of any misplaced heavy fines. Mintek has a pilot RC-100TM from FLSmidth installed in its Minerals Processing Division's Physical Separation Bay 3 for independent testing on various fines ore-types.

MPD's modelling capability uses both size by assay data and Particle Tracking Analyses (PTA) data produced by Mineral Liberation Analyser in Mintek's Mineralogy Division to provide a comprehensive process evaluation service. These models assess amenability of different ores to upgrading by a variety of fines gravity separation technologies including the RCTM. This approach has already resulted in commercial work from a wide spectrum of clients, particularly for flowsheet evaluations for the recovery of fine chromite. One major study recently completed was for a UG2 Platinum Concentrator Plant where the client is looking to remove chromite without PGM losses in the interstage on the primary rougher flotation tails before fine re-milling and secondary flotation. Plant construction has been completed with final commissioning underway. Mintek looks forward to a possible invitation for a full audit upon handover by the engineering company responsible for construction.

Fine iron ore and coal are the other areas where this technology is likely to make a big impact.



Typical commercial size RCTM unit (courtesy of FLSmidth)

Other Projects

As a response to the renewed interest in Cu/Co processing, a Mintek delegation visited Tenke Fungurumi in the DRC to do a plant audit as well as to market technologies for Cu and Co processing developed by the Hydrometallurgy Division. This visit generated significant interest in Mintek's MgO recycle and SO_2/air technology since they are having problems with both aspects. Although no new proposals have resulted for Mintek as yet, from this visit, the possibilities look promising and has yielded a request for work from Mintek's Mineralogy Division.

Mintek followed up on a longstanding relationship with a major Japanese resource procurer in February 2018 in order to identify any services that Mintek may be able to supply to them. They showed particular interest in the direct Co-EW route for cobalt production for export to Japan. This requires a two-pronged approach to both potential buyers and potential producers, which they are willing to undertake.

4.3 Ferrous Minerals

PyEarth™

PyEarth™ facilitated via the Ferrous Metals Cluster, is a novel smelting process to concentrate rare earths in slag whilst extracting the iron from the ore as a pig iron product. The process was demonstrated at pot scale and includes testing of the downstream hydrometallurgical processing of the slag. The results from the tests were promising and a provisional patent was filed. The PyEarth™ process can facilitate unlocking resources previously deemed untreatable via normal physical upgrading processes. A pilot plant test is planned to support the patent application.

4.4 Precious Metals

Gold Recovery from Carbon Fines

The patented process for the recovery of gold from carbon fines had previously been demonstrated on laboratory scale. During the fourth quarter an integrated continuous mini-pilot plant run had been completed to demonstrate that the process can be applied in a continuous fashion. The design criteria produced from this work is expected to lead to the design and supply of a modular technology package for the recovery of gold from broken carbon particles in the conventional gold processing flowsheet.

Other Gold Refining Technologies

Interest in gold refining technologies developed by Mintek continued during the latter half of the year. The first desktop study on Minataur (the Mintek alternative technology for gold refining) had been commissioned by a commercial client from Indonesia and this has led to a request for confirmatory test work from Mintek. If this projects proceeds then there is an opportunity for license revenue for Mintek. A further development was a quotation for the supply of a gold electrowinning cell to a client from Russia.

Pressure Oxidation

Pressure oxidation (POX) is commonly viewed as the most environmentally appropriate technology for processing arsenic-containing refractory gold ores due

to the stabilisation of arsenic in the leach residue. One of the largest disadvantages of POX, however, is that iron precipitates which form during POX exhibits high reactivity towards lime during the downstream cyanidation process and this leads to a large cost penalty. Mintek has developed a new technology for the intelligent manipulation of the iron to arsenic ratio in the solution of the POX autoclave, leading to the reduction of lime consumption by half.

Flotation Recovery from PGM Tailings

Projects focusing on flotation recovery from PGM tailings were executed during the year. These include the Dikgosi Selous project and Platmile project which employs Mach reactor technology as a means of enhancing metallurgical performance. Significant improvements in grade and recovery have been obtained utilizing this technology. The Impala Characterisation project is another PGM tailings recovery project focused on recovery of PGM's from existing Impala Chromite circuit. Testwork here has indicated that PGM of up to 40% is attainable from this stream. Another key project in this portfolio which was completed was the Everest Booysendal project, where approximately 30% of PGMs within the tailings were recovered via flotation.

4.5 Eco Efficiency and Environmental Protection

Treatment of Mine Effluent

Mintek undertook a two-year laboratory-scale test work programme to evaluate the passive biological sulphate reduction process for the removal of sulphate and metals from acid mine drainage (AMD). Metal precipitation and sulphate reduction efficiencies of over 95% were achieved under these conditions. Based on the test work programme conducted over the preceding two years, a set of process design parameters was specified, which was used for the design of a pilot plant.

The on-site pilot plant has subsequently been constructed, installed and commissioned at a coal mine site near eMalahleni. The early indications are encouraging and suggest that similar performance levels to the laboratory tests can be achieved under a similar operating regime. The plan is to operate the plant for a few months, during both summer and winter cycles. A preliminary benchmarking study was undertaken to estimate the capital and operating costs of an industrial-scale passive water treatment plant treating 1 ML/d of AMD.

SAVMIN™

Following years of research and development in intelligent

View of the installed biological sulphate reduction plant

process solutions for solid and liquid mine effluent, Mintek hosted a technology demonstration to showcase technologies at the Mintek Technology Demonstration site in Randfontein during March 2018. The demonstration site provides a platform for the intelligent integration of Mintek technologies developed to treat highly polluted waste water sites with high uranium concentrates such as Robinson Lake in Randfontein. The technology demonstration highlighted Mintek's revolutionary processes for solid and waste water treatment, namely: SAVMIN™, MetRIX™, NICMembrane™, Biological Oxidation, and Biological Sulphate Reduction. Made possible by the unique partnership with Sibanye-Stillwater, where collectively, the technologies have been refined to treat the mine-impacted waste water, acid mine drainage and the removal of toxic and radioactive elements such as uranium from the lake sediments to minimize the environmental impact of mining and mining legacies.

Learners from the local communities (i.e. Simunye Secondary School and Letsatsing Secondary School) were invited and transported to the demonstration site. This event was a great success, with 48 leaners and 2 teachers attending the event. The leaners showed great interest in the technologies and also to science, technology, engineering, and mathematics.

Learners and Mintek staff at the installed biological sulphate reduction plant

E-waste Treatment

The research programme evaluating and developing technologies for the recycling of e-waste continued during this financial year with focus on the hydrometallurgical recovery of valuable metals from printed circuit boards, the recycling of cathode ray tubes using a gas-fired rotary furnace and re-use of e-plastics. There is currently interest from various stakeholders in locally developed technologies and the intention is to pilot the processes within the next two years.

Austrian partners on the "Beyond Europe" funded project, evaluating the feasibility of implementing mobile e-waste treatment technologies in South Africa, visited Mintek during April 2017 and December 2017. During these visits the types and quantities of electronic waste collected from different sources in South Africa were mapped and a number of recyclers in Gauteng, Western Cape and Kwazulu-Natal were visited. In addition, a number of successful meetings were held with South African stakeholders including the Department of Environmental Affairs, TIA, eWASA and equipment manufacturers to discuss technology implementation and opportunities to form partnerships. There is currently much interest in the topic of e-waste management and treatment and there is clearly a role for Mintek to play, especially focusing on technology development and beneficiation.

Mine Site Rehabilitation

Mintek is managing the implementation of a programme of mine rehabilitation in collaboration with, and funded by the DMR. The programme formally continued from previous programmes with the conclusion of contract between the parties on 22 March 2016 with effect from 1 April 2016.

Locals at work on the Streatham project, Limpopo province

The programme is currently funded to the value of R150 million over a period of three years, ending on 31 March 2019.

Notable achievements related to the programme during the past year include:

- Commencement of works on the four (4) projects in the Streatham valley in the Penge area, Limpopo province, the biggest asbestos rehabilitation project conducted by the Department to date, creating work for more than 160 people;
- Completion of the designs and tender specifications for a further 5 projects, of which 4 are in Limpopo province (Steelpoort, Penge Village, Lagerdraai and Uitkyk) and 1 in Mpumalanga (Msauli). Two of these (Steelpoort and Msauli) commenced the tender processes during the year; and
- Completion of the field investigations and scoping reports for 61 medium-risk asbestos sites remaining on public land to enable future risk ranking and prioritisation.

4.6 Advanced Metal Applications

HySA/Catalysis Programme

Given the increasing demand for membrane electrode assemblies (MEAs) from HySA/Catalysis, both from the programme's commercialisation arm (HyPlat) and national demonstration projects driven by the DST, the need has arisen for both University of Cape Town and Mintek to adopt a single MEA fabrication procedure. An agreement was reached for both centres to implement the Dual Direct™ catalyst coated membrane (CCM) route given that most commercial demand is for CCM based MEAs that typically have a performance advantage over the standard catalyst coated substrate (CCS) or gas diffusion electrodes based MEAs. In addition the Dual Direct™ method lends itself more readily to high volume and lower cost manufacturing of MEAs that will become more important as demand for the HySA/Catalysis MEAs grows. In this work, the application of the Dual Direct™ CCM procedure was validated at Mintek on several H_2-only and CO-tolerant based MEAs. The H_2-only MEAs were compared to a benchmark CCM supplied by the University of Cape Town, against which

MinDiagnostics Malaria HRP II Test kit, a product of the Biolables Nanotechnology Unit.

the performance of the MEAs matched very well. The CO-tolerant CCMs, on the other hand, were compared to an industrial reference MEA, and again these closely matched the performance of the benchmark MEA under pure H_2, H_2/N_2 and reformate testing conditions. Hence, the Dual Direct™ CCM route was successfully implemented at Mintek and will be adopted in the majority of MEA development activities going forward. This will ensure direct transferability between Mintek and the University of Cape Town of any advances made at either centre, and has improved the production capacity of HyPlat, allowing increased demand to be more easily met.

Future work will focus on evaluating the durability of the HySA/Catalysis fuel cell catalysts in MEAs through the application of in-situ accelerated durability test protocols developed in the US DoE fuel cells programme, which have become the industry standard protocols. Specifically these protocols target the inherent Pt particle stability of the catalysts and the corrosion of the support carbon materials under operational conditions. This will provide a complete picture of catalyst durability and afford invaluable guidance in the development of HySA/Catalysis' next generation of electrocatalysts.

Nanotechnology Innovation Centre (NIC)

The DST/Mintek Nanotechnology Innovation Centre (NIC) is a DST Flagship programme that was initiated in 2007 with the focus of using nanotechnology and nanoscience to develop products and technologies in the areas of nanominerals (nanostructured materials), water (treatment and remediation) and health (diagnostics and bio-sensing). The Centre has four Units that carry out this mandate:

Biolabels Nanotechnology Unit

The aim of the Biolabels Unit is to develop nanotechnology-based alternatives for addressing health issues, such as diagnostics and therapeutics. The Unit does research and development of rapid diagnostic tests for animal and human disease detection for use at the point of care testing. Prototypes for HIV and Malaria have been developed and are currently undergoing field testing to validate their performance. Rapid test for zoonotic disease detection (Rift Valley Fever Virus and Brucellosis) are under development. Once the prototypes have been validated, manufacturing will take place in Mintek's ISO 5 manufacturing cleanroom for commercialization.

The environmentally-controlled cleanroom has semi-automated machinery, with production capacity of 21 million tests per annum. The Unit has partnered with an industry partner (Afri-sky Medical), who will be marketing and commercializing the diagnostic tests. The Unit together with its partners Afri-sky Medical and a South Korean-based company, NanoEntek Inc, have been awarded a 3-year contract for the supply of confirmatory HIV rapid test kits to the South African government in five Provinces (i.e. Eastern Cape, Western Cape, Mpumalanga, Free State and KwaZulu-Natal).

Water Nanotechnology Unit

The Water Unit continues to perform the development of novel membrane materials and adsorbent composites for water treatment and wastewater remediation. The Water Unit intensified its technology demonstration programme by conducting medium-term piloting of its technologies on the treatment of acid mine drainage/mining effluent and car wash effluent, and these assessments showed an upgrade of the water quality to levels that show potential for reuse in various applications.

Furthermore, the Unit was awarded a grant to the value of €90 000 under the Leading Integrated Research Agenda (LIRA) 2030 for Africa programme, to conduct a feasibility study on the use of renewable energy for use to power decentralized water treatment plants for the supply of clean drinking water to growing township communities in African cities. This study will be undertaken jointly with the Copperbelt University (Zambia) and the Human Sciences Research Council of South Africa. The study is expected

A selection of Nanominerals products developed by the Nanominerals Nanotechnology Unit.

to generate new solutions-oriented knowledge and contribute to the development of new urban paradigms in Africa and make African cities more resilient, adaptable and healthier.

Sensor Nanotechnology Unit

The Sensor Unit's mandate is to develop electrochemical sensors that are easy to use and do not necessarily require skilled personnel, that are robust in that they can be used in remote areas where sophisticated storage equipment is not available, portable and affordable. The Unit has developed a glucose sensor that uses nanoparticles produced in-house instead of enzymes used in the traditional sensors, and in-house produced screen printed electrodes which form the base of the sensors. The Unit is busy working on fine tuning the sensor to function in the presence of other interfering biological species. The Unit is currently working with the Measurement and Control (MAC) Division to develop a meter used to read the sugar levels in human beings.

Nanominerals Nanotechnology Unit

The Nanominerals Unit undertakes scientific research projects which have direct applications and correlation to the other development units (Water, Sensors and Biolabels) within the Mintek NIC. The Unit houses researchers with a wide range of proficiencies. This range and depth of expertise enable the staff members to synthesize a range of nano-inspired products and compounds that includes nanostructures of numerous shapes and sizes such as nanotubes, nanowires, and nanoparticles of a wide range of metals and compounds.

These are characterized extensively and applied to various technologies such as water treatment and rapid diagnostic test kits and gas sensors. The Unit has successfully synthesized and tested the application of a new type of nanowires for gas sensing, especially on one of the most dangerous gases which has claimed many lives of underground miners.

Centre for Metal-based Drug Discovery

The Centre for Metal-based Drug Discovery (CMDD) undertakes early stage drug discovery with the primary objective of identifying novel inhibitors of HIV-1 replication. The Centre comprises both chemists and biochemists and utilizes a structure-based approach to design and discover useful, small-molecule, inhibitors.

Based on a wide range of expertise that have been developed in the Centre for many years, the activities have been expanded to include Products and Services (P&S) provision and the development of advanced analytical methods for application in toxicity studies in water and the environment. In support of this future growth strategy, two senior members of the team attended the South African Department of Environmental Affairs (DEA) coordinated Chemicals and Waste Economy PHAKISA planning and implementation meetings that were held on 23 July – 25 August 2017. Through the CMDD, Mintek plans to have a presence in the execution of the broader National PHAKISA Strategy.

Products and Services (P&S) – During this financial year, the CMDD continued to successfully secure commercial work for internal and external clients, offering services such as organic chemical analysis, microbial count, bacterial identification, xanthates analysis, etc. CMDD sought the provision of SANS 241-1: 2015 for assessing the quality of drinking water, and had started implementing some of the analytical tests for ca. 50 determinants. This offering is an extension to other waste water quality analyses that are already offered). The new services offered included acute aquatic toxicity tests and toxicity identification evaluation in waste water systems.

The CMDD has acquired a Microtox®M500 analyser to determine acute aquatic toxicity, and Mintek effluent plant, boreholes, fish pond and water

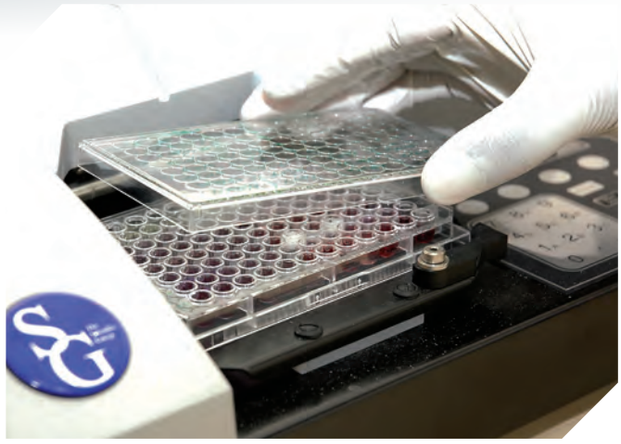
treatment technology developments were identified as key areas to best illustrate the capabilities of the toxicity test. This test can help in the early detection of any toxic effect emanating from industrial operations by monitoring the quality of the surrounding aquatic environments, locating and remediating the cause of toxicity at its source. It can also provide a fast means of assessing progress during the development stages of water treatment technologies (i.e. acid mine drainage).

Due to the above work, CMDD was requested to monitor some of the influents to Mintek treatment plant, highlighting the importance of correct disposal and treatment of acidic waste, which as per Mintek procedures, must be done at the source.

Dioxin Responsive CALUX® Bioassay — CMDD is building new capacity around the provision of a cost-effective environmental testing and monitoring solution for dioxin and other harmful persistent pollutants in gas emissions and other matrices.

Food Security – Aiming to develop novel compounds against agriculturally related pests and diseases, significant progress has been made on the Rep protein production and activity assays. Chicoric acid, was tested against Rep, and inhibited the protein, even at low micro molar concentrations. The inhibition of Rep by chicoric acid is a novel finding of this study, and may prove to be significant in the development of strategies in combating plant viruses.

Drug Discovery Research – An adaptation of the robust AlphaScreen assay for High Throughput Screening (HTS) of a 20,000 commercial compound library has been successfully implemented, allowing the identification of 66 compounds with novel structures as HITS for the HIV-1 Integrase-LEDG/p75 assay – with inhibitory percentage of over 50% at 10 µM following the TRUHITS validation assay. Two new families of compounds were designed, synthesised and biologically evaluated with the objective of selecting compounds showing over 50% inhibition at 100 µM for further chemical modification, while other two families of compounds were submitted for provisional IP protection. This project has a heavy human capital development component as most of the projects are executed in partnership with universities located both in South Africa and abroad.



The Centre for Metal based Drug Discovery (CMDD) screens natural or synthetic compounds, peptides and nanoparticles for antiviral and antibacterial properties as well as cellular toxicity against an array of cell lines

Physical Metallurgy

Mintek's Advanced Materials Division is currently executing an important and strategic programme, the Ferrous Metals Development Network (FMDN) on behalf of the Advanced Metals Initiative (AMI) programme of the DST. The objectives of the programme is to conduct research on high-performance materials aligned with the Department of Trade and Industry's (DTI) steel industry objectives, including the broader metals-related industry.

There are a number of R&D areas that were identified as key and those include computational materials science, corrosion, iron and steel research and precious metals alloys (platinum (Pt), other PGMs (palladium (Pd), ruthenium (Ru), iridium (Ir) and gold (Au)) that are coordinated under the AMI's Precious Metals Development Network (PMDN). Accordingly, a number of R&D programmes in those key areas are currently in progress in collaborative partnerships between Mintek and a number of Higher Education Institutes (HEIs) in South Africa. With regards to corrosion challenges that are prevalent in the broader South African industry, the Physical Metallurgy Group is involved in projects related to the use of corrosion mitigation measures to optimise plant performance in various sectors of the industrial economy.

During this financial year, the Physical Metallurgy Group executed about 250 projects in the service to the South African metals-related industries. These types of projects ranged from small projects (~ R10 000) usually provided to small and medium-sized clients; and large projects

(~R200 000) that are carried out on behalf of big clients such as well-established mining houses. The large projects, particularly, emanate from local industry, as well as large firms from SADC (Southern African Development Community) and ECOWAS (Economic Community of West African States) countries such as Ghana.

Small business development

Research in Small Scale Mining

During the year a number of artisanal, small and medium scale operations treating various ferrous metals were visited. This exercise was as a result of an increase in inquiries received by Mintek's Small Scale Mining & Beneficiation (SSMB) Division on how these operations can optimize their production. SSMB realised there was an opportunity to develop equipment that can be used to concentrate heavy ferrous minerals, especially suitable for artisanal and small scale operators. The final design of the gravity concentrator is a modified Pan-American jig design, with a pair of balanced jig cells and changeable mesh screens. Each cell consists of an upper hutch, a lower hutch, joined by an annular diaphragm of flexible rubber to allow up-and down movement of the lower hutch. This equipment will assist with increasing the productivity and generate more revenue for the artisanal and small scale miners.

A research project was initiated to find alternative uses to mineral waste, one such being fly ash. The focus of this project was on the conversion of fly ash to glass ceramics, incorporating other wastes as part of the process. It was successfully completed with the development of glass ceramic products with diopside ($MgCaSi_2O_6$) as the only crystalline phase. In the process certain heavy metals which are of major health concern were reduced through successive thermal treatments. The process developed from this research will enable the production of glass ceramics using mainly two waste streams, namely, fly ash and beverage waste glass.

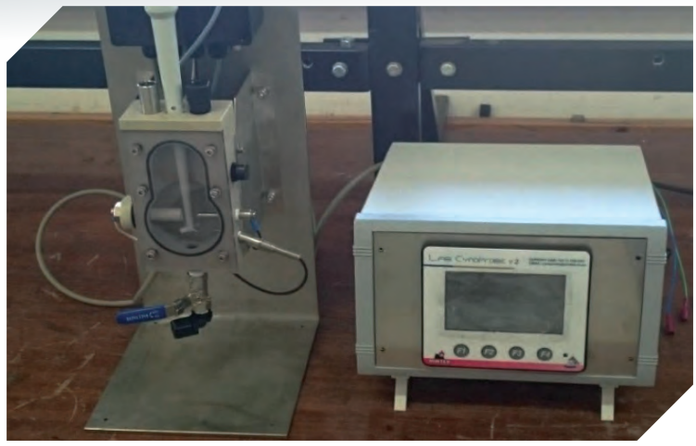
Mintek has entered into an MoU with DB Mining which is a small emerging mining company with interests in alluvial diamond mining and exploration with the intent to start operations on the mineral deposits in Bakerville, Northern West Province. Research and test work is being undertaken at Mintek to develop an efficient and economical small scale diamond processing flowsheet. The flowsheet will also involve the use of the Mintek designed diamond pan for small scale mining. The success of this project will not only allow for the start-up of a diamond mining operation but will also create several employment opportunities for the communities in the Bakerville region.

Training and Development

As part of its SMME Support and Incubation project, Mintek assisted in the resuscitation of Hulisani Mukondeni Pottery Primary Co-op which is located at Mukondeni Village, Ward 12 of Makhado Local Municipality in the Limpopo Province. The co-operative is operating on 3 hectares of land, where they are producing pottery products. They collect clay from the nearby river to make traditional pots. Mintek assisted the group to become operational by arranging for the supply of electricity to the project needed for the pottery furnace, connection, installation and commissioning of the furnace controller and facilitating further training to enhance the skills of the learners. The project created jobs for 16 unemployed individuals. Mintek also assisted the group with market access and sales of their products.

Mintek continued to provide technical assistance, marketing support and training to the OR Tambo group located in Benoni, Gauteng. During the year the learners were provided with pottery training at an intermediate level, glass slumping/fusion training and also an introductory business skills course. This training has helped the group run as a business and also expand its product range which in the past was only pottery. The group also designed and manufactured the glass trophy for the Mintek Diversity Forum Heritage Day celebrations.

The training of 40 learners in jewellery design and manufacturing was completed during the year. The learnership was funded by the MQA and includes learners at level 2, 3 and 4. The learners that benefited from this training programme were from Gauteng, North West and Northern Cape Provinces.



Mintek reached the impressive milestone of the 100th sale of the Cynoprobe v3.

4.8 Process monitoring and control

Technology Development

Another exciting development is the kick-off of the Mine Cooling Optimisation project at a local deep-level mine. The ultimate aim of the project is to use Mintek's sophisticated process modelling and real-time optimisation technologies to optimise the operation of the mine's refrigeration plant. This is done in order to maximise inventory build-up of cooling water during Eskom's off-peak periods so as to minimise the need to use the plant during peak hours, where electricity can be up to six-times more expensive than at off-peak times.

Energy costs account for 17% and 23% of the total cost of extraction of PGMs and gold respectively, and the refrigeration and ventilation systems required to enable work in deep mines account for a substantial share of this - so any energy savings here can have a big impact. Control of this process is highly interactive and notoriously difficult, with several prior APC vendors' attempts at automatic control failing as a consequence. As this is a completely new process area for Mintek's Measurement and Control (MAC) Division, the system was offered on a 3-month trial basis to allow the client time to evaluate the benefits. The client was however convinced of the performance after just 3 days of operation and chose to proceed with the purchase of the first phase implementation. Discussions are currently underway to expand the system further.

Process Instruments

A first order for the very specialised PulpCam, a camera-based Resin-In-Pulp concentration monitoring system, was received from a gold company in the USA. Mintek's FloCam, a camera-based instrument for measuring flotation froth velocity, which is used by Mintek's FloatStar control system to maximise grade (quality) and recovery (production) in PGM and base metal flotation plants, also received success with Northam's Booysendal PGM concentrator buying further cameras. Mintek also received an order for an additional Cynoprobe for the Herradura plant in Mexico. This is the 12th Cynoprobe to be bought by the Penoles/Fresnillo group. Interest in Mintek's carbon concentration meter, the C2 Meter, also appears to be increasing in North America. Atsco were appointed as distributors for this product in the USA, and they managed to secure an order for two C2 Meters within a month of being appointed. An additional C2 Meter was sold to a Canadian gold mining company for long-term evaluation.

During this year, Mintek reached the impressive milestone of the 100th sale of the Cynoprobe v3. The fact that this has been attained in only 8 years makes this achievement truly remarkable. The 100th Cynoprobe also happened to be the first sale of a Cynoprobe into Mauritania, bringing the number of countries where the Cynoprobe has been sold up to 28. Further sales were also made into Argentina, Burkina Faso, and Mexico during the same period.

Process Control Systems

A new embedded Robust Non-linear Model Predictive Control (RNMPC) process controller was successfully tested at a large gold mine in the Witwatersrand. Through innovative enhancements to the software, and improvements in computer processing power, this product runs one of the most sophisticated process

FloCam operator interface, displaying video streams of 6 flotation cells.

control algorithms available (RNMPC) on a cost-effective single-board computer. To put this into perspective, it was impossible to run this particular computer algorithm in real-time on clusters of the best available desktop computers not more than 10 years ago. The embedded system integrates directly with Mintek's Cynoprobe analyser to facilitate cyanide dosage control using Mintek's advanced RNMPC controller. This allows clients to benefit from Mintek's advanced cyanide controller technology with reduced capital investment in comparison to installing Mintek's PC-based StarCS control system, which requires a full desktop computer as well as expensive communication software.

In addition to the embedded RNMPC controller, Mintek also demonstrated a spiral control system on an industrial chrome-producing spiral plant. These spirals, which are used extensively within South African mining operations for the concentration of minerals such as chromite and heavy mineral sands, typically have no automatic system of regulation, resulting in fluctuating performance and loss of valuable mineral recovery. In FY17 an initial ON/OFF control system was implemented, and in FY18 the control was enhanced to provide continuous control. The system reduced the concentrate variability by more than 3 times and the 24 hour moving average by more than 6 times. This may open opportunities for the production of material that is of a high enough quality to beneficiate locally and results in cost savings of R57 000 per day for a typical small chrome producer. The technology is currently in the final stages of the PCT (Patent Cooperation Treaty) application process, with an encouraging first examination opinion having already been received.

After reviewing and experimenting with the various deep learning artificial intelligence frameworks available with the view to determining which are most appropriate for the application to process control, MAC was able to successfully apply the deep learning technology to solve process control challenges. The attention to, and capabilities of, this area of artificial intelligence have exploded on the global arena in the last few years, and the technology is set to revolutionise the way work is conducted in many areas in the future. The focus going forward will be to master more complex challenges and fine tune the implementation to enhance speed and efficiency. Mintek has in the process established contact with other centres of competence in this area in RSA, such as the CSIR Meraka Institute. Although the main focus of the MACs work will be on the application to process control, investigations into other areas in Mintek that may benefit from this technology will also be conducted with the view to creating a critical mass of skills in this area within Mintek.

Marketing Activities

The MAC Division presented the results obtained from the demonstration of its gravity spiral control system, reported during Quarter 4, at the SAIMM Chrome Colloquium held at Mintek in June 2017. The presentation was well received, with a leading international spiral producer expressing interest in Mintek's technology.

In September 2017, a MAC Senior Engineer presented a paper at the World Gold 2017 conference in Vancouver Canada, showing the long term savings accomplished through the application of advanced process control on the Thickener at RandGold's Loulo mine in Mali. The results obtained for the 12 months after commissioning showed a 10% saving in flocculent and 15% in lime when compared to the 12 months before commissioning. These significant savings in energy and reagent costs all help to keep existing mines sustainable in the face of the current tough economic conditions – helping to keep mines operating and miners employed.

The relationship with RandGold continues to bear fruit for both parties, with increased coverage of Mintek's advanced process control solutions and better and faster measurements provided by Mintek's instruments -

delivering more ounces at lower cost to RandGold. Other expansions include the extension of the FloatStar Flow Optimiser system to the cleaner circuit flotation cells at the local Tharisa PGM concentrator plant, and the purchase of the Flow Optimiser system on the rougher section at the Lubambe Copper Mine in Zambia after a successful trial.

Collaborations and Science Promotion

International Collaborations

- Test work on the Horizon 2020 funded project, INTMET (Integrated Metallurgy), is progressing well. The project focuses on on-site 'mine-to-metal' hydrometallurgical processing of low-grade, complex, polymetallic ores to achieve efficient recovery of valuable metals such as Cu, Zn, Pb and Ag. A flowsheet has been developed at Mintek for an integrated bioleaching-metal recovery pilot process based on the results obtained during a laboratory-scale programme. An integrated pilot plant is currently operated at Mintek to validate the process and supply data for a costing study. As part of the dissemination activities a presentation, 'The EU INTMET Project to exploit the Iberian Pyrite Belt polymetallic ores', was delivered at the Metals Mining Hall, Seville, Spain during October 2017.

- The Hydrometallurgy Division continued to explore new funding and collaboration opportunities through the European Union collaborative R&D initiatives such as Horizon 2020. In February 2018 a senior researcher visited a workshop in Serbia for a review of the INTMET consortium project as well as to discuss new initiatives for the exploitation of low grade polymetallic deposits.

- A Steering Committee meeting was also held in February 2018 with Mintek's Finnish partners in the bilateral research initiative on the exploitation of phosphogypsum dumps as a secondary source of REE (Rare Earth Elements). An exciting new technology had been developed as a result of this work that promises to more than double the extraction efficiency of REE from these dumps.

- Mintek staff members attended the 2018 SME Annual Conference & Expo in Minneapolis, USA from 25 - 28 February 2018. They delivered oral presentations on the following papers:

  o An Overview of Mintek's Competency in Phosphate Beneficiation; and

  o Pre-concentration of fluorspar using Dense Media Separation.

  The presentations were well received by the attendees and resulted in the Americans requesting that they collaborate with Mintek on joint research studies focusing on iron ore.

- As part of Mintek's initiative to bring the CALUX® technology to South Africa for the detection of Polychlorinated Diaromatic Hydrocarbons (PCDHs), Polychlorinated Biphenyls (PCBs), dioxins, furans, other biological toxicants as well as measurement of contamination levels at industrial sites. To this end, a staff member participated at the 37th International Symposium on Halogenated Persistent Organic Pollutants (POPs) - DIOXIN 2017 that was held in Vancouver, Canada from 20 – 25 August, 2017. The staff member delivered an oral presentation entitled: From e-Waste Smelting Processes to the Implementation of the CALUX® Bioassay.

- Staff from the Minerals Processing Division attended the MetPlant 2017 that was held in Perth, Australia from 11-12 September 2017. The conference brought together design and maintenance Engineers, Operations Managers, Planning Engineers, Metallurgists and Process Engineers, Environmental Specialists, Equipment Suppliers, Service providers and Consultants to discuss and

review developments in metallurgical plant design and the optimization of operations.

- A staff member attended the 2017 Energy Harvesting Workshop and Conference that was held from 11 – 14 September 2017 in Falls Church, Virginia, USA. The staff member delivered an invited talk entitled: Development of Lean-Rare Earth Permanent Magnet for Renewable Energy Applications. The objective of the presentation was to seed interest in rare earth work that is ongoing at Mintek and to cement plans for collaboration between Mintek and Virginia Tech on materials for energy research.

- Minerals Processing Division staff members attended the "Computational Modelling 2017" and "Physical Separation 2017" conferences in Falmouth, United Kingdom from 13 – 16 June 2017 to promote visibility of Mintek. The conferences were attended by academics from various universities around the world as well as by researchers from the Commonwealth Scientific and Industrial Research Organisation (CSIRO). At these conferences, three papers were presented namely "Stirred media milling modelling"; "Discrete element method (DEM) computational modelling technique"; and "Pilot Dense Medium Separation of Fe ore fines".

- Staff members from the Advanced Materials Division presented at the discussion workshop on: "Advanced Materials and Nanotechnologies" – Smart Sensing: Quantum Investigations in Living Systems, that was held at Tor Vergata, Rome, Italy (11 – 12 May, 2017). Thereafter, from 13 – 19 May 2017, technical visits organized by the USA-Italy Joint Commission were undertaken. Various national laboratories under the auspices of the National Research Council (CNR) in Italy, namely the Institute of Polymers, Composites & Biomaterials - IPCB-CNR-Naples/Portici, the Italian Aerospace Research Centre (CIRA), CNR-Bologna Research Campus, the Institute for Microelectronics and Microsystems - IMM-CNR and the University of Bologna, Bologna, Italy were visited and presentations on Mintek were delivered at each of these institutions. During these interactions, discussions on potential collaborations with a number of leading scientists in Smart Sensing and other related areas were initiated with the aim of jointly applying for research funding to enable collaborations.

Africa

- Mintek staff members visited Tenke Fungurume Mining (TFM) in the Democratic Republic of Congo from 5 – 9 February 2018. During this visit they were taken through the vast facility comprising Ore handling, Milling, Leaching, Solvent Extraction, Cu Electrowinning, Co precipitation and H_2SO_4 production plant. While going through the plant, process flowsheets were discussed and areas for potential improvement were identified. The relationship established between Mintek and TFM through this trip has paved a way for further engagement in the future.

- Mintek hydrometallurgy researchers attended the SAIMM Uranium 2017 conference in Swakopmund, Namibia and presented three well received papers on the poisoning of uranium resins by polythionate formation and the application and operation of NIMCIX ion exchange columns. After the conference, operations of Rössing and Langer Heinrich were visited where direct discussion on potential collaborative projects took place.

- As part of enhancing the visibility of the on-going R&D programmes the Mintek CMDD group hosted twenty two (22) Honours students from the Botswana Institute of Health Sciences on 1 March 2018. As part of further enhancing the visibility and credibility of Mintek, by promoting various R&D programmes that are currently ongoing, a manuscript entitled "Screening of the NIH Clinical Collection for inhibitors of HIV-1 integrase activity" has been published in the South African Journal of Science Volume 114, Number 3/4. In addition, a review article entitled Synthesis and application of pillared clay heterogeneous catalysts for wastewater treatment has been published in a prestigious Royal Society journal.

- The Commissioner of the Ministry of Mineral Resources for Adamawa State, Nigeria visited the Analytical Services Division. The purpose of the visit was to analyze some gold samples and to initiate discussions about the establishment of a Mintek office in Nigeria. Mintek is keen to assist the Nigerian government to establish their own analytical facility in Nigeria, rather than a Mintek office.

Delegates from the joint CIMERA (Centre of Excellence for Integrated Mineral and Energy Resource Analysis) and AMREP (Applied Mineralogy for Resource Efficiency of Platinum group elements) consortium, hosted by Mintek in March 2018.

- Mintek was invited by the Raw Materials Research and Development Council (RMRDC) in Nigeria to present a plenary address at their 5th RMRDC International Conference held in Abuja from 11 – 13 July 2017. The presentation was entitled "Imperatives of Small Scale Minerals Processing in Economic Development".

- During the week of 19 – 24 June 2017, a Mintek delegation undertook a trip to the Democratic Republic of Congo to conduct a series of visits to mining companies and institutions to raise awareness of the products and services offered by Mintek.

- A staff member participated and represented Mintek at the Joint Nanotechnology Workshop between South Africa and Senegal, which took place in Dakar in June 2017.

South Africa

- During March 2018 Mintek hosted the joint CIMERA (Centre of Excellence for Integrated Mineral and Energy Resource Analysis) and AMREP (Applied Mineralogy for Resource Efficiency of Platinum group elements) consortium, an international collaborative research programme between German and South African research partners to foster knowledge and technology exchange in Geometallurgy. The goal of the consortium is to develop a geometallurgical model for PGE (platinum group elements) in the Bushveld LG (lower group) and MG (middle group) chromitites using Cronimet's Thaba Mine as a case study". The programme supports three PhD and four MSc students who are studying in Germany. The programme has had exchange visits of three Mintek staff in Germany and one German student in Mintek.

- Mintek and the DMR hosted a two day workshop from 19 – 20 October 2017 on Small Scale Mining and Minerals Beneficiation for the South African Women in Mining Association (SAWIMA) at Mintek, Randburg. The event was highly successful and the keynote address on the first day was presented by the Honourable Deputy Minister of Mineral Resources, Mr. Godfrey Oliphant.

- The 15th International Ferro-Alloy Congress was successfully hosted by SAIMM, ICFA (International Committee on Ferro-Alloys), with PDD leading the organizing committee and presenting four presentations during the conference, held from 25 – 28 February 2018 in Cape Town.

- According to the National Association of Corrosion Engineers (NACE), the cost of corrosion is currently estimated $1.8 trillion dollars/year worldwide. In the water supply chain, most critically, this leads to ~ 25-30% of the water supply wasted due to leakages owing to corroded underground steel pipes. For this reason, and to ensure Mintek's relevance as a corrosion solutions provider, several staff members in the Physical Metallurgy Group are actively involved in the Corrosion Institute of Southern Africa (CorrISA), where one staff is the Chairperson of the CorrISA Student Organisation (CorrISO) and another senior staff member is a Conference Organising Committee Member responsible for the international AfriCORR 2018 Conference.

- The Mine Metallurgical Managers Association of South Africa (MMMA) in association with Mintek hosted the FLSmidth REFLUX Classifier™ (RC™) open day on 8 August 2017. The event was well attended by over 80 mining and engineering house delegates with interests in a wide range of commodities, largely chrome/PGM's, Iron Ore and Coal.

Deputy Minister of Mineral Resources Godfrey Oliphant speaking at the South African Women in Mining Association (SAWIMA) workshop on Small-Scale Mining & Beneficiation held at Mintek on 19 October 2017.

- A dewatering and water recycling facility to recycle process water from Mintek's flotation pilot plant was built and commissioned. The dewatering process was demonstrated using a PGM ore, with and without recycling water back to the flotation plant. The effect of flocculant and flotation reagent build-up on flotation performance was also evaluated and found to be negligible at low levels of residual flocculant in the recycle water. A group of 46 vacation work students assisted in the commissioning and operation of the plant as part of a collaborative venture with Wits University.

- An agreement was signed in accordance with an MoU with Unisa for the joint acquisition of an X-ray microscopy instrument. This will allow shared use between Mintek and Unisa towards research on 3D imaging for beneficiation purposes and advanced materials analysis. A visit to Unisa's Florida Campus offered further opportunities for collaborative projects.

- Staff members from the Minerals Processing Division attended the 7th International Platinum Conference 18 – 19 October 2017 hosted by SAIMM in Polokwane, South Africa. A staff member presented a paper titled "Experience in the development of flowsheet options for BRPM's Styldrift resource". Attending the conference was important since the presentation and the resulting interactions with delegates were able to give Mintek the required exposure and positioning as the place where important research could be undertaken.

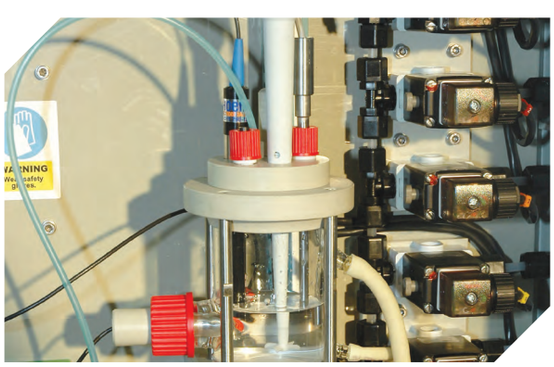
- Staff members from the Advanced Materials Division attended a number of very strategic workshops and conferences with the aim of further enhancing the visibility and credibility of Mintek, by promoting various R&D programmes that are currently ongoing in the Division. The conferences included: the Science Forum South Africa (SFSA) 2017 that was held from 7 – 8 December 2018 at the CSIR International Convention Centre; the 2nd LIRA 2030 (Leading Integrated Research for Agenda 2030) stakeholders' workshop on 13 December 2017, where stakeholders from the Department of Water and Sanitation, Eskom, South African Local Government Association, Biogas SA, International Council for Science (ICSU, the project funders), the Human Sciences Research Council (HSRC, project partner), University of Johannesburg, the City of Johannesburg Municipality and its subsidiaries (Gauteng City Region Observatory, Johannesburg Water).

- Staff members from the Advanced Materials division participated in the Operation Phakisa on Chemicals and Waste Economy from 20 July - 25 August 2017. During this period work-streams (i.e. waste minimization, municipal waste, industrial waste and chemicals) were defined and the task team was charged with the responsibility to identify and develop initiatives critical for the reduction of environmental impact, GDP growth and job creation. Mintek participated actively in industrial waste stream and committed itself to work with the Department of Environmental Affairs on the sub-stream of soil amelioration.

The Mintek/DST Nanotechnology Innovation Centre (NIC) tours are open to the public.

SUSTAINABLE DEVELOPMENT

5



Mintek sells its 100th Cynoprobe V3 worldwide

5.1

PERFORMANCE AGAINST MINTEK'S SUSTAINABILITY FOCUS AREAS

For a global leader in its field, it is vital for Mintek to adopt a business practice of sustainable development. Mintek has therefore tailored its activities, to not only meet the needs of its stakeholders, but also ensuring that its practises enhance, protect and sustain human and natural resources for the future. The activities vary from upskilling the workforce to raising awareness and funds for just causes.

The table below lists Mintek's sustainability-related focus areas and summarises its progress in addressing these areas.

INVESTING IN MINTEK'S PEOPLE	
HOW MINTEK PERFORMED IN 2017/18 FY	**WHAT MINTEK IS COMMITTED TO**
• Allocated 31 full time and 178 (109 in 2016/17) part time bursaries towards feeding its bursary pipeline and for the recruitment and retention of critical skills.	• Continue efforts to build a values-driven high-performance culture across all of the operations.
• Mintek trained 14 learners on the artisan learnership programme against a target of 6.	• Intensify positive progress towards achieving employment equity in the workplace and in particular, increase the female component at Mintek.
• For the first time in many years, Mintek was able to achieve its target of 90% of designated group representation.	• Increase the proportion of staff with MSc and PhD degrees.
• As in last year, achieved the target of 3% for employees with disabilities.	• Roll out more empowerment strategies for women and people with disabilities.
• Achieved 8% staff turnover rate against a target of 9%.	• Increase innovative activities centred on graduate mentoring and training of mentors.
• Hosted 11 wellness interventions against a target of 5.	• Continue to implement strategies to retain professional staff at Mintek.
• Spent 2.1% of payroll on training and development interventions for its employees.	• Further develop the capability and increase the ability of Mintek to attract a broad spectrum of young graduate scientists and/or engineers.
• Against a target of an average of 6 years of Mintek experience for its researchers, Mintek was able to achieve an average of 9 years, well above the target.	• Continue to enhance employee health and wellness programmes.
• Average age of researchers at Mintek at 37 years.	• Award all available bursaries and attempt to absorb as many bursars as possible.

The lifestyle challenge participants are doing a variety of exercises which help them to maintain a healthy lifestyle.

ENSURE SAFETY, HEALTH AND WELLBEING OF MINTEK'S PEOPLE	
HOW MINTEK PERFORMED IN 2017/18 FY	**WHAT MINTEK IS COMMITTED TO**
• The Lost Time Injury- and Health Incident Frequency rates at year-end were both 0 and well below the tar gets of 1.0.	• Continue efforts to have zero harm in all areas of safety, health and wellness.
• There were no major environmental incidents reported during the year.	• Continue blood donation drives, TB screening initiatives and awareness campaigns and weight maintenance programmes through amongst others, the boot camp sessions held at Mintek after work hours.
• As is the trend over the years, there were no work-related fatalities during the year.	• Increase audiometry and ENT initiatives amongst employees to determine incidences of hearing loss due to noise.
• All Mintek divisions scored higher than the 80% target on their internal audit scores for integrated SHEQ audits.	• Continue efforts on HIV/AIDS awareness and support.
• Conducted 860 medical surveillances for employees, bursars and trainees, including 493 annual medicals, 183 entrance medicals and 165 exit medicals.	• Continue to encourage employees to do physical exercises and quit smoking in order to improve spirometry.
• A total of 679 spirometry tests were performed with all spirometry tests results within normal ranges and therefore no external referral to pulmonologists.	
• A total of 839 audiometry tests were performed during the year. Only 10 of these tests recorded were in the PLH (10-19.9%) range while a total of 23 fell within the PLH (5-9.9%) range. Therefore, a total of 806 employees had normal interpretation results according to the SANS 10083-2013 specifications.	

Pholokgolo Ramothwala during the Candle Light memorial

MINTEK'S RESPONSE TO ENVIRONMENTAL CHALLENGES	
HOW MINTEK PERFORMED IN 2017/18 FY	**WHAT MINTEK IS COMMITTED TO**
• A total of 2.5 tonnes of waste comprising cardboard, paper and plastic was recycled, compared to 9.3 tonnes the previous year.	• To continuously report on environmental process improvements.
• A total rebate of R20 526 was received for recycled scrap metal, cardboard, paper and plastic. During the 2016/17 FY, Mintek embarked on a massive cleaning operation and generated a total rebate of R47 123.	• Further investments and increased investigations to reduce atmospheric emissions.
• Approximately 24 tons of scrap metal was recycled, compared to approximately 73 tons the previous year.	• To intensify efforts to save water through the reticulation project.
• Total carbon emissions measured for the year amounted to 11 982 tons/year CO_2, up by 547 tons/year CO_2 on the previous year. The 2017 figure reflects a decrease of 57% on the 2011 base line year figure of 37 468.	• Mintek should fast-track the current project pertaining to the recycling of effluent plant water for reuse.
• Total water consumption has increased from 38,100 kilolitres last year to 46,153 kilolitres this reporting period.	• Investigate the harvesting of rainwater on Mintek premises for use in operations.
	• Enforcing the movement of water saving awareness e.g. display all water consumptions (similarly to the electricity consumptions) via the display panels in the Block 9 foyer.
	• The required electronic meters are being bought to record the most important consumption points.
	• Continue to document all water losses across the campus including evaporation and seepage. However, this process will take some time as some data is not readily available.

ASD employees proudly wearing Mintek red and black gather for a group photo during the Analytical Symposium

THE QUALITY OF MINTEK'S WORK	
HOW MINTEK PERFORMED IN 2017/18 FY	**WHAT MINTEK IS COMMITTED TO**
• Mintek produced an average external customer satisfaction frequency rate of 93%, against a target of 90% for 10 technical divisions. Five (5) of the 10 divisions received zero bad surveys for the twelve-month period.	• To continue with value-adding process improvements, process performance and management programmes with regards to quality of Mintek's research and technology development work.
• All technical divisions reached their 80% target for project information chart (PIC) submission success. PIC is a measure of the quality of the initial information on environmental aspects and compliance with Mintek codes and policies.	• To increase training interventions and ensure that more employees are educated on ISO9001 changes.
• In terms of IP creation and transfer, Mintek filed 2 patents, finalised 1 license agreement and made 15 discoveries (IPR_PFDR Act).	• To continually work on improving external and internal customer satisfaction rates.
• Mintek produced 57 technical articles in credible publications (14% higher than the target of 50).	• To continue to send young scientists and engineers to participate at relevant conferences all over the world. More focus will be placed on opportunities for young, black female scientists and engineers.
• Mintek participated in 135 conference presentations and posters. This is 39% higher than the target of 97.	

The Mintek Undergraduate Bursar students walked away with awards during the Work Integrated Learning (WIL) and Bursar Seminar, and Undergraduate Bursar (UGB) Awards held on 25 January 2018.

SMALL BUSINESS AND SUPPLIER DEVELOPMENT

HOW MINTEK PERFORMED IN 2017/18 FY	WHAT MINTEK IS COMMITTED TO
• As in the previous financial year, Mintek's Small Scale Mining and Beneficiation Division successfully adapted and developed 2 new technologies relevant to small scale operators, for transfer to rural and marginalised communities.	• In line with Mintek's key strategic objectives, continue to develop and support economically sustainable rural and marginalised communities.
• Through its support for rural and marginalised communities, Mintek successfully created 4 new businesses against a target of 4. From these businesses, 42 jobs were created.	• Intensify training and skills development interventions in rural and marginalised communities.
• 100% against a target of 95% of businesses set up in 2017 are still in existence after 1 year, while 73% against a target of 71% of businesses are still in operation after 2 years.	• Sustain efforts to provide technical and marketing support to beneficiation centres in all provinces agreed on with the MQA and other funders.
• Mintek's accreditation in jewellery manufacturing/ design and small scale mining has been extended to August 2018.	• Continue its efforts with preferential procurement spend with Empowering Suppliers qualifying as QSEs, EMEs, minimum 51% black owned and minimum 30% black women owned suppliers.
• Spent 90%, against a target of 85%, on BEE procurement as a % of total discretionary spend.	• Intensify efforts to increase expenditure on learning programmes for black people and disabled black employees.
• Mintek qualified and is measured as a Generic Specialised Enterprise.	

5.2 INVESTING IN MINTEK'S PEOPLE

Mintek's training and development interventions that were implemented during the period under review had a dual-focus. The first area of focus was the development of employees through short skills training and part-time bursaries towards substantive qualifications. Training and development of employees positively contributes to Mintek's strategy execution and overall performance as an organisation. It enhances employee engagement and connectedness with the organisation, and is a critical component of Mintek's retention strategy.

In this regard, Mintek invested a total of R6 342 389 in payments to service providers for the delivery of various employee development programmes including short courses, certificate programmes. Ninety percent (90%) of the employee development programmes spent went towards core/technical training. In addition, Mintek invested R1 170 579 in employee bursaries.

As a consequence, Mintek's qualification profile continually improves, reflecting the substantial investments in employee development that characterises the company ethos. By the end of the financial year, more than two-thirds of employees had qualifications that were at NQF Level 6 and above. Even more encouraging is the fact that 39% of employees had post-graduate qualifications that at honours, masters and doctoral levels. For a science council that relies heavily on the quality of employees to develop products and services, Mintek's training and development interventions must yield suitably qualified scientists, engineers, technicians and even support staff.

The second area of focus was the talent pipeline of young people who were studying full-time towards a qualification in the science, engineering and technology fields of study. Externally focused programmes are aimed at developing Mintek's future pipeline of science and engineering candidates by providing undergraduate and postgraduate bursary programmes for full-time study and internships supported by mentoring. A total of R3 317 718 was transferred to a number of universities, as part of Mintek's bursary programme that funded 31 students. Female representation in the bursary cohort has improved significantly to at 60% at undergraduate level

EMPLOYMENT STATISTICS

OCCUPATIONAL LEVELS	MALE				FEMALE						TOTAL
	A	C	I	W	A	C	I	W	MALE	FEMALE	
Top Management	3			2	1						**6**
Senior Management	6	1	1	2	1			3			**14**
Professionals, Specialists and mid-management	19	2	5	22	19	1	7	7	4	4	**90**
Skilled technical, academically-qualified, junior management and supervisors	111	7	5	22	150	6	8	22	5	2	**338**
Semi-skilled	91	4		1	24	1					**121**
Unskilled	53	1			1						**55**
Total Permanent	283	15	11	49	196	8	15	32	9	6	**624**
%	45%	2%	2%	8%	31%	1%	3%	5%	1%	1%	**100%**
Gender %	**59%**				**41%**						**3%**

Graduate trainees complete Mintek GDP. From left to right: Walter Ndlovu, Hlengiwe Mnculwane, Mosili Pebane, Nanji Sheni and Mbavhalelo Maumela.

and 69% at postgraduate level. These are future Mintek employees, who will not only contribute effectively to the core business of Mintek, but will also yield a positive shift in the demographic profile of the organisation as it strives to attain its employment equity targets.

Employment Statistics

On 31 March 2018, the total permanent employee count at Mintek was 624. The accompanying table gives a breakdown by occupational level, race and gender.

For the first time in its history, Mintek reached the 41% mark in female representation. This milestone is a result of continued efforts to encourage women in science and technology and has come from a base of 33% four years ago. Mintek will continue to strive towards the attainment of 46% female representation in its staff compliment, which is higher than the female component in the Gauteng economically active profile of the population. While this is a stretch target, it is attainable with amplified efforts.

Pipeline Development Programmes

Effectively identifying and developing the next wave of scientists and engineers is crucial to Mintek's ability to develop a healthy talent pipeline that supports succession and ensures business continuity. As mentioned above, Mintek has a healthy bursary programme that serves to maintain the desired flow of suitably qualified graduates over the long-term. Furthermore, the Graduate Development Programme (GDP) and coaching and mentoring programmes provide a more structured approach to nurturing and advancing the skills and capabilities of both new graduates and existing employees in Mintek. The GDP emphasises on-the-job technical training supplemented with formal supervisory and management training. While the coaching and mentoring programme will promote a culture of continuous learning and growth within Mintek.

During this financial year Mintek awarded 31 full time bursaries. Some highlights include:

- Increased number of female bursars to 68%;
- 93% of the awarded bursaries are from the previously disadvantaged groups;
- 100% absorption rate of the 2 undergraduate students who successfully completed their studies; and
- 18 undergraduates and 13 postgraduate students benefitted from the full time bursary scheme.

A critical success factor of Mintek's GDP is the regular assessments of the competency levels and progress monitoring of the graduate trainees at the different stages of their rotation between various Mintek divisions. Ultimately, graduates are rated on the Mintek performance management system based on input that includes records of attendance and participation in training programmes. During quarter 3, the FameLab format of presenting was introduced in the GDP programme. The reason for the introduction of FameLab was to ensure that new engineers and scientists are able to talk confidently and accessibly about their research work in order to facilitate opportunities for collaboration and funding. All GDP participants, excluding one GDP who was appointed last July, have successfully met or exceeded requirements of the programme, which meant that they could proceed from trainees to the next level of employment as professionals.

Mintek also implemented other pipeline development programmes that are a collaborative effort between Mintek and other state entities, namely, the NRF, the DST and the MQA.

The annual DST and NRF Internship Programme, known as the Professional Development Programme (PDP) attracted sixteen candidates during the course of the year, seven Pre-Doctoral and nine Post-Doctoral candidates. The PDP is a critical initiative of the DST and NRF, whose objective is

Staff from MPD as the Apex award winners for the Sensors Sorting of Coal-Demonstration plant.

to address the shortage of students registering for full-time post-graduate studies. Mintek hosted five candidates full-time on a fixed-term contract basis, and provided them the much-needed opportunity to conduct their research using Mintek equipment and resources, under the supervision of Mintek's research specialists.

A few programmes of the MQA were also implemented during the year. MQA programmes are largely work integrated learning programmes and form a critical requirement for National Diploma students to qualify. To support this need, Mintek, would host the students in the Work Integrated Learning (WIL) programme, to offer practical learning to students from Universities of Technology. During the year 82 students participated in different programmes. Of these:

- 37 WIL new students were appointed in January and February 2018;
- 29 Interns were funded by MQA, NRF, Mintek and SAASTA; and
- 16 RPDP students were enrolled.

Both the PDP and the WIL programmes are examples of the success that can be attained when state entities collaborate for the benefit of the country. Programme participants not only obtain an opportunity for practical learning experience, they also stand to be the first people to be considered for employment, should entry level positions become vacant. Equally, Mintek has an opportunity to identify high potential students who could be suitable for future absorption into the business ranks. During the second half of the year, the WIL students were required to present as part of their programme close off. Through these presentations, Mintek was able to ascertain the positive impact it had on the students, as they came in with no technical experience at the beginning of the programme and are now exiting the programme with a wealth of technical knowledge.

Artisan Learnership Programme

The Artisan Learnership Programme is a unique initiative that is both an employee development and a pipeline development programme. It emerged from a history where it was solely focusing on "growing our own timber", but has since extended to include external participants. The motivation for extending the reach of the programme was primarily to recruit females into a field that has previously been dominated by males. Mintek has partnered with the MQA to deliver the programme. The programme enrolled 14 learner-artisans. Of the 14 learners (8 internal and 6 external), 6 were females. Three (3) internal learners completed their programme.

Recognition and Excellence Awards

Mintek fosters the culture of recognising employee performance and long service commitment.

Apex Awards

The Mintek Achievement of Performance Excellence Awards (Apex Awards) are prestigious accolades that are aimed at giving due recognition to excellence amongst employees. In December 2017, these awards were awarded in four categories (a) Demonstration, (b) Technical Innovation, (c) Technology Transfer and (d) Commercialisation. The excellence awards ceremony is preceded by a rigorous selection process that ensures that only the best ideas go through for consideration by the selection committee. The awards were handed over by a team comprising the Board Chairperson and some Board members, the Acting CEO and staff from the HRD and IAC divisions.

The Demonstration Award category recognises successful demonstration of pilot plant testwork or a technology demonstration which could lead to technology transfer. The award in this category went to a team in the Minerals Processing Division, for "Successfully commissioning the sensor sorting of coal – Demonstration Plant". The

Proud recipients of the 5-year Service Awards Group. There were also award recipients for 10,15, 20, 25, 30 and 35 years.

demonstration plant was commissioned at Vlakfonfontein mine. The recipients comprised Isabel King, Neo Makhalemele, Carl Bergmann, Mluleki Hopu, Ashley Sehume, Desmond Mangena, Tshepo Magaseng, Unathi Mqala, Paul Miyanga, David Tshikumbana, Sammy Mathebula, Getrude Marape and Thato Radebe.

The Technical Innovation Award for an adaptation or discovery of a process or product with novel characteristic which ultimately lead to beneficial commercial application. This award went to Tshiamo Legoale, a scientist in the Small-Scale Mining and Beneficiation Division for winning the International FameLab, science talk competition in the United Kingdom. A second award went to Dr Eugene Lakay and Dr Olga Yahorava from the Hydrometallurgy Division for the "Enhanced recovery of rare earth elements from modified forms of phosphogypsum" project.

The Technology Transfer Award is given to recipients when a process or product has successfully been transferred to industry. Dr Loutjie Coetzee and Marcelle de Kock of the Measurement and Control Division received the award for a "Model-based Optimisation of a Mine Cooling Water System". John Neale and Stefan Robertson of the Biotechnology Division also received the award for the "Mondo Minerals Nickel Sulphide Bioleach Plant" project.

The Commercialisation Award is awarded for a project completed with income generation well above realistic budgeted targets. The award was received by Stefan Smit, Nathan Anthony, Ruphus Rabulanyana, Tshepo Ramatheko, Vikash Arjun, and Christopher Hockaday for the "100th Sale of Cynoprobe v3 units".

Long Service Awards

The long service awards recognise values and contribution of employees who have reached a service milestone through their loyalty and commitment to the success of the organisation.

The awards were given to employees in the 5, 10, 15, 20, 25, 30 and 35 year categories.

The 5 years category was given to 36 employees, the 10 years category to 46 employees, the 15 years category to 6 employees, while 7 employees received the 20 years long service award. The 25 years award was received by Trevor Ashley Shame and the 30 Years award went to Sandra Graham. The 35 Years award went to Rodney Jones, Samson Mbewe and Philemon Shalang.

Recognitions

Jeffry Baloyi, a scientist in the Advanced Materials Division, was awarded the Best Session Oral Presentation and Paper on the 9 December 2017 at the International Conference on Advances in Science, Engineering, Technology and Waste Management (ASETWM-17) hosted by North West University.

5.3 SAFETY, HEALTH AND WELLBEING OF MINTEK'S PEOPLE

Four (4) Corporate SHEQ meetings were held during the financial year. The meetings are used for monitoring and reporting on progress that is made against safety and health targets and standards; progress on environmental protection, including radiation protection and nuclear material management as well as training and inspections, among other things. The meetings also review policy, objectives, targets and procedures of the SHEQ system, as well as customer satisfaction frequency rates, both internal and external. All the relevant safety statistics are captured in section 5.1 of the report and in the CEO's review report.

Mintek intensified its efforts to ensure the safety and good health of all employees, including contractors. A site audit was conducted in Streatham where Mintek is implementing a mine rehabilitation project under the Derelict and Ownerless (D&O) mines programme. The Mintek team was accompanied by a team of inspectors from the DMR who advised Mintek on what to implement to ensure that contractors working on Mintek projects comply with legal requirements for SHEQ. There were no incidents of lost time injury at the D&O sites.

Occupational Health

Occupational health services are best suited in identifying both occupational and non-occupational risk factors that can pose a challenge to employees' health in the workplace.

Mintek therefore closely monitors and reports to the Board on the following aspects of occupational health care:

- Medical surveillance programme (including entrance, periodic, exit and executive medicals);
- Medical surveillance testing (including audiometry, spirometry and biological monitoring);
- Injuries on duty (IOD); and
- Non-Occupational health (primary healthcare, wellness screenings, etc.).

At the end of the financial year, 26 IOD cases were reported to the clinic. These were categorised as follows:

- 3 minor injuries which required first aid;
- 20 injuries treated at the Mintek clinic by occupational health nurses; and
- 3 injuries required the attention of outside medical professionals and were reported to COID.

Mintek continued its strong focus on primary prevention of hazards. Mintek achieves this by constantly training employees on safety procedures and other training such as Health and Safety Law, basic fire-fighting training and basic radiation protection training. In addition, there is a very strong SHEQ structure that meets regularly and reports on any health and safety issues. Mintek also ensures that it protects the work environment. As a result of Mintek's stringent rules, no major health incident has

A nurse from the Sandown Clinic is conducting a rapid diagnostic test for cholesterol before taking sputum specimen for TB screening on Jackson Tshabalala.

A rapid oral fluid test is taken from a participant by swabbing the device against the upper and lower gums.

been reported throughout the year.

Employee Wellness and Non-Occupational Health Programmes

Mintek's employee wellness programme is a comprehensive programme that includes occupational and primary health management provided under the auspices of the Occupational Health Clinic, as well as the Employee Assistance Programme (EAP).

Wellness and incentive programmes can be used to drive and reinforce healthy behaviours, bringing benefits to the employer, the employee, and to the community. Employers may utilise a wide range of wellness initiatives such as smoking cessation programmes, flu shots and health fairs, newsletters, etc. Mintek recognizes the benefits of investing in the wellness of their employees and feel that the wellness benefits it offers are appreciated by employees, positively impact their health and well-being and create long-term value for the organisation.

Throughout the year the Occupational Health Clinic also monitored canteen hygiene, and sent monthly food samples for external testing for all forms of bacterial contamination. During the Listeriosis outbreak, the Clinic focused its monitoring on Listeriosis Monocytogenes, and requested reports on the contracting suppliers to ensure that foods marked by the Department of Health as dangerous, were not used by the canteen. The reports ascertained that the hygiene in the canteen was satisfactory and that the food was safe for consumption and free from Listeria bacteria.

At the end of the financial year, Mintek had 4 blood donation drives where a total of 60 employees successfully donated blood. Some employees that were keen on donating but failed screening tests were counselled by the SANBS nursing staff.

A wellness screening week was conducted in May 2017 and further screening took place during September and October 2017. Health screening tests included blood pressure, cholesterol, glucose and body mass index. Nearly 300 employees attended the wellness week and at least 65 employees benefited from screening day organised by Mintek on behalf of Discovery Health. Other non-occupational health programmes and activities included primary health care programmes, first-aid competitions, cancer screening, an HIV prevalence survey as well as HIV management programmes, tuberculosis awareness campaigns and healthy lifestyle challenge competitions.

Dominic Jordan (MAC) completes a health questionnaire to undergo a health screening.

5.4 PROTECTING THE ENVIRONMENT

Organizations must exemplify a desire to integrate the economic, environmental and societal aspects of its business to achieve sustained financial success, safeguard the environment and develop the company's reputation as a respected corporate citizen. It is believed that if businesses realistically and carefully make attempts for sustainable development, they can reduce the adverse environmental impacts of business operations on local communities, develop clean manufacturing and pollution prevention processes and technologies, explore environmentally neutral or beneficial products and services, and help conserve natural resources and improve environmental conditions around the world.

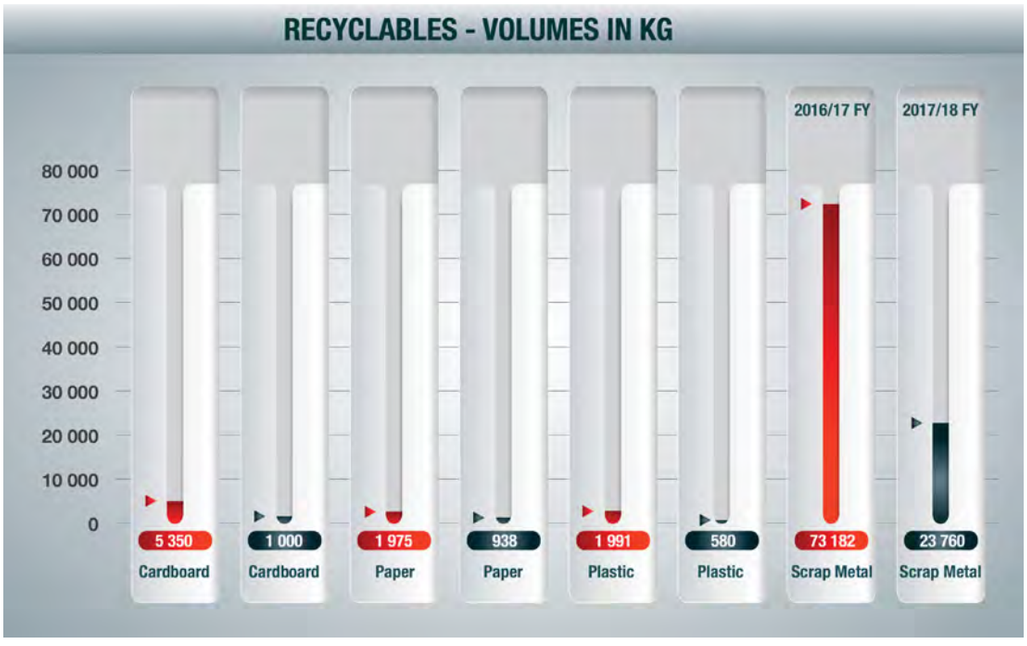
Mintek continues to integrate its sustainable development agenda, and associated programmes and standards fully in all activities and all functions as an essential element of management. Like most businesses, Mintek produces its fair share of waste. From excess packaging to uneaten food, this waste extracts a huge environmental toll through increased deforestation, greater use of energy and filling up landfills. By using recycled products, Mintek puts in a concerted effort to reduce its environmental impact.

Mintek also continues to responsibly ensure that its operations do not contribute to environmental degradation by monitoring its environmental footprint and implementing a wide range of measures to protect the environment. The measures implemented on the Mintek campus mainly pivot around water and energy use, as well as the management of waste that follows the waste lifecycle that prioritises reduction, re-use and recycling, recovery, and treatment before disposal.

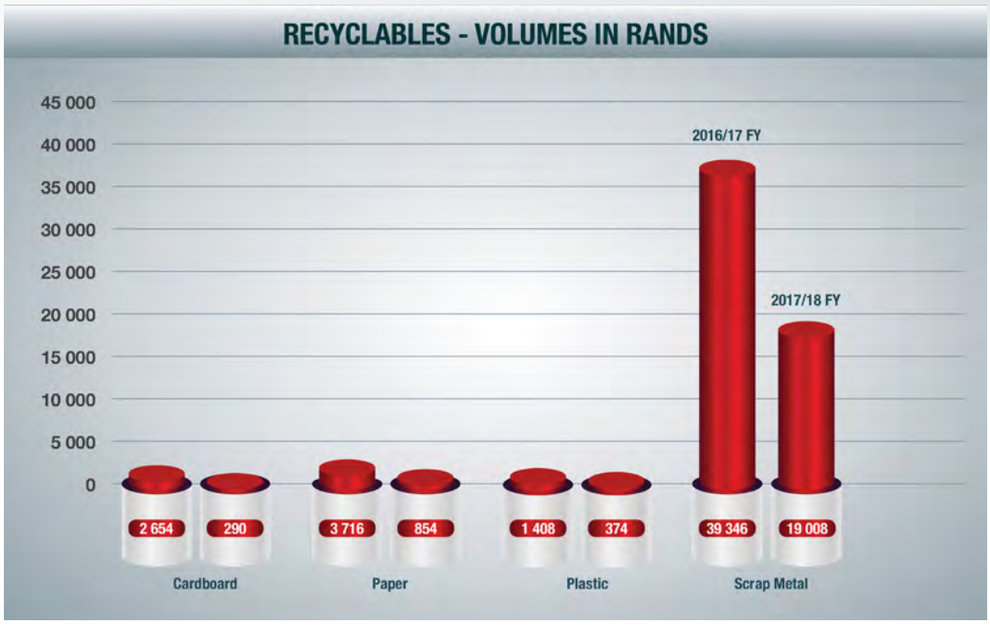
Management of Waste

Recycling is the process of converting waste materials into new materials and objects. It can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing energy usage, air pollution (from incineration), and water pollution (from landfilling) and makes the environment more attractive.

Mintek's recyclable volumes of metal, plastic, paper and cardboard over the last two years are depicted in graph 1 below.



Graph 1: Comparison of volumes of recyclables over the last two years



Graph 2: Comparison of rebates received for recyclables over the last two years

Graph 2 above depicts the rebates received from the waste service provider for the collection of these recyclables over the last two years. During the 2016/17 financial year, Mintek embarked on a concerted effort to clean up the entire campus and as a result the recyclable waste was significantly higher than the waste recycled during this financial year.

Mintek's Water footprint

For Mintek, the update and recording of its water footprint is a long-term requirement for saving of both water consumption and costs. The continued, ensured supply of water is a real risk that could pose increasing challenges to businesses during the next few years. This scarcity could contribute to raising prices, increased operating costs and increased levels of regulation and competition among stakeholders for access to water. To ensure continued operation in this challenging environment, Mintek must institute actions to execute its business activities with less water. For an R&D organisation such as Mintek, achieving that goal is an opportunity as well as a necessity.

Mintek's water footprint report contains the quantification and analysis of the water footprint of the research and development (R&D) operations at Mintek for the period 01 January 2017 to 31 December 2017. The report records the amount of water used and improves the existing water footprint data record in Mintek. The information contained in this report can be used to more effectively manage water consumption, reduce water pollution, and identify risks and areas where improvements in water efficiency can be enhanced. The expected result is to reduce water wastage, develop more sustainable products and use resources in a more efficient way.

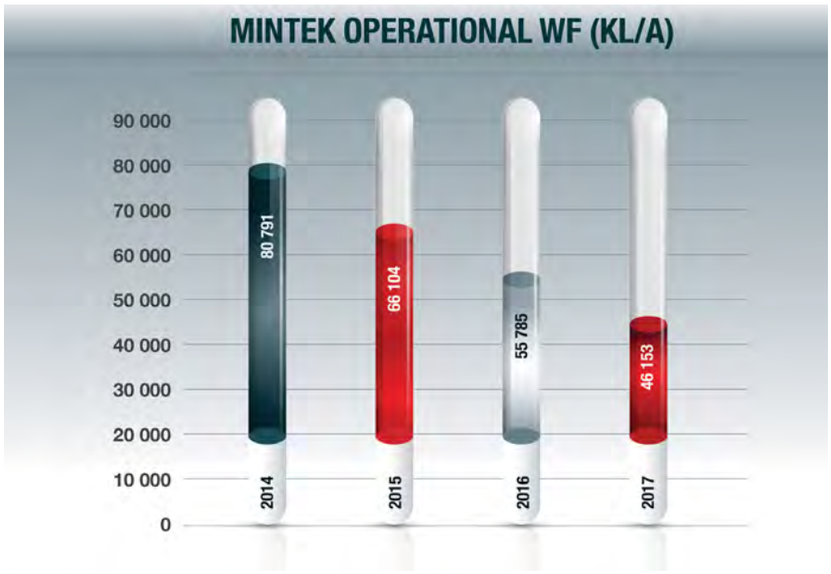
The total blue water footprint which reflects direct consumption for Mintek, was measured at 46,153 Kl for the period 01 January 2017 to 31 December 2017. On-site R&D activities which make up the blue WF were quantified for the entire operation of Mintek production chain. The result indicates that more than 90% of the total blue WF is attributable to services that Mintek produces and offers.

Approximately 2% of the blue water used on site to water lawns is sourced from dedicated boreholes on the premises. Mintek's blue water consumption has reduced by approximately 60% from the consumption originally reported in 2014, when the first water footprint report for Mintek was conducted. Most of Mintek's water footprint is attributable to operational water usage. The facilities that consume considerable amounts of water at Mintek include the Jumbo bay & store, crushing and drying areas, and the west yard and gardens, followed by Block 9000 and the single quarters. Mintek has reduced its total blue water footprint (freshwater consumption) year-on-year by a cumulative 60% since the water consumption was first recorded and the monitoring and management of water on-site.

Table 1				
Mintek Operational WF (kl/a)	**2014**	**2015**	**2016**	**2017**
Green*	0	0	0	0
Blue**	80 791	66 104	55 785	46 153
Grey***	0	0	0	-
TOTAL	**80 791**	**66 104**	**55 785**	**46 153**

*Refers to the consumption of rain water stored as moisture in the unsaturated zone of soil.
** Refers to water consumed from surface water sources, including municipal supplies.
*** Refers to water pollution and is defined as the volume of freshwater required to assimilate the load of pollutants based on ambient quality standards.

The table above and Graph 3 below illustrate the blue WF from the baseline year (2014) to date. There has been a significant reduction of both potable water consumption and effluent discharges from 2014 to date, owing to the implementation of water management strategies.



Graph 3: Downward trend of blue WF Y2014 – Y2017.

The water footprints of external companies providing services to Mintek were not part of this study. The volumes of outflows consist of effluent discharges and water losses through evaporation and seepages for the facilities at Mintek. The overall amount of outflows released for the period from 01 January to 31 December 2017 is approximately 20 084.765 kl/a. More than 90% of the outflows are effluent discharges generated from the technical divisions where most of the test work and laboratory analyses take place. This process water is regularly analysed and treated before its discharged to the municipal sewerage system. As part its sustainability reporting, Mintek is considering the recycling of the process water and harvesting of rainwater in order to reduce as much as possible the usage of potable water from Rand Water Board.

Using information from monthly water usage and effluent discharges, annual water balances are presented in the form of a water balance sheet which has now included see page and evaporation. Using data from the water balance, an input-output and operational model were drawn up. Going forward, this model will assist in reporting data, especially the outflows which will now include water losses, in a consistent manner. In this regard, additional recommendations will be made to achieve even more savings in water consumption.

A key to a sustainable future for Mintek's production system lies in understanding and utilising resources (water and energy) more efficiently. In the five years since the release of the first water footprint study, several advances have been made in the organisation to standardise water reporting. This process often poses challenges for other companies in the early stages, especially when attempting to examine the entire corporate production chain. This study addresses these gaps by clearly defining terms and system boundary choices in a way that could be easily emulated by other companies in a similar economic sector.

5.5 QUALITY OF MINTEK'S WORK

Like most businesses, Mintek creates products and services that are sold to its customers for a reasonable profit. In return, these products or services must live up to a certain quality standard expected by Mintek's customers. If the quality level is not met, Mintek faces consequences such as customer defection, reputational damage, legal issues and unsafe products.

Mintek's customer base largely consists of repeat clients who are drawn to its products and services by a consistent quality management systems that assures them of the quality of Mintek's work. Mintek continues to build its reputation for quality by maintaining certification with the ISO Integrated Management Systems. By doing so, Mintek ensures the consistent quality of its products and services and this makes an important contribution to its long-term revenue and profitability.

Mintek's promise to quality is tested through client surveys that customers, both internal and external, are asked to complete at the end of each phase of the project or at times only at the end of the project. The survey tests a customer's satisfaction with the product or service, the promptness within which the product or service was delivered, the degree of satisfaction with communication during a project, and the customer's perception of "value for money". Furthermore, customers are asked if they would bring repeat business and recommend Mintek to others. At the end of the 2017/2018 financial year, the average external customer satisfaction frequency rate (CSFR) for the 10 technical divisions was 93%, which is above the target of 90%. The two divisions that missed the target are the Advanced Materials division and the Measurement and Control division. Reasons submitted by customers for poor surveys included turnaround time of report submission, product payment terms and poor communication regarding travel arrangements. Mintek's internal CSFR average at the end of the financial year was 94% against a target of 90%. The only division that could not reach the corporate target was the Engineering and Maintenance Services division. In terms of SHEQ integrated audit scores, all 16 Mintek divisions (including the service divisions) exceeded the target of 80% with the corporate average at 92%.

Project Information, Safety and the Environment

Mintek monitors the risks associated with its work through project information charts (PIC). The quality of the information submitted for the risk assessment is measured by the PIC submission success rate where the target has been set at 80%. The PIC provides assurance that all Mintek's projects are executed according to a set of protocols that consider whether the project involves the treatment of solid or liquid materials; whether it involves the building or operation of equipment and whether the project has any potential significant environmental or safety risks. At the end of this financial year, all Mintek technical divisions were able to achieve submission success rates of higher than the 80% target. The average obtained for the 10 technical divisions was 93%.

Technician transferring samples after dissolution on PGM prills.

5.6 CORPORATE SOCIAL RESPONSIBILITY

Mintek's Corporate Social Responsibility (CSR) strategy espouses the organisational value of teamwork and building a common sense of purpose amongst all its staff. The strategy is anchored and based on two key tenets, the mobilisation of employees to do good by their fellow citizens and a corporate programme that largely focuses on education and training initiatives within the mineral processing and metallurgy fields.

Mintek's CSR encompasses projects/activities that are external to the normal business activities of Mintek and not directly for purposes of increasing profit. Mintek's projects have a strong developmental approach and utilise company resources, primarily through the time and efforts of its employees to benefit and uplift communities and are not primarily driven as marketing initiatives.

Minerals Education Trust Fund

Mintek supports the Minerals Education Trust Fund, which was founded by the Chamber of Mines so that the industry could consolidate its support towards education, teaching and research. The fund supports institutions of higher learning, attracts, retains and develops undergraduate teaching staff; creates academic centres of excellence; and fosters collaboration.

Employees showing colourful hairstyles and props during the Mintek workplace CANSA Shavathon.

CANSA Shavathon

Mintek employees raised R38 140 during the Shavathon challenge for the cancer patient care and support programmes of the Cancer Association of South Africa (CANSA). In 2017, R42 720 was donated to CANSA. The event was held to show solidarity to families, friends and colleagues who have been affected by cancer.

Learners showing smiles of appreciation after receiving sanitary towels from members of Mintek's Diversity Forum.

Sanitary Drive

Mintek employees, through the Diversity Forum participated in the Sanitary Drive campaign to help deprived school-going girls by collecting 715 sanitary wear and 38 underwear. The items will be donated to a secondary school in Cosmo City, Johannesburg.

PDD staff members celebrated Casual Day dressed in blue & white outfits.

Casual Day

In support of the National Council for Persons with Physical Disabilities in South Africa's flagship initiative, Casual Day, Mintek mobilised employees to support the campaign by purchasing tickets at R10 each. A total of 475 tickets were sold throughout the organisation. The Pyrometallurgy Division staff members celebrated Casual Day dressed in blue & white outfits to show their immense support to people living with disabilities.

Goods (tables, chairs and cabinets) being donated to Mbhekwa High School.

Nelson Mandela Day

The International Nelson Mandela Day has inspired people to take action and effect some change. Mintek joined the global movement to do well in honour of the late former President Nelson Mandela. Mintek donated furniture (comprising chairs, tables and cabinets) to Mbhekwa High School in KwaZulu-Natal province. Preloved beds, mattresses and chairs were also donated to Othandweni Family Care Centre in Soweto. The furniture was delivered by road freight from Mintek, Randburg to the respective destinations.

The SABC Education aired the Ispani 8 episode 26, showcasing Ntiskelelo Shange, a Mintek Bursar and a Jewellery design and manufacturing student at the University of Johannesburg.

Career Guidance programmes

Mintek recognises the importance of creating awareness of careers and the work it does. Working with Blue Wizard Productions, producer for the SABC education TV programme Ispani, Mintek supported two episodes featuring careers of an analytical chemist and jewellerymaking in Mintek. The episodes profiled careers of Mintek Scientist, Hlengiwe Mnculwane, and Ntsikelo Shange, a Mintek bursar studying for jewellery makes and manufacture at the University of Johannesburg.

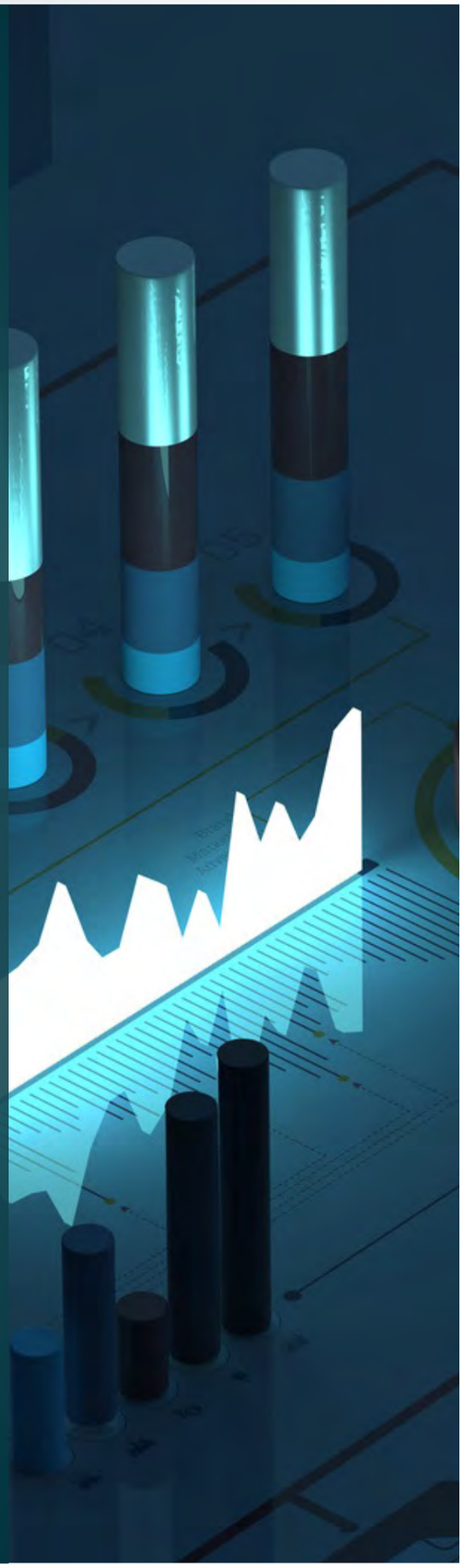
Learners from Dr BW Vilakazi Secondary School in Soweto, during their visit to Mintek.

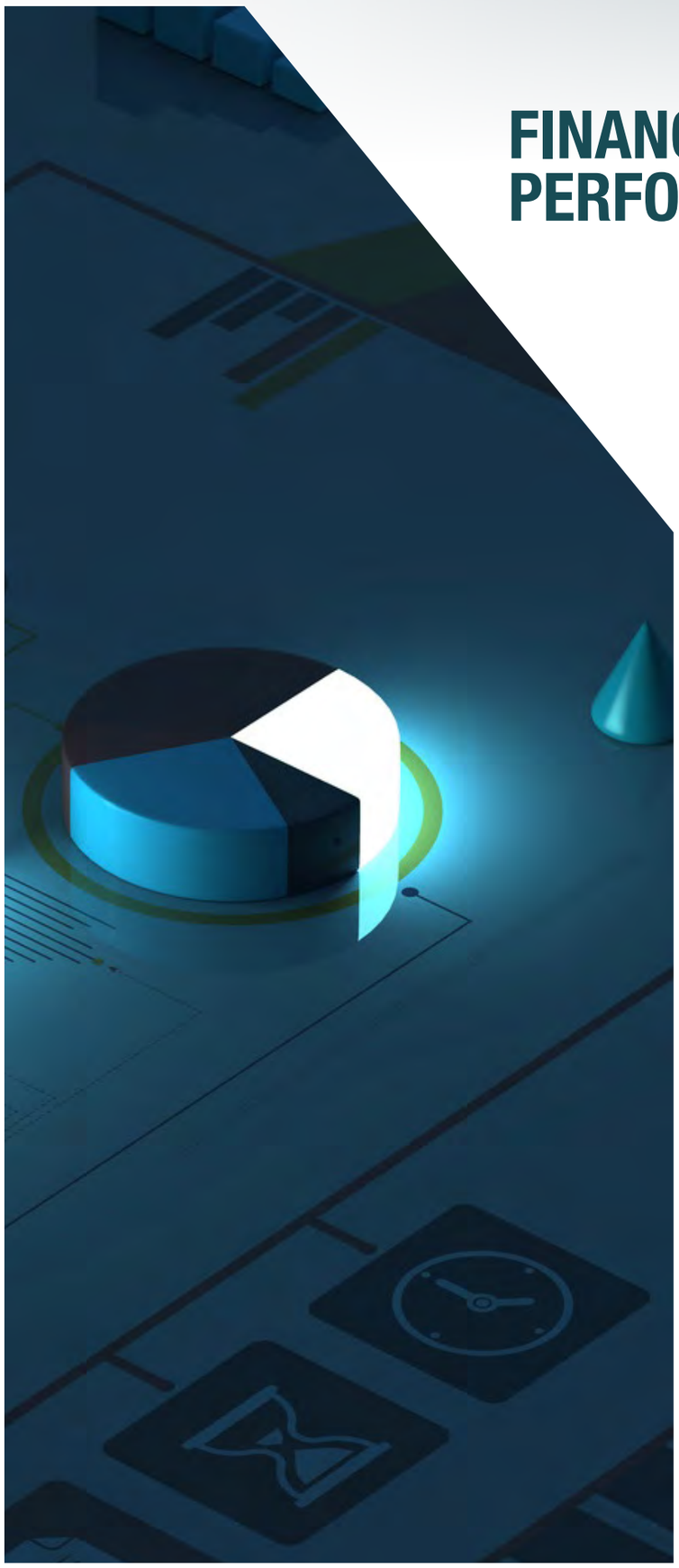
Take a Child to Work Day

Mintek participated in the Take a Child to Work Day initiative affording 10 high school learners an opportunity to be job-shadowed in various Mintek divisions. The learners were taken on a tour of Mintek technical divisions and were exposed to the work done by professionals in Mintek. The programme provided students with an insight in careers in science, technology and engineering which could inspire them to study further at institutions of higher learning.

GENERAL INFORMATION

Country of Incorporation & Domicile	South Africa
Mintek Directors (As at 31 March 2018)	Namane Dickson Masemola *Chairperson* David Msiza *Acting CEO* Dumisani Dlamini Daan du Toit Khetiwe McClain Phahlani Mkhombo Andries Moatshe Samke Ngwenya Morale Rachidi Dr Siyabonga Simayi Dr Sarah Mohlala
Mindev Directors	MA Mngomezulu SA Simelane RL Paul M Mphomela GL Rapoo
Registered Office	200 Malibongwe Drive Randburg 2194 South Africa
Business Address	200 Malibongwe Drive Randburg 2194 South Africa
Postal Address	Private Bag X3015 Randburg 2125 South Africa
Holding company	Mintek (100% owned) incorporated in South Africa
Auditors	Auditor-General South Africa





FINANCIAL PERFORMANCE

6

6.1 CHIEF FINANCIAL OFFICER'S REVIEW

1. Profitability

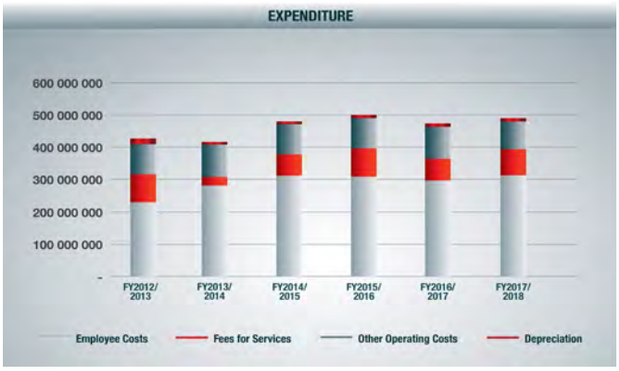
1.1 Revenue

Mintek's revenue for the year under review was 7% higher when compared with the prior year. The rise in revenue was above the 6% average inflation rate (CPI). The improved performance is mainly due to derelict and ownerless asbestos mine rehabilitation in addition to revenue enhancement initiatives that Mintek embarked on during the latter part of the year under review. The improved performance is also attributable to a boost in business confidence within the mining industry and a better economic outlook in 2017/2018.

1.2 Operating Costs

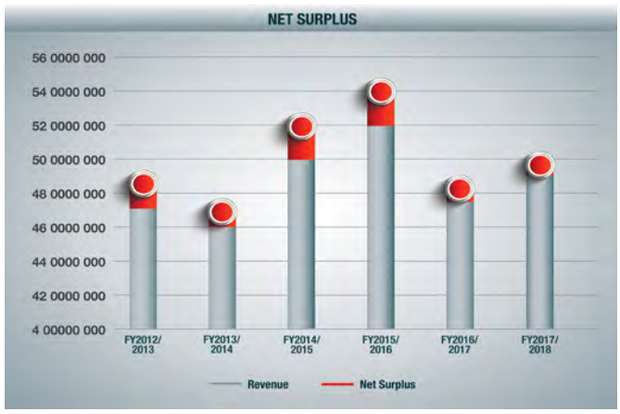
The 8% overall increase in operating costs was above inflation and is line with revenue growth. Employee costs increased by 3% from R308.4m in 2016/2017 to R317.2m in 2017/2018. Employee costs as a percentage of total operating costs were 62% compared to 65% for the prior year. The high contribution to total operating expenditure is due to highly specialised unique skills that Mintek needs for its sustainability.

Other operating costs as percentage of total expenditure rose from 35% in 2016/2017 to 38% in 2017/2018 due to higher outsourced services for asbestos rehabilitation that anticipated. Foreign exchange losses decreased significantly by 99% due to a stronger Rand against major foreign currencies.

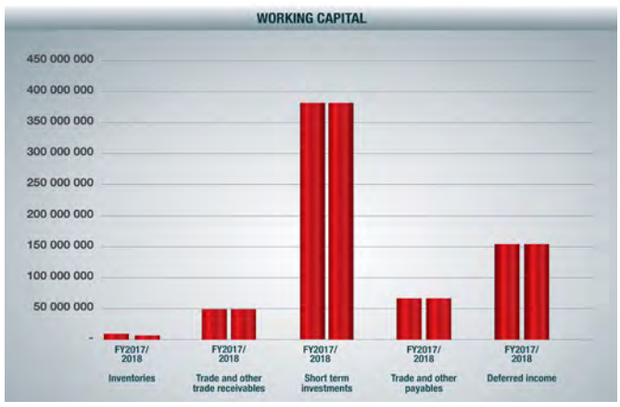


1.3 Net surplus

Net surplus for the year decreased by 63% from R6m to R2.2m although revenue increased by 7%.This is mainly attributable to Mintek's high operating leverage as a result of a high fixed costs structural base.



2. Working Capital Management



2.1 Trade Receivables

Trade receivables decreased by 4% from R35.4m to R34m and trade receivable days were maintained at 45. Although trade debtors days were slightly higher than the 30 day Mintek payment terms there were no bad debts written off during the year under review. This is mainly due to strict credit control and consistency in collection of repayments from customers. Mintek's strict credit policy is relaxed where appropriate as customers may be lost to suppliers with more favourable credit terms.

2.1 Trade Payables

Trade payables declined by 1% compared to the 14% decline during the prior year. The decline is in line with the Mintek's strategy of avoiding stretching payment to creditors as this might have an impact on service levels and reputation. Payment terms with suppliers are also strictly adhered when making payments to suppliers.

2.2 Deferred income and Advance Client billing

Deferred income decreased from R167.7m to R159.6m in 2017/2018. The decrease is mainly due to more government related contracts executed and recognised as revenue during the year under review compared to prior year.

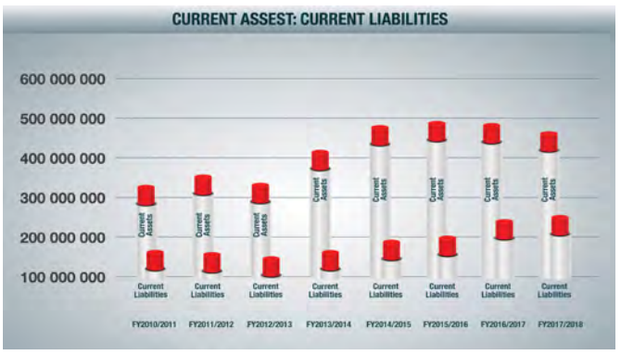
Advance client billing increased from R7.9m to R9.5m. This is mainly attributable to more invoicing in the last quarter of 2017/2018 for work that had not been performed at reporting date compared to prior year.

2.3 Inventory

Inventory increased from R7.8m in 2016/2017 to R9.6m in 2017/2018. The increase is mainly due to more stock holding for MAC product components compared to the previous financial year.

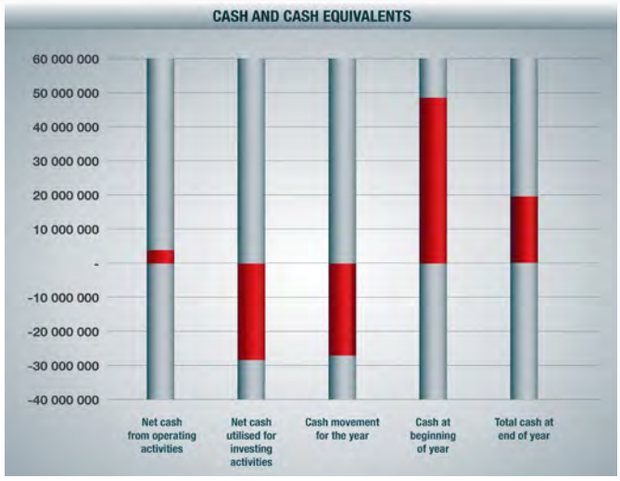
2.4 Short term investments

Mintek holds short term fixed deposits with various reputable financial institutions. Fixed investments held with these financial institutions are partly earmarked for financing Mintek liabilities and other capital expenditure. These investments decreased from R413.7m in 2016/2017 to R408.7m in 2017/2018. The decrease is mainly attributable to more capital expenditure that was financed by investments as cash flow from operations declined significantly during the year.



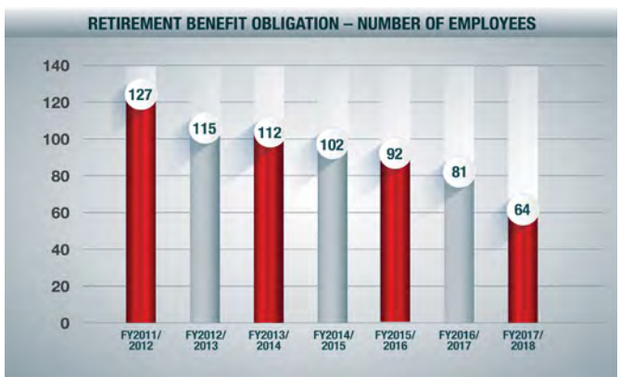
3. Cash Flow Management

Net cash from operating activities declined by 74% from R17.1m to R4.4m. The decline is mainly due to more cash outflows for cash paid to suppliers and employees compared to the previous year. Net cash from investing activities fell from R15.9m cash inflow to R29.7m cash outflow. This is mainly due to a decline in funding received from towards purchasing of property, plant and equipment and a decrease in investments. The cash settlements for post-retirement health care amounted to R3m compared to R3.3m. The increased cash outflows during the year under review resulted in an overall 59% decline in cash and cash equivalents at reporting date from R48.3m to R20m.



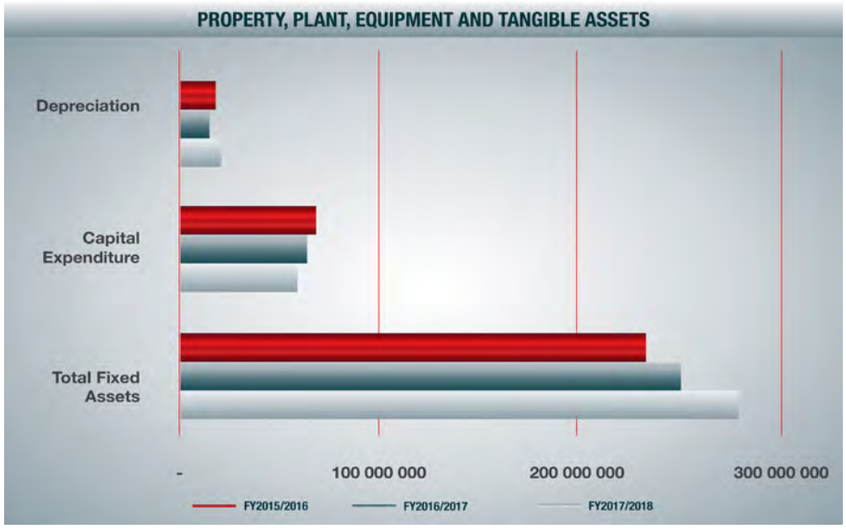
4. Long Term Liabilities - Post Retirement Medical Aid Obligation

Mintek's only long term obligation is a post - retirement medical benefit to certain pensioners and their dependants. The decline in the value of the obligation by 18% from R24.1m to R19.8m is in line with the decline in the number of employees that are covered on the medical scheme. The membership declined from the 81 in 2016/2017 to 64 during the year under review. An actuarial gain of R3.3m was recognised during the year under review due to re-measurement to fair value of the obligation by independent actuaries at the reporting date. R3m was paid as settlements to employees on the schemes compared to R3.3 paid during the previous financial year.



5. Capital Investments

In order to sustain its long term growth Mintek invested R51.5m in fixed assets. This is a 6% decline from the R55.6m that was invested in the previous financial year. Depreciation increased by R3.6m from R13.5m to R17.1m. Mintek re-assessed the useful life of all zero value assets due to the fact that they are still in use and have future economic value. The amount recognised for this adjustment during the year under review was R6.5m compared to R4.9m for prior year.



6.2

AUDIT AND RISK COMMITTEE REPORT

REPORT OF THE AUDIT AND RISK COMMITTEE (ARC) – as required by Treasury Regulations 27.1.7 and 27.1.10 (b) and (c) issued in terms of sections 51(1)(a)(ii) and 76(4)(d) of the Public Finance Management (PFMA) Act 1 of 1999, as amended by Act 29 of 1999.

1. Audit and Risk Committee members and attendance

The ARC consists of the members listed hereunder. During the financial year under review the audit and risk committee held four meetings and appropriate feedback was provided to the relevant Accounting Authority on matters that were within the mandate of the ARC.

NAME	QUALIFICATION	CATEGORY	ATTENDANCE
D Dlamini	M Com, PGD Bus Mngt, BTech Taxation, ND Accounting, Prof Accountant SA	Non-executive	4/4
M Rachidi	PTC, Mngt Dev Progarmme, Computer Operations and Programming	Non-executive	4/4
S Ngwenya	MBA, PGD in Mngt, BCom	Non-executive	3/4
P Mkhombo	LLM, LLB, BProc	Non-executive	4/4
D Msiza	BSc Mining Engineering, EDP MMC	Executive	2/2
M Moalusi	B Acc, CA (SA)	Independent	2/4
T Hlongwane	B Com, HDE (Acc), CA (SA)	Independent	2/4

2. Audit and Risk Committee Responsibility

The Mintek ARC wishes to report that it has complied with its responsibilities arising from section 51(1)(a) as well as with Treasury Regulations 27.1.7 and 27.1.10 (b) and (c) issued in terms of sections 51(1)(a)(ii) and 76(4)(d) of the Public Finance Management Act 1 of 1999, as amended by Act 29 of 1999. The ARC also wishes to report that it had adopted formal terms of reference.

The ARC is able to report that an external audit; which is performed by the Auditor-General, is independent of Mintek. The ARC has discharged all its responsibilities as contained in the ARC charter.

3. Effectiveness of Internal Control

The PFMA 51(1)(a)(i) states that the accounting authority must ensure that the entity has maintained an effective, efficient and transparent system of financial and risk management and internal control.

Based on the quarterly reports of the internal audit section, management report and the audit report on the annual financial statements of the AGSA, no material deficiencies were reported in the system of internal control. The ARC is of the opinion that, overall, the internal controls including financial controls of Mintek are adequate and effective.

4. Governance of Risk

The PFMA 51(1)(a)(i) states that the accounting authority must ensure that the entity maintains an effective, efficient and transparent system of financial and risk management and internal control.

The ARC has the responsibility to ensure that a risk management process is in place at Mintek and as such can report that Mintek has maintained an effective system of risk management.

5. Internal Audit

The ARC was responsible for ensuring that Mintek's internal audit section was independent and had the necessary resources, standing and authority within Mintek to enable it to effectively and efficiently discharge its duties. Furthermore, the audit and risk committee oversaw cooperation between the internal and external auditors, and served as a link between the accounting authority and these functions.

The ARC considered and approved the internal audit three-year rolling strategic audit plan for the period 2018/2019 – 2010/2021, the internal audit charter and the external quality assessment review of the Internal Audit Section. The ARC further reviewed and interrogated the internal audit quarterly reports. The ARC reviewed the external quality assurance review report that was performed during the year under review.

6. Auditor General

The ARC is satisfied with the independence, objectivity and effectiveness of the Auditor General South Africa (AGSA). The ARC discussed and reviewed the audit strategy to confirm the audit scope, approach and audit fees for the year under review.

7. Whistle Blowing

The ARC received and dealt with any concerns or complaints, whether from within or outside of Mintek, relating to fraud, corruption, theft and maladministration.

8. The Quality of Management and Monthly/Quarterly Reports Submitted in Terms of the PFMA

The ARC reports that, during the year under review, they were presented with regular monthly or quarterly management reports to enable them to:

i. Monitor the integrity, accuracy and reliability of the financial position of Mintek;

ii. Review the management accounts of Mintek to provide the accounting authority with an authoritative and credible view of the financial position of Mintek;

iii. Review the disclosure in the financial reports of Mintek and the context in which statements on the financial health of Mintek are made; and

iv. Review all material information presented together with the management accounts.

9. The quality of Budgets Submitted in Terms of the PFMA

The ARC reports that, during the year under review, they were regularly presented with a budget to enable them to:

i. Review and ensure that the annual budgets of Mintek were balanced, credible and realistic against the approved business plans; and

ii. Monitor and periodically review the implementation of the approved budget of Mintek by the accounting authority.

10. Evaluation of Financial Statements

The ARC has evaluated the group and the company Financial Statements for the year ended 31 March 2018 and concluded that they fully complied in all material aspects with the requirements of the Public Finance Management Act (PFMA) no. 1 of 1999, as amended by Act 29 of 1999, and South African Statements of Generally Accepted Accounting Practice (SA Statements of GAAP).

Mr D Dlamini *(Chairperson)*

6.3 DIRECTORS' RESPONSIBILITIES AND APPROVAL

The directors are required in terms of the public finance management act to maintain adequate accounting records and are responsible for the content and integrity of the financial statements and related financial information included in this report.

It is their responsibility to ensure that the financial statements fairly present the state of affairs of the group as at the end of the financial year and the results of its operations and cash flows for the period then ended, in conformity with Generally Accepted Accounting Policies (SA GAAP) and are based upon appropriate accounting policies consistently applied and supported by reasonable and prudent judgments and estimates. The external auditors are engaged to express an independent opinion on the financial statements.

The directors acknowledge that they are ultimately responsible for the system of internal financial control established by the group and place considerable importance on maintaining a strong control environment. To enable the directors to meet these responsibilities, the directors set standards for internal control aimed at reducing the risk of error or loss in a cost effective manner. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk.

These controls are monitored throughout the group and all employees are required to maintain the highest ethical standards in ensuring the group's business is conducted in a manner that in all reasonable circumstances is above reproach. The focus of risk management in the group is on identifying, assessing, managing and monitoring all known forms of risk across the group. While operating risk cannot be fully eliminated, the group endeavours to minimise it by ensuring that appropriate infrastructure, controls, systems and ethical behaviour are applied and managed within predetermined procedures and constraints.

The directors are of the opinion, based on the information and explanations given by management that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the financial statements. However, any system of internal financial control can provide only reasonable, and not absolute, assurance against material misstatement or loss.

In the opinion of the directors the group has adequate resources to continue in operational existence for the foreseeable future. This opinion is based on the 2018 budget and the current financial position of the group.

The external auditors are responsible for independently reviewing and reporting on the group's financial statements. The financial statements have been examined by the group's external auditors and their report is presented on pages 96 and 97.

The financial statements set out on pages 90 to 127, which have been prepared on the going concern basis, were approved by the directors on 27 July 2018 and were signed on their behalf by:

Namane Masemole
Chairperson

David Msiza
Acting CEO, Mintek

DIRECTORS' REPORT

Financial year 2017/2018 Financial Performance Highlights

The directors have the pleasure of presenting their report, which forms part of annual financial statements for the year ended March 31, 2018.

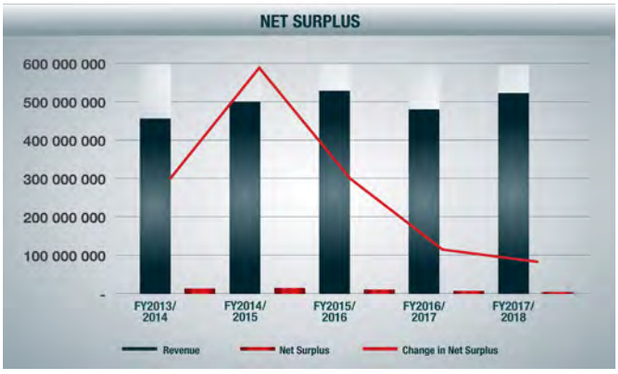
1. Nature of Business

Mintek is South Africa's national mineral research organisation and is one of the world's leading technology organisations specialising in mineral processing, extractive metallurgy and related areas. Mintek works closely with industry and other R&D institutions and provides service test work, process development and optimisation, consulting and innovative products to clients worldwide. Mintek is a state owned science council which reports to the Minister of Mineral Resources.

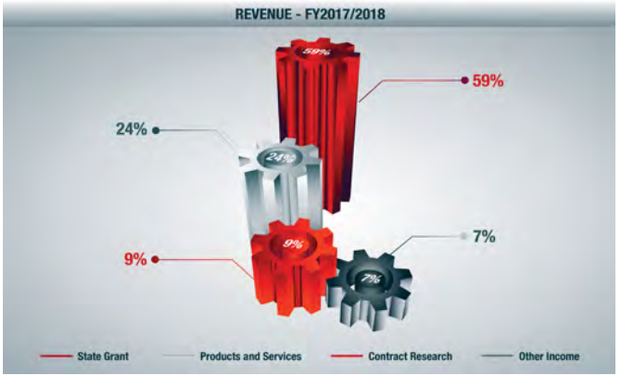
2. Material Changes in the Group

There were no material changes in the group during the financial year 2017/2018.

3. Review of Activities and Results

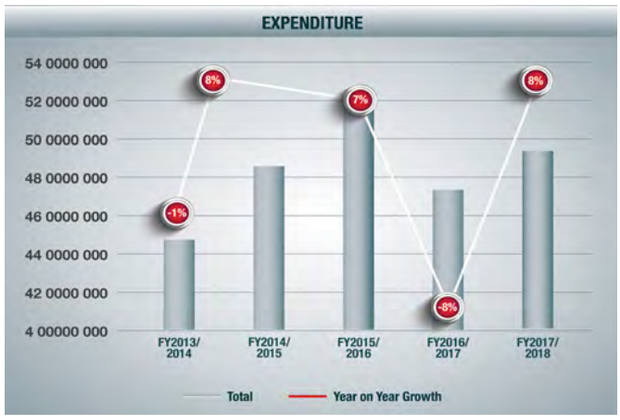


On a high level it appears that 2017/2018 was financially a better year for Mintek. Revenue for the year was R509.7m (2016/2017: R479,3m), but total operating expenditure was R507.3m (2016/2017: R473.2m) resulting in a R2,4m surplus compared to a surplus of R6,0m achieved in the 2016/2017 financial year. This is 255% lower than the previous financial year. This is largely due to the fixed nature of expenditure and the inflationary increases thereof.



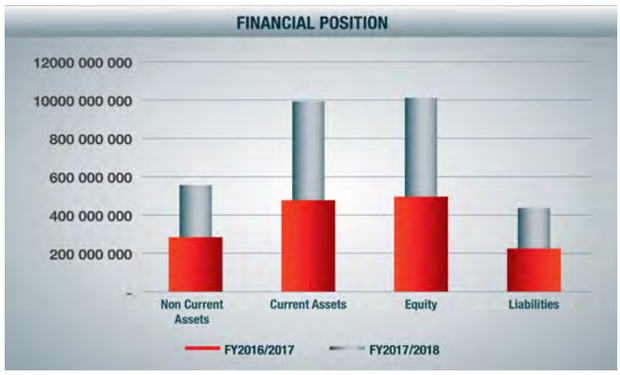
Revenue increased by 6% over the prior year. The increase could be ascribed to work performed on asbestos rehabilitation but also improved customer engagements that resulted in commercial projects in the last quarter of the financial year.

A corresponding increase was evident in operating expenditure which was directly related to the cost of subcontractors for asbestos rehabilitation but also, in more general terms, the inflationary increases in specifically employee costs.



Further information on the activities, performance and financial position of the Group is presented in the consolidated annual financial statements and notes thereto.

4. Financial Position



During the year, the Group invested R52.0m, (2016/2017: R55.6m) in property, plant, equipment and intangible assets. Of this capital expenditure R36.5m, (2016/2017: R26.1m) was for equipment. The capital expenditure was funded by internal cash generations and government grant (R17.3m).

The re-assessment of useful lives of assets, with zero book value increased to R6,5m compared to R4,9m for the previous year resulting in a lower depreciation for the year.

The group maintains a strong balance sheet position where total assets equate to three times total liabilities. The cash position remains positive although it has decreased compared to the prior year (R408,6m vs R413,7m). The liquidity ratio deteriorated slightly as the current ratio decraesed from 2.16 to 2.08. Debtor's days remained constant at 45 days as a result of debt collection efforts and only a marginal increase in commercial income towards the end of the financial year.

5. Changes in Accounting Policy

During the 2017/2018 financial year, there were no changes in accounting policies for the Mintek group.

6. Going Concern

Mintek annual financial statements have been prepared on the going concern basis.

The Board has performed a formal review of the Group's ability to continue trading as a going concern in the foreseeable future and based on this review, consider that the presentation of the financial statements on this basis is appropriate. There are no pending or threatened legal or arbitration proceedings, which have had or may have a material effect on the financial position of the Group.

7. Events after the Reporting Date

There have been no facts or circumstances of a material nature that have arisen between the financial year-end and the date of this report.

8. Other Matters

There were no current material significant negotiations for major transactions at the reporting date.

9. Country of Incorporation

Mintek is incorporated in South Africa

10. Registered Office and Postal Address

200 Malibongwe Drive, Randburg 2194
Private Bag X3015
Randburg 2125
South Africa

11. Auditors

Auditor General of South Africa (AGSA)

6.5 REPORT OF THE AUDITOR-GENERAL SOUTH AFRICA

Report of the auditor-general to Parliament on the Mintek group

Report on the auditor of the consolidated and separate financial statements

Opinion

1. I have audited the consolidated and separate financial statements of the Mintek group and its subsidiary set out on pages 100 to 129, which comprise the consolidated and separate statement of financial position as at 31 March 2018, the consolidated and separate statement of comprehensive income, statement of changes in equity, and the statement of cash flows for the year then ended, as well as the notes to the consolidated and separate financial statements, including a summary of significant accounting policies.

2. In my opinion, the consolidated and separate financial statements present fairly, in all material respects, the consolidated and separate financial position of Mintek group as at 31 March 2018, and its financial performance and cash flows for the year then ended in accordance with South African Statements of Generally Accepted Accounting Principles (SA Statements of GAAP) and the requirements of the Public Finance Management Act of South Africa, 1999 (Act No. 1 of 1999) (PFMA).

Basis for Opinion

3. I conducted my audit in accordance with the International Standards on Auditing (ISAs). My responsibilities under those standards are further described in the auditor-general's responsibilities for the audit of the consolidated and separate financial statements section of my report.

4. I am independent of the public entity in accordance with the International Ethics Standards Board for Accountants' Code *of ethics for professional accountants* (IESBA code) and the ethical requirements that are relevant to my audit in South Africa. I have fulfilled my other ethical responsibilities in accordance with these requirements and the IESBA code.

5. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Responsibilities of the accounting authority for the consolidated and separate financial statements

6. The board of directors, which constitutes the accounting authority is responsible for the preparation and fair presentation of the consolidated and separate financial statements in accordance with the SA Statements of GAAP, the requirements of the PFMA, and for such internal control as the accounting authority determines is necessary to enable the preparation of consolidated and separate financial statements that are free from material misstatement, whether due to fraud or error.

7. In preparing the consolidated and separate financial statements, the accounting authority is responsible for assessing the Mintek group and its subsidiary's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the intention is to liquidate the public entity or to cease operations, or there is no realistic alternative but to do so.

Auditor-general's responsibilities for the audit of the consolidated and separate financial statements

8. My objectives are to obtain reasonable assurance about whether the consolidated and separate financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated and separate financial statements.

9. A further description of my responsibilities for the audit of the consolidated and separate financial statements is included in the annexure to the auditor's report.

Report on the Audit of the Annual Performance Report

Introduction and Scope

10. In accordance with the Public Audit Act of South Africa, 2004 (Act No. 25 of 2004) (PAA) and the general notice issued in terms thereof I have a responsibility to report material findings on the reported performance information against predetermined objectives for selected objectives presented in the annual performance report. I performed procedures to identify findings but not to gather evidence to express assurance.

11. My procedures address the reported performance information, which must be based on the approved performance planning documents of the public entity. I have not evaluated the completeness and appropriateness of the performance indicators included in the planning documents. My procedures also did not extend to any disclosures or assertions relating to planned performance strategies and information in respect of future periods that may be included as part of the reported performance information. Accordingly, my findings do not extend to these matters.

12. I evaluated the usefulness and reliability of the reported performance information in accordance with the criteria developed from the performance management and reporting framework, as defined in

the general notice, for the following selected objectives presented in the annual performance report of the public entity for the year ended 31 March 2018:

Objectives	Pages in the Annual Performance Report
Objective 2: Research and develop efficient mineral processing technologies and value added products and services	21 - 23
Objective 3: Promote the mineral-based economies of rural and marginalised communities	24

13. I performed procedures to determine whether the reported performance information was properly presented and whether performance was consistent with the approved performance planning documents. I performed further procedures to determine whether the indicators and related targets were measurable and relevant, and assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

14. I did not identify any material findings on the usefulness and reliability of the reported performance information for the following objectives:

    - Objective 2: Research and develop efficient mineral processing technologies and value added products and services
    - Objective 3: Promote the mineral-based economies of rural and marginalised communities

Other matter

15. Although I identified no material findings on the usefulness and reliability of the reported performance information for the selected objectives, I draw attention to the matter below.

Achievement of Planned Targets

16. Refer to the annual performance report on pages 20 to 30 for information on the achievement of planned targets for the year and explanations provided for the under and overachievement of certain targets.

Report on Audit of Compliance with Legislation

Introduction and scope

17. In accordance with the PAA and the general notice issued in terms thereof I have a responsibility to report material findings on the compliance of the public entity with specific matters in key legislation. I performed procedures to identify findings but not to gather evidence to express assurance.

18. I did not identify any instances of material non-compliance with specific matters in key legislation, as set out in the general notice issued in terms of the PAA.

Other Information

19. The Mintek group and its subsidiary's accounting authority is responsible for the other information. The other information does not include the consolidated and separate financial statements, the auditor's report and those selected objectives presented in the annual performance report that have been specifically reported on in the auditor's report.

20. My opinion on the financial statements and findings on the reported performance information and compliance with legislation do not cover the other information and I do not express an audit opinion or any form of assurance conclusion thereon.

21. In connection with my audit, my responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated and separate financial statements and the selected objectives presented in the annual performance report, or my knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on the work I have performed on the other information obtained prior to the date of this auditor's report, I conclude that there is a material misstatement of this other information, I am required to report that fact. I have nothing to report in this regard. Internal control deficiencies

Internal Control Deficiencies

22. I considered internal control relevant to my audit of the consolidated and separate financial statements, reported performance information and compliance with applicable legislation; however, my objective was not to express any form of assurance thereon. I did not identify any significant deficiencies in internal control.

Auditor-General

Pretoria

31 July 2018

AUDITOR-GENERAL SOUTH AFRICA

Auditing to build public confidence

6.6 ANNEXURE – AUDITOR-GENERAL'S RESPONSIBILITY FOR THE AUDIT

1. As part of an audit in accordance with the ISAs, I exercise professional judgement and maintain professional scepticism throughout my audit of the consolidated and separate financial statements, and the procedures performed on reported performance information for selected objectives and on the public entity's compliance with respect to the selected subject matters.

Financial Statements

2. In addition to my responsibility for the audit of the consolidated and separate financial statements as described in the auditor's report, I also:

   - Identify and assess the risks of material misstatement of the consolidated and separate financial statements whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

   - Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the public entity's internal control.

   - Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related dis closures made by the board of directors, which constitutes the accounting authority.

   - Conclude on the appropriateness of the board of directors, which constitutes the accounting authority's use of the going concern basis of accounting in the preparation of the financial statements. I also conclude, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Mintek group and its subsidiary's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements about the material un certainty or, if such disclosures are inadequate, to modify the opinion on the financial statements. My conclusions are based on the information available to me at the date of the auditor's report. However, future events or conditions may cause a company to cease to continue as a going concern.

   - Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

   - Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the group to express an opinion on the consolidated financial statements. I am responsible for the direction, supervision and performance of the group audit. I remain solely responsible for my audit opinion.

Communication with those charged with Governance

3. I communicate with the accounting authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

4. I also confirm to the accounting authority that I have complied with relevant ethical requirements regarding independence, and communicate all relationships and other matters that may reasonably be thought to have a bearing on my independence and here applicable, related safeguards.

Statements of Financial Position as at 31 March 2018

FIGURES IN RAND	NOTE(S)	GROUP 2018	GROUP 2017	COMPANY 2018	COMPANY 2017
Assets					
Non-Current Assets					
Property, plant and equipment	2	**271 492 584**	248 478 101	**271 492 584**	248 478 101
Intangible assets	3	**2 560 321**	1 985 443	**2 560 321**	1 985 443
Investments in subsidiaries	4	**-**	-	**100**	100
		274 052 905	250 463 544	**274 053 005**	250 463 644
Current Assets					
Inventories	5	**9 572 992**	7 970 481	**9 572 992**	7 970 481
Trade and other receivables	6	**34 023 077**	35 359 248	**34 023 077**	35 359 248
Short term investments	7	**408 653 981**	413 675 429	**408 653 981**	413 675 429
Cash and cash equivalents		**20 033 826**	48 301 404	**20 033 826**	48 301 404
		472 283 876	505 306 562	**472 283 876**	505 306 562
Total Assets		**746 336 781**	755 770 106	**746 336 881**	755 770 206
Equity and Liabilities					
Equity					
Reserves		**146 775 577**	148 306 174	**146 775 577**	148 306 174
Retained income		**353 249 861**	349 357 294	**313 734 918**	309 842 351
		500 025 438	497 663 468	**460 510 495**	458 148 525
Liabilities					
Non-Current Liabilities					
Retirement benefit obligation	8	**19 800 000**	24 114 428	**19 800 000**	24 114 428
Current Liabilities					
Loans from group companies	9	**-**	-	**39 515 043**	39 515 043
Trade and other payables	10	**56 491 984**	57 488 163	**56 491 984**	57 488 163
Deferred income	11	**169 117 824**	175 447 940	**169 117 824**	175 447 940
Provisions	12	**901 535**	1 056 107	**901 535**	1 056 107
		226 511 343	233 992 210	**266 026 386**	273 507 253
Total Liabilities		**246 311 343**	258 106 638	**285 826 386**	297 621 681
Total Equity and Liabilities		**746 336 781**	755 770 106	**746 336 881**	755 770 206

Statements of Comprehensive Income for the year ended 31 March 2018

FIGURES IN RAND	NOTE(S)	GROUP 2018	GROUP 2017	COMPANY 2018	COMPANY 2017
Continuing operations					
Revenue	13	**473 941 152**	441 222 016	**473 941 152**	441 222 016
Other operating income	14	**5 477 559**	6 052 326	**5 477 559**	6 052 326
Deficit on exchange differences		**(37 007)**	(2 774 092)	**(37 007)**	(2 774 092)
Investment income	15	**30 284 982**	32 017 660	**30 284 982**	32 017 660
Employee costs	16	**(317 216 291)**	(308 444 589)	**(317 216 291)**	(308 444 589)
Operating expenses		**(91 128 283)**	(93 096 557)	**(91 128 283)**	(93 096 557)
Finance costs	17	**(3 329 118)**	(3 602 187)	**(3 329 118)**	(3 602 187)
Auditors remuneration	18	**(2 816 025)**	(2 075 243)	**(2 816 025)**	(2 075 243)
Fees for services	19	**(85 011 696)**	(54 878 724)	**(85 011 696)**	(54 878 724)
Depreciation, amortisation and impairments	20	**(17 098 137)**	(13 469 832)	**(17 098 137)**	(13 469 832)
Reassessment of assets useful lives	20	**6 496 487**	4 876 697	**6 496 487**	4 876 697
Loss on sale of assets		**(534 662)**	(858 478)	**(534 662)**	(858 478)
Actuarial gain		**3 333 009**	1 048 852	**3 333 009**	1 048 852
Surplus for the year		**2 361 970**	6 017 849	**2 361 970**	6 017 849
Total comprehensive income		**2 361 970**	6 017 849	**2 361 970**	6 017 849

Statements of Changes in Equity for the year ended 31 March 2018

FIGURES IN RAND	REVALUATION RESERVE	RETAINED INCOME	TOTAL EQUITY
Group			
Balance at 01 April 2016	**149 836 771**	**341 808 848**	**491 645 61**
Surplus for the year	-	6 017 849	6 017 849
Depreciation on revaluation of land and buildings	(1 530 597)	1 530 597	-
Total comprehensive income for the year	**(1 530 597)**	**7 548 446**	**6 017 849**
Balance at 01 April 2017	**148 306 174**	**349 357 294**	**497 663 468**
Surplus for the year	-	2 361 970	2 361 970
Depreciation on revaluation of land and buildings	(1 530 597)	1 530 597	-
Total comprehensive income for the year	**(1 530 597)**	**3 892 567**	**2 361 970**
Balance at 31 March 2018	**146 775 577**	**353 249 861**	**500 025 438**
Company			
Balance at 01 April 2016	**149 836 771**	**302 293 905**	**452 130 676**
Surplus for the year	-	6 017 849	6 017 849
Depreciation on revaluation of land and buildings	(1 530 597)	1 530 597	-
Total comprehensive income for the year	**(1 530 597)**	**7 548 446**	**6 017 849**
Balance at 01 April 2017	**148 306 174**	**309 842 351**	**458 148 525**
Surplus for the year	-	2 361 970	2 361 970
Depreciation on revaluation of land and buildings	(1 530 597)	1 530 597	-
Total comprehensive income for the year	**(1 530 597)**	**3 892 567**	**2 361 970**
Balance at 31 March 2018	**146 775 577**	**313 734 918**	**460 510 495**

Statements of Cash Flows for the year ended 31 March 2018

FIGURES IN RAND	NOTE(S)	GROUP 2018	GROUP 2017	COMPANY 2018	COMPANY 2017
Cash flows from operating activities					
Cash receipts from customers		**473 991 406**	458 339 300	**473 991 406**	458 339 300
Cash paid to suppliers and employees		**(499 158 215)**	(472 560 851)	**(499 158 215)**	(472 560 851)
Cash used in operations	22	**(25 166 809)**	(14 221 551)	**(25 166 809)**	(14 221 551)
Interest received		**29 591 732**	31 324 518	**29 591 732**	31 324 518
Finance costs		**(2 508)**	(6 210)	**(2 508)**	(6 210)
Net cash from operating activities		**4 422 415**	17 096 757	**4 422 415**	17 096 757
Cash flows from investing activities					
Additions to property, plant and equipment	2	**(51 466 031)**	(55 117 858)	**(51 466 031)**	(55 117 858)
Additions to intangible assets	3	**(573 773)**	(441 495)	**(573 773)**	(441 495)
Funding received towards purchasing of property, plant and equipment	2	**17 314 131**	27 539 643	**17 314 131**	27 539 643
Decrease in investments		**5 021 448**	43 982 949	**5 021 448**	43 982 949
Net cash from investing activities		**(29 704 225)**	15 963 239	**(29 704 225)**	15 963 239
Cash flows from financing activities					
Post-retirement health care - settlement		**(2 985 768)**	(3 348 294)	**(2 985 768)**	(3 348 294)
Total cash movement for the year		**(28 267 578)**	29 711 702	**(28 267 578)**	29 711 702
Cash at the beginning of the year		**48 301 404**	18 589 702	**48 301 404**	18 589 702
Total cash at end of the year		**20 033 826**	48 301 404	**20 033 826**	48 301 404

Accounting Policies as on 31 March 2018

1. Presentation of Financial Statements

The financial statements have been prepared in accordance with South African Generally Accepted Accounting Practices, the Public Finance Management Act and Treasury Guidelines. The financial statements have been prepared on an accrual basis in accordance with historical cost basis except for certain assets and liabilities at fair value, and incorporate the principal accounting policies set out below. They are presented in South African Rand.

These accounting policies are consistent with the previous period.

For purposes of these financial statements, all references to 'Company' refers to Mintek, the public entity.

1.1 Basis of consolidation

The consolidated financial statements incorporate the financial statements of the company and all entities, controlled by the company.

Control exists when the company has the power to govern the financial and operating policies of an entity so as to obtain benefits from its activities.

All intra-group transactions, balances, income and expenses are eliminated in full on consolidation.

1.2 Property, plant and equipment

The cost of an item of property, plant and equipment is recognised as an asset when:

- it is probable that future economic benefits associated with the item will flow to the company; and
- the cost of the item can be measured reliably.

Property, plant and equipment are initially measured at cost.

Costs include costs incurred initially to acquire or construct an item of property, plant and equipment and costs incurred subsequently to add to, replace part of, or service it. If a replacement cost is recognised in the carrying amount of an item of property, plant and equipment, the carrying amount of the replaced part is derecognised.

Land and buildings are carried at revalued amount, being the fair value at the date of revaluation less any subsequent accumulated depreciation on buildings only and subsequent accumulated impairment losses. Revaluations are made with sufficient regularity such that the carrying amount does not differ materially from that which would be determined using fair value at the end of the reporting period.

When an item of property, plant and equipment is revalued, any accumulated depreciation at the date of the revaluation is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Any increase in an asset's carrying amount, as a result of a revaluation, is recognised to other comprehensive income and accumulated in the revaluation surplus in equity. The increase is recognised in other comprehensive income to the extent that it reverses a revaluation decrease of the same asset previously recognised in the Statement of Comprehensive Income.

Any decrease in an asset's carrying amount, as a result of a revaluation, is recognised in the Statement of Comprehensive Income in the current period. The decrease is recognised in other comprehensive income to the extent of any credit balance existing in the revaluation surplus in respect of that asset. The decrease recognised in other comprehensive income reduces the amount accumulated in the revaluation surplus in equity.

The revaluation surplus in equity related to a specific item of property, plant and equipment is transferred directly to retained earnings when the asset is been utilised.

The useful lives of items of property, plant and equipment have been assessed as follows:

Item	Average useful life
Land	Indefinitely
Buildings	50 years
Plant and machinery	5 - 10 years
Furniture and fixtures	5 - 10 years
Motor vehicles	5 years
Office equipment	5 - 10 years
IT equipment	3 - 5 years

The residual value, useful life and depreciation method of each asset are reviewed at the end of each reporting period. If the expectations differ from previous estimates, the change is accounted for as a change in accounting estimate.

The depreciation charge for each period is recognised in the Statement of Comprehensive Income unless it is included in the carrying amount of another asset.

The gain or loss arising from the derecognition of an item of property, plant and equipment is included in the Statement of Comprehensive Income when the item is derecognised. The gain or loss arising from the derecognition of an item of property, plant and equipment is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the item.

1.3 Intangible assets

An intangible asset is recognised when:

- it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity; and
- the cost of the asset can be measured reliably.

Intangible assets are initially recognised at cost.

Expenditure on research (or on the research phase of an internal project) is recognised as an expense when it is incurred. Intangible assets are carried at cost less any accumulated amortisation and any accumulated impairment losses.

Gains or losses arising from derecognition of an intangible asset are measured as the difference between the net disposal proceeds and the carrying amount of the asset and are recognised in the statement of comprehensive income when the asset is derecognised.

Amortisation is provided to write down the intangible assets, on a straight-line basis, to their residual values as follows:

Item	Useful life
Computer software	3 - 5 years

1.4 Investments in subsidiaries

In the Mintek financial statements, investments in subsidiaries are carried at cost less any accumulated impairment. The cost of an investment in a subsidiary is the aggregate of:

- the fair value, at the date of exchange, of assets given, liabilities incurred or assumed, and equity instruments issued by the company; plus
- any costs directly attributable to the purchase of the subsidiary.

An adjustment to the cost of a business combination contingent on future events is included in the cost of the combination if the adjustment is probable and can be measured reliably.

1.5 Financial instruments

Classification

The group classifies financial assets and financial liabilities into the following categories:

- Financial assets at fair value through the Statement of Comprehensive Income - held for trading
- Held-to-maturity investment
- Loans and receivables
- Financial liabilities measured at amortised cost

Classification depends on the purpose for which the financial instruments were obtained / incurred and takes place at initial recognition. Classification is re-assessed on an annual basis, except for derivatives and financial assets designated as at fair value through the Statement of Comprehensive Income, which shall not be classified out of the fair value through the Statement of Comprehensive Income category.

Initial recognition and measurement

Financial instruments are recognised initially at fair value when the group becomes a party to the contractual provisions of the instruments.

The group classifies financial instruments, or their component parts, on initial recognition as a financial asset or a financial liability in accordance with the substance of the contractual arrangement.

For financial instruments which are not at cost through the Statement of Comprehensive Income, transaction costs are included in the initial measurement of the instrument.

Subsequent measurement

Financial instruments at cost through the Statement of Comprehensive Income are subsequently measured at fair value, with gains and losses arising from changes in fair value being included in profit or loss for the period.

Loans and receivables are subsequently measured at amortised cost, using the effective interest method, less accumulated impairment losses.

Held-to-maturity investments are subsequently measured at amortised cost, using the effective interest method, less accumulated impairment losses.

Gains and losses arising from changes in fair value are recognised in other comprehensive income and accumulated in equity until the asset is disposed of or determined to be impaired.

Financial liabilities at amortised cost are subsequently measured at amortised cost, using the effective interest method.

Derecognition

Financial assets are derecognised when the rights to receive cash flows from the investments have expired or have been transferred and the group has transferred substantially all risks and rewards of ownership.

Impairment of financial assets

At each reporting date the group assesses all financial assets, other than those at fair value through the Statement of Comprehensive Income, to determine whether there is objective evidence that a financial asset or group of financial assets has been impaired.

For amounts due to the group, significant financial difficulties of the debtor, probability that the debtor will enter bankruptcy and default of payments are all considered indicators of impairment.

Impairment losses are recognised in the Statement of Comprehensive Income.

Impairment losses are reversed when an increase in the financial asset's recoverable amount can be related objectively to an event occurring after the impairment was recognised, subject to the restriction that the carrying amount of the financial asset at the date that the impairment is reversed shall not exceed what the carrying amount would have been had the impairment not been recognised.

Reversals of impairment losses are recognised in the Statement of Comprehensive Income except for equity investments classified as available-for-sale.

Impairment losses are also not subsequently reversed for available-for-sale equity investments which are held at cost because fair value was not determinable.

Where financial assets are impaired through use of an allowance account, the amount of the loss is recognised in the Statement of Comprehensive Income within operating expenses. When such assets are written off, the write-off is made against the relevant allowance account. Subsequent recoveries of amounts previously written off are credited against operating expenses.

Loans to/(from) group companies

These include loans to and from the holding company and the subsidiary. Loans to group companies are classified as loans and receivables. Loans from group companies are classified as financial liabilities measured at amortised cost.

Trade and other receivables

Trade receivables are measured at initial recognition at fair value, and are subsequently measured at amortised cost using the effective interest rate method. Appropriate allowances for estimated irrecoverable amounts are recognised in the Statement of Comprehensive Income when there is objective evidence that the asset is impaired. Significant financial difficulties of the debtor, probability that the debtor will enter bankruptcy or financial reorganisation, and default or delinquency in payments are considered indicators that the trade receivable is impaired. The allowance recognised is measured at the carrying amount.

The carrying amount of the asset is reduced through the use of an allowance account, and the amount of the loss is recognised in the Statement of Comprehensive Income within operating expenses. When

a trade receivable is uncollectable, it is written off against the allowance account for trade receivables. Subsequent recoveries of amounts previously written off are credited against operating expenses in the Statement of Comprehensive Income.

Trade and other payables

Trade payables are initially measured at fair value, and are subsequently measured at amortised cost, using the effective interest rate method.

Cash and cash equivalents

Cash and cash equivalents comprise cash-on-hand and demand deposits, and other short-term highly liquid investments that are readily convertible to a known amount of cash and are subject to an insignificant risk of changes in value. These are initially and subsequently recorded at fair value.

Derivatives

The Group does not use derivative financial instruments including forward rate agreements and forward exchange contracts to hedge exposure rate and foreign fluctuations. It is the Group's policy not to hedge its exposure from foreign currency fluctuations, as it does not consider the impact to be significant. It is the policy of the Group not to trade in derivative financial instruments for speculative purposes.

1.6 Investments

Investments consist of short-term money market instruments initially recorded at cost, which is the fair value of the cash placed with the institution. These investments are surplus funds which are classified as held-to-maturity financial assets. Interest is accrued using the effective interest rate method and included in the Statement of Comprehensive Income on an accrual basis.

1.7 Taxation

Current tax assets and liabilities

Current tax for current and prior periods is, to the extent unpaid, recognised as a liability. If the amount already paid in respect of current and prior periods exceeds the amount due for those periods, the excess is recognised as an asset.

Current tax liabilities/(assets) for the current and prior periods are measured at the amount expected to be paid to/ (recovered from) the tax authorities, using the tax rates (and tax laws) that have been enacted or substantively enacted by the end of the reporting period.

The company is exempt from paying Income Tax in terms of section 10(1) cA(i) of the Income Tax Act no.58 of 1962, but registered for VAT. Mindev is registered for Income Tax.

The tax currently payable is based on taxable profit for the financial year. Mindev's liability for current tax is calculated using tax rates that have been enacted or substantively enacted at the financial year end date.

1.8 Irregular, fruitless and wasteful expenditure

Irregular expenditure means expenditure incurred in contravention of, or not in accordance with, a requirement of any applicable legislation, including:

- The Public Finance Management Act; or,
- Any provincial legislation providing for procedures in that state owned entity.

Fruitless and wasteful expenditure means expenditure that was made in vain and could have been avoided had reasonable care been exercised. All irregular, fruitless and wasteful expenditure is charged against income in the period in which they are incurred.

1.9 Financing costs

Interest in Mintek arises from bank overdraft, creditors and post retirement medical aid liability. Financing costs are recognised in the statement of comprehensive income in the period in which they are incurred.

1.10 Leases

A lease is classified as a finance lease if it transfers substantially all the risks and rewards incidental to ownership. A lease is classified as an operating lease if it does not transfer substantially all the risks and rewards incidental to ownership.

Finance leases – lessee

Finance leases are recognised as assets and liabilities in the Statement of Financial Position at amounts equal to the fair value of the leased property or, if lower, the present value of the minimum lease payments. The corresponding liability to the lessor is included in the Statement of Financial Position as a finance lease obligation.

The discount rate used in calculating the present value of the minimum lease payments is the company's incremental borrowing rate.

The lease payments are apportioned between the finance charge and reduction of the outstanding liability. The finance charge is allocated to each period during the lease term so as to produce a constant periodic rate on the remaining balance of the liability.

Operating leases - lessor

Operating lease income is recognised as an income on a straight-line basis over the lease term.

Initial direct costs incurred in negotiating and arranging operating leases are added to the carrying amount of the leased asset and recognised as an expense over the lease term on the same basis as the lease income.

Income for leases is disclosed under other operating income in the Statement of Comprehensive Income.

Operating leases – lessee

Operating lease payments are recognised as an expense on a straight-line basis over the lease term. The difference between the amounts recognised as an expense and the contractual payments are recognised as an operating lease asset. This liability is not discounted.

1.11 Inventories

Inventories are measured at the lower of cost and net realisable value on the weighted average cost method.

Net realisable value is the estimated selling price in the ordinary course of business less the estimated costs of completion and the estimated costs necessary to make the sale.

The cost of inventories comprises of all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition.

The cost of inventories of items that are not ordinarily interchangeable and goods or services produced and segregated for specific projects is assigned using specific identification of the individual costs.

When inventories are sold, the carrying amounts of those inventories are

recognised as an expense in the period in which the related revenue is recognised. The amount of any write-down of inventories to net realisable value and all losses of inventories are recognised as an expense in the period the write-down or loss occurs. The amount of any reversal of any write-down of inventories, arising from an increase in net realisable value, are recognised as a reduction in the amount of inventories recognised as an expense in the period in which the reversal occurs.

1.12 Impairment of assets

The group assesses at each end of the reporting period whether there is any indication that an asset may be impaired. If any such indication exists, the group estimates the recoverable amount of the asset.

Irrespective of whether there is any indication of impairment, the group also:

- tests intangible assets with an indefinite useful life or intangible assets not yet available for use for impairment annually by comparing its carrying amount with its recoverable amount. This impairment test is performed annually.

If there is any indication that an asset may be impaired, the recoverable amount is estimated for the individual asset. If it is not possible to estimate the recoverable amount of the individual asset, the recoverable amount of the cash-generating unit to which the asset belongs is determined.

The recoverable amount of an asset or a cash-generating unit is the higher of its fair value less costs to sell and its value in use.

If the recoverable amount of an asset is less than its carrying amount, the carrying amount of the asset is reduced to its recoverable amount. That reduction is an impairment loss.

An impairment loss of assets carried at cost less any accumulated depreciation or amortisation is recognised immediately in profit or loss. Any impairment loss of a revalued asset is treated as a revaluation decrease.

The company assesses at each reporting date whether there is any indication that an impairment loss recognised in prior periods for assets may no longer exist or may have decreased. If any such indication exists, the recoverable amounts of those assets are estimated.

A reversal of an impairment loss of assets carried at cost less accumulated depreciation or amortisation other than goodwill is recognised immediately in the Statement of Comprehensive Income. Any reversal of an impairment loss of a revalued asset is treated as a revaluation increase.

1.13 Share capital and equity

An equity instrument is any contract that evidences a residual interest in the assets of an entity after deducting all of its liabilities.

1.14 Employee benefits

Defined contribution plans

Payments to defined contribution retirement benefit plans are charged as an expense as they fall due.

Payments made to retirement benefit schemes are dealt with as defined contribution plans where the group's obligation under the schemes is equivalent to those arising in a defined contribution retirement benefit plan.

For defined contribution plans, the Group pays contribution to privately administered pension insurance plans on a contractual basis. The Group has no further payment obligations once the contributions have been paid. The contributions are recognised as employee benefit expense when they are due.

Defined benefit plans

Actuarial valuations are conducted on an annual basis by independent actuaries separately for each plan.

Actuarial gains and losses are recognised in full in the reporting period it relates to and is the excess over the greater of the present value of the past service obligation at the reporting period before deducting the present value of assumed assets at the same date.

Valuations of these obligations are carried out annually by independent, qualified actuaries using the appropriate mortality tables, long-term estimates of increases in medical costs and appropriate discount rates.

Consideration is given to any event that could impact the funds up to the end of the reporting period where the interim valuation is performed at an earlier date.

Past service costs are recognised immediately to the extent that the benefits are already vested, and are otherwise amortised on a straight line basis over the average period until the amended benefits become vested.

The liability recognised in the Statement of Financial Position in respect of the defined benefit pension plans is the present value of the defined obligation at the Statement of Financial Position date less the fair value of plan assets, together with adjustments for unrecognised past-service costs. The defined benefit obligation is calculated annually by independent actuaries using the projected unit credit method.

Prepaid contributions are recognised as an asset to the extent that a cash refund or a reduction in the future payment is available.

The Group has an obligation to fund the medical aid benefits of all its past employees and dependents of past employee who retired or were in the employment of the Group prior to 1 January 2000. The plan liability is unfunded and fully provided for in the financial statements. The Group uses the projected unit credit actuarial method to determine the present value of its past service cost. General increases to medical aid contributions were estimated taking into account the projected future changes in the cost of medical services resulting from both inflation and specific changes to medical costs.

1.15 Provisions and contingencies

Provisions are recognised when:

- the group has a present obligation as a result of a past event;
- it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation; and
- a reliable estimate can be made of the obligation.

The amount of a provision is the present value of the expenditure expected to be required to settle the obligation.

Where some or all of the expenditure required to settle a provision is expected to be reimbursed by another party, the reimbursement shall be recognised when, and only when, it is virtually certain that reimbursement will be received if the entity settles the obligation. The reimbursement shall be treated as a separate asset. The amount recognised for the reimbursement shall not exceed the amount of the provision.

Provisions are not recognised for future operating losses.
If the company has a contract that is onerous, the present obligation

under the contract shall be recognised and measured as a provision.

After their initial recognition contingent liabilities recognised in business combinations that are recognised separately are subsequently measured at the higher of:

- the amount that would be recognised as a provision; and
- the amount initially recognised less cumulative amortisation.

Contingent assets and contingent liabilities are not recognised. Contingencies are disclosed in note 24.

1.16 Government grants

Government grants are recognised at fair value when there is reasonable assurance that:

- the group will comply with the conditions attaching to them; and
- the grants will be received.

Government grants are recognised as income over the periods necessary to match them with the related costs that they are intended to compensate.

A government grant that becomes receivable as compensation for expenses or losses already incurred or for the purpose of giving immediate financial support to the entity with no future related costs is recognised as income of the period in which it becomes receivable.

Government grants related to assets, including non-monetary grants at fair value, are presented in the Statement of Financial Position by setting up the grant as deferred income or by deducting the grant in arriving at the carrying amount of the asset.

Grants related to income are presented as a credit in the Statement of Comprehensive Income (separately).

Where a loan is received from government at below market interest rate, the difference between the fair value of the loan and the amount received is recognised as a government grant.

1.17 Revenue

Revenue from the sale of goods is recognised when all the following conditions have been satisfied:

- the group has transferred to the buyer the significant risks and rewards of ownership of the goods;
- the group retains neither continuing managerial involvement to the degree usually associated with ownership nor effective control over the goods sold;
- the amount of revenue can be measured reliably;
- it is probable that the economic benefits associated with the transaction will flow to the group; and
- the costs incurred or to be incurred in respect of the transaction can be measured reliably.

When the outcome of a transaction involving the rendering of services can be estimated reliably, revenue associated with the transaction is recognised by reference to the stage of completion of the transaction at the end of the reporting period. The outcome of a transaction can be estimated reliably when all the following conditions are satisfied:

- the amount of revenue can be measured reliably;
- it is probable that the economic benefits associated with the transaction will flow to the group;
- the stage of completion of the transaction at the end of the reporting period can be measured reliably; and
- the costs incurred for the transaction and the costs to complete the transaction can be measured reliably.

When the outcome of the transaction involving the rendering of services cannot be estimated reliably, revenue shall be recognised only to the extent of the expenses recognised that are recoverable.

Service revenue is recognised by reference to the stage of completion of the transaction at the end of the reporting period. Stage of completion is determined by the actual costs in relation to the planned cost of a project.

Service fees included in the price of the product are recognised as revenue over the period during which the service is performed.

Contract revenue comprises:

- the initial amount of revenue agreed in the contract; and
- variations in contract work, claims and incentive payments:
  - to the extent that it is probable that they will result in revenue; and
  - they are capable of being reliably measured.

Revenue is measured at the fair value of the consideration received or receivable and represents the amounts receivable for goods and services provided in the normal course of business, net of trade discounts and volume rebates, and value added tax.

Interest is recognised, in the Statement of Comprehensive Income, using the effective interest rate method.

1.18 Translation of foreign currencies

Foreign currency transactions

A foreign currency transaction is recorded, on initial recognition in Rand, by applying to the foreign currency amount the spot exchange rate between the functional currency and the foreign currency at the date of the transaction.

At the end of the reporting period:

- foreign currency monetary items are translated using the closing rate;
- non-monetary items that are measured in terms of historical cost in a foreign currency are translated using the exchange rate at the date of the transaction; and
- non-monetary items that are measured at fair value in a foreign currency are translated using the exchange rates at the date when the fair value was determined.

Exchange differences arising on the settlement of monetary items or on translating monetary items at rates different from those at which they were translated on initial recognition during the period or in previous financial statements are recognised in profit or loss in the period in which they arise.

Cash flows arising from transactions in a foreign currency are recorded in Rand by applying to the foreign currency amount the exchange rate between the Rand and the foreign currency at the date of the cash flow.

FIGURES IN RAND

	2018			2017		
	Cost / Valuation	Accumulated Depreciation	Carrying Value	Cost / Valuation	Accumulated Depreciation	Carrying Value
Land	**112 334 241**	**-**	**112 334 241**	112 334 241	-	112 334 241
Buildings	**91 686 170**	**(30 571 928)**	**61 114 242**	91 686 170	(28 636 186)	63 049 984
Plant and machinery	**26 874 630**	**(21 832 281)**	**5 042 349**	47 213 680	(26 541 151)	20 672 529
Furniture and fixtures	**9 114 264**	**(5 614 482)**	**3 499 782**	8 898 525	(5 328 400)	3 570 125
Motor vehicles	**7 330**	**(7 048)**	**282**	7 330	(6 896)	434
Equipment	**437 411 898**	**(367 197 519)**	**70 214 379**	353 538 395	(329 860 661)	23 677 734
Capital assets under construction	**19 287 309**	**-**	**19 287 309**	25 173 054	-	25 173 054
Total	**696 715 842**	**(425 223 258)**	**271 492 584**	638 851 395	(390 373 294)	248 478 101

Reconciliation of the carrying value of property, plant and equipment - Group and Mintek - 2018

	Opening Balance	Additions	Disposals	Funded Assets	Transfers	Adjustments	Depreciation	Total
Land	**112 334 241**	**-**	**-**	**-**	**-**	**-**	**-**	**112 334 241**
Buildings	**63 049 984**	**-**	**-**	**-**	**-**	**107 354**	**(2 043 096)**	**61 114 242**
Plant and machinery	**20 672 529**	**80 517**	**(20 739)**	**(3 129 837)**	**(10 983 754)**	**285 141**	**(1 861 508)**	**5 042 349**
Furniture and fixtures	**3 570 125**	**387 027**	**(23 668)**	**-**	**-**	**553 140**	**(986 842)**	**3 499 782**
Motor vehicles	**434**	**-**	**-**	**-**	**-**	**-**	**(152)**	**282**
Equipment	**23 677 734**	**36 554 732**	**(490 255)**	**(12 355 675)**	**29 484 635**	**4 938 069**	**(11 594 861)**	**70 214 379**
Capital assets under construction	**25 173 054**	**14 443 755**	**-**	**(1 828 619)**	**(18 500 881)**	**-**	**-**	**19 287 309**
	248 478 101	**51 466 031**	**(534 662)**	**(17 314 131)**	**-**	**5 883 704**	**(16 486 459)**	**271 492 584**

Reconciliation of the carrying value of property, plant and equipment - Group and Mintek- 2017

	Opening Balance	Additions	Disposals	Funded Assets	Transfers	Adjustments	Depreciation	Total
Land	112 334 241	-	-	-	-	-	-	112 334 241
Buildings	65 219 980	-	-	-	-	-	(2 169 996)	63 049 984
Plant and machinery	5 363 712	6 768 559	(3 931)	-	7 851 109	1 314 042	(620 962)	20 672 529
Furniture and fixtures	2 951 170	1 352 507	(13 842)	-	-	260 473	(980 183)	3 570 125
Motor vehicles	145	-	-	-	-	141	148	434
Equipment	37 787 070	26 136 763	(840 705)	(38 248 805)	5 064 081	2 928 267	(9 148 937)	23 677 734
Capital assets under construction	6 519 053	20 860 029	-	10 709 162	(12 915 190)	-	-	25 173 054
	230 175 371	55 117 858	(858 478)	(27 539 643)	-	4 502 923	(12 919 930)	248 478 101

2. Property, Plant and Equipment (continued)

Other information

Details of properties

Funding received during the current financial year for the purchase of assets is R17,314,131 (R27,539,643 for 2017).

Capital assets under construction relates to the construction of plants and the renovation of buildings. These assets were under construction at year-end and are not ready for for use yet.

A register containing the information required by Regulation 25(3) of the Companies Regulations, 2011 is available for inspection at the registered office of the company.

Funded assets with a total acquisition value of R333,034,868 (2017 - R270,430,012) are still in use.
Mintek reassessed the useful life of all zero value assets due to the fact that they are still in use and have future economic value. The useful lives were extended based on the assumptions that assets will be replaced in the next two years due to a capitalisation plan. The original acquisition value for these assets were R27,261,640 and the resultant depreciation write back was R6,496,487 of which R5,883,704 relates to property, plant and equipment and R612,783 relates to intangible assets (refer to note 20).

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Carrying value				
Land	**112 334 241**	112 334 241	**112 334 241**	112 334 241
Buildings	**61 114 242**	63 049 984	**61 114 242**	63 049 984
Plant	**5 042 349**	20 672 529	**5 042 349**	20 672 529
Equipment	**70 214 379**	23 677 734	**70 214 379**	23 677 734
Vehicles	**282**	434	**282**	434
Furniture and fittings	**3 499 782**	3 570 125	**3 499 782**	3 570 125
Capital work in progress	**19 287 309**	25 173 054	**19 287 309**	25 173 054
	271 492 584	248 478 101	**271 492 584**	248 478 101
Freehold land and buildings at costs:				
Land and buildings original cost	**11 759 900**	11 759 900	**11 759 900**	11 759 900
Revaluation until 31 March 2006	**75 373 132**	75 373 132	**75 373 132**	75 373 132
Revaluation 31 March 2008	**49 324 836**	49 324 836	**49 324 836**	49 324 836
Additions and transfers 2009	**3 068 180**	3 068 180	**3 068 180**	3 068 180
Additions and transfers 2010	**12 401 768**	12 401 768	**12 401 768**	12 401 768
Additions and transfers 2011	**882 252**	882 252	**882 252**	882 252
Revaluation 31 March 2011	**24 485 158**	24 485 158	**24 485 158**	24 485 158
Additions and disposals 2012	**1 088 371**	1 088 371	**1 088 371**	1 088 371
Additions 2013	**2 600 682**	2 600 682	**2 600 682**	2 600 682
Revaluation and disposal 31 March 2016	**23 036 132**	23 036 132	**23 036 132**	23 036 132
Revaluation at cost	**204 020 411**	204 020 411	**204 020 411**	204 020 411
Directors' valuation	**204 020 411**	204 020 411	**204 020 411**	204 020 411

2. Property, Plant and Equipment (continued)

Portion 175 and portion 226 of the farm Klipfontein, 203-IQ Johannesburg, with buildings thereon and the sectional title of units at Malanshof Heights located at Erf 560 Malanshof. The value of the land and building complexes were estimated at R204,020,411 by Resurgent Projects (Pty) Ltd, an independent valuator, during the financial year ending 31 March 2016. The valuation is done every 5 years and the latest valuation report was issued on 18 April 2016. The key assumptions used were that the value of the property be based as sale of vacant land and buildings for rental investment using various rental income figures for different areas of the Mintek property. These calculated rentals were then capitalised at 13.5%.

The estimated useful lives of depreciable property, plant, equipment and vehicles are as follows:

Land	Indefinitely
Buildings	50 years
Plant	5 - 10 years
Equipment	5 - 10 years
Computer equipment	3 - 5 years
Vehicles	5 years
Furniture and fittings	5 - 10 years

3. Intangible Assets

FIGURES IN RAND						
GROUP AND MINTEK	2018			2017		
	Cost / Valuation	Accumulated Amortisation	Carrying Value	Cost / Valuation	Accumulated Amortisation	Carrying Value
Computer software	**7 170 717**	**(4 610 396)**	**2 560 321**	6 596 944	(4 611 501)	1 985 443

Reconciliation of intangible assets - Group and Mintek - 2018

	Opening Blance	Additions	Adjustments	Amortisation	Total
Computer software	1 985 443	573 773	612 783	(611 678)	2 560 321

Reconciliation of intangible assets - Group and Mintek - 2017

	Opening balance	Additions	Adjustments	Amortisation	Total
Computer software	1 720 076	441 495	373 774	(549 902)	1 985 443

The estimated useful lives of amortisable intangible assets are as follows:
3 - 5 years

4. Interests in Subsidiaries Including Consolidated Structured Entities

Company

Name of company	Held by	% holding 2018	% holding 2017	Carrying Amount 2018	Carrying Amount 2017
Mindev (Pty) Ltd	Mintek	**100**	100	**100**	100

Mindev is engaged in the commercialisation of Mintek's patents and technology through the identification of suitable partners to advance such interests by way of direct investment in equity and through joint ventures.

Mintek holds 100% of the issued share capital of Mindev (Propriety) Limited. The carrying amounts of the subsidiary is shown net of impairment losses.

5. Inventories

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Consumables	**7 129 715**	5 799 382	**7 129 715**	5 799 382
Finished goods	**1 467 251**	984 933	**1 467 251**	984 933
Work-in-progress	**976 026**	1 196 596	**976 026**	1 196 596
	9 572 992	7 980 911	**9 572 992**	7 980 911
Provision for obsolete inventories	**-**	(10 430)	**-**	(10 430)
	9 572 992	7 970 481	**9 572 992**	7 970 481
Carrying value of inventories carried at fair value less costs to sell	**9 572 992**	7 970 481	**9 572 992**	7 970 481

Consumables are held in stock for daily business requirements. Finished goods relate to products manufactured by the MAC division

6. Trade and other Receivables

Trade receivables	**25 655 432**	16 262 377	**25 655 432**	16 262 377
Prepayments	**2 192 295**	12 761 960	**2 192 295**	12 761 960
Unearned interest on fair value debtors (discounting)	**32 076**	36 389	**32 076**	36 389
Project work in progress	**6 170 447**	6 304 757	**6 170 447**	6 304 757
Other receivables	**275 118**	283 055	**275 118**	283 055
Less: Provision for doubtful debts	**(302 291)**	(289 290)	**(302 291)**	(289 290)
	34 023 077	35 359 248	**34 023 077**	35 359 248

Project work-in-progress relates to projects where work has been executed, but not yet billed.

Age analysis

The following is an age analysis of trade receivables at balance sheet date:

0-30 days	**22 212 800**	13 822 633	**22 212 800**	13 822 633
31-60 days past due	**1 910 484**	1 737 042	**1 910 484**	1 737 042
61-90 days past due	**747 623**	221 534	**747 623**	221 534
90+ days past due	**784 525**	481 168	**784 525**	481 168
	25 655 432	16 262 377	**25 655 432**	16 262 377

The age analysis reflects the categories of overdue debtors.

6. Trade and other Receivables *(continued)*

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Fair value of trade receivables				
Trade receivables	**25 655 432**	16 262 377	**25 655 432**	16 262 377

In terms of IAS 39 outstanding customer invoices are discounted throughout the year to show the deemed interest that Mintek has forfeited. An effective interest rate been used due to the fact that this is a fair representation of the interest that Mintek earns through liquid deposits.

Provision for impairment
Included in the trade receivable balance are debtors which are past the original expected collection date at the reporting date, with a carrying amount of R1,229,857 (2017: R413,412) for which the company has not provided as there has not been a significant change in credit quality and the amounts are still considered recoverable. The company does not hold any collateral over these balances. The average age of outstanding balances is 45 days (2017 : 45 days). A summarised age analysis of due debtors is set out below.

The ageing of amounts due but not impaired is as follows:				
60 - 90 days	**747 623**	221 534	**747 623**	221 534
More than 90 days	**482 234**	191 878	**482 234**	191 878
	1 229 857	413 412	**1 229 857**	413 412

Trade and other receivables impaired

The amount of the provision was R302,291, of which R246,336 relates to staff debts, as at 31 March 2018 (2017:R289,290 of which staff debts amounts to R284,655). No debt (2017:R41,008) was written-off as bad debts directly to the Statement of Comprehensive Income during the year under review. The ageing of these trade receivables is as follows:

More than 90 days	**302 291**	289 290	**302 291**	289 290

Reconciliation of provision for impairment of trade receivables

Opening balance	**289 290**	295 848	**289 290**	295 848
Provision for impairment - Trade debtors	**55 955**	-	**55 955**	-
Provision for impairment - Staff debts	**105 252**	228 002	**105 252**	228 002
Amounts written off as uncollectable - Staff debts	**(143 571)**	-	**(143 571)**	-
Amounts settled	**(4 635)**	(234 560)	**(4 635)**	(234 560)
	302 291	289 290	**302 291**	289 290

In determining the recoverability of a trade receivable, the company considers any change in the credit quality of the trade receivable from the date credit was initially granted up to the reporting date. Accordingly, the directors believe that there is no further credit provision required in excess of the provision for doubtful debts.

The maximum exposure to credit risk at the reporting date is the fair value of each class of receivable. The group does not hold any collateral as security.

6. Trade and other Receivables *(continued)*

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Currencies				
The carrying amount of trade receivables are denominated in the following currencies				
Rand	**23 359 952**	14 421 155	**23 359 952**	14 421 155
USD	**1 942 102**	1 744 280	**1 942 102**	1 744 280
EUR	**353 378**	-	**353 378**	-
AUD	**-**	96 942	**-**	96 942
	25 655 432	16 262 377	**25 655 432**	16 262 377

7. Short Term Investments

Short term investments - Current Portion	**408 653 981**	413 675 429	**408 653 981**	413 675 429

Investments in short-term fixed deposits are held with various reputable financial institutions at market value and interest has been earned at prime overdraft rates less a varied percentage over the year.

Fixed investments held with various financial institutions are partly earmarked for the financing of Mintek's liabilities and other capital expenditure.

A cession of R 2,155,000 (2017: R2,155,000) is held over these investments. Refer to note 25.

8. Retirement Benefits

Carrying value

Post-retirement medical aid	**19 800 000**	24 114 428	**19 800 000**	24 114 428
Number of employees	**64**	81	**64**	81

Post-retirement medical benefits

Medical cover is provided through a number of different schemes. Post-retirement medical cover in respect of qualifying employees is recognised as an expense over the expected remaining service lives of the relevant employees. Mintek has an obligation to provide medical benefits to certain pensioners and dependents. These liabilities have been provided for in full, calculated on an actuarial basis. These liabilities are unfunded. Periodic valuation of this obligation is carried out by an independent actuary every year, the latest one being 31 March 2018.

The amounts included in the balance sheet arising from Mintek's obligation in respect of post-retirement medical benefits are as follows:

Present value of obligations as at 31 March 2018	**19 800 000**	24 114 428	**19 800 000**	24 114 428

8. Retirement Benefits *(continued)*

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Post-retirement medical benefit obligation				
Fixed investment held with various financial institutions is partly earmarked as financing for post-retirement medical aid liability. Mintek has not assigned a specific fund to hedge the post-retirement medical aid liability.				
Movement in the net liability recognised in the statement of financial position				
Net-past service benefit liability: Beginning of the year	**24 114 428**	26 284 506	**24 114 428**	26 284 506
Interest costs	**2 200 000**	2 400 000	**2 200 000**	2 400 000
Contributions paid to service providers	**(195 651)**	(172 932)	**(195 651)**	(172 932)
Net actuarial gain	**(3 333 009)**	(1 048 852)	**(3 333 009)**	(1 048 852)
Settlements	**(2 985 768)**	(3 348 294)	**(2 985 768)**	(3 348 294)
Net-past services benefit liability: End of the year	**19 800 000**	24 114 428	**19 800 000**	24 114 428
Key assumptions				
Discount rate	**8.90 %**	9.80 %	**8.90 %**	9.80 %
Expected increase in medical inflation	**7.70 %**	8.30 %	**7.70 %**	8.30 %
Amounts recognised in the statement of comprehensive income are as follows:				
Current Costs	**2 200 000**	2 400 000	**2 200 000**	2 400 000
Benefits paid				
Contributions paid	**195 651**	172 932	**195 651**	172 932

The results are dependent on the assumptions used. The table below shows how the past service cost as at 31 March 2018 would be impacted by changes to these assumptions.

Sensitivity analysis on past service cost				
Discount rate increased by 1% p.a.	**16 700 000**	21 314 428	**16 700 000**	21 314 428
Discount rate decreased by 1% p.a.	**22 000 000**	27 514 428	**22 000 000**	27 514 428
Subsidy inflation increased by 1% p.a.	**21 800 000**	27 314 428	**21 800 000**	27 314 428
Subsidy inflation decreased by 1% p.a.	**17 400 000**	21 314 428	**17 400 000**	21 314 428
Retirement age 58	**21 900 000**	25 414 428	**21 900 000**	25 414 428

9. Loans from Group Companies

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Subsidiaries				
Mindev (Pty) Ltd	-	-	**39 515 043**	39 515 043

The loans granted are unsecured and do not have fixed repayment terms.
The carrying amount of the loan to Mintek is denominated in Rands.

10. Trade and other Payables

Trade payables	**16 373 887**	15 973 953	**16 373 887**	15 973 953
SARS - VAT	**6 753 954**	5 784 608	**6 753 954**	5 784 608
Other payables	**10 396 637**	9 865 351	**10 396 637**	9 865 351
Incentive bonus provision	**4 500 000**	4 300 000	**4 500 000**	4 300 000
Accrued leave pay	**10 987 222**	11 085 845	**10 987 222**	11 085 845
Accruals	**7 411 606**	10 410 312	**7 411 606**	10 410 312
Deposits received - Mintek property rentals	**24 298**	26 798	**24 298**	26 798
Unpaid interest on fair value - creditors	**44 380**	41 296	**44 380**	41 296
	56 491 984	57 488 163	**56 491 984**	57 488 163

Fair value of trade and other payables

Trade and other payables	**56 491 984**	57 488 163	**56 491 984**	57 488 163

In terms of IAS 39 outstanding supplier invoices are discounted throughout the year to show the deemed interest that Mintek has forfeited. An effective interest rate has been used due to the fact that this is a fair representation of the interest that Mintek earns through liquid deposits.

11. Deferred income

Deferred income	**159 632 507**	167 581 810	**159 632 507**	167 581 810
Advance client billing (Unearned income)	**9 485 317**	7 866 130	**9 485 317**	7 866 130
	169 117 824	175 447 940	**169 117 824**	175 447 940

Deferred income arises as a result of contracts undertaken for several government departments and institutions in respect of amounts received in cash not yet accounted for as revenue.
Advance client billing income arises as a result of contracts undertaken in terms of commercial work where invoices are raised based on work that has not been done. The quantum of costs incurred provides the basis for the level of revenue recognised in the period.

12. Provisions

Reconciliation of provisions - Group and Company - 2018

	Opening balance	Additions	Reversed During the Year	Total
Product warranties	**1 056 107**	**901 535**	**(1 056 107)**	**901 535**

Reconciliation of provisions - Group and Company - 2017

Product warranties	518 982	1 056 107	(518 982)	1 056 107

The provision for product warranties arises from Mintek recognising its probable liability for meeting its obligation in terms of products and services as stipulated in its contracts with its customers.

13. Revenue

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Government grants	**302 997 809**	284 617 874	**302 997 809**	284 617 874
State Grant	**322 154 386**	312 645 218	**322 154 386**	312 645 218
Prior year carry-over	**130 642 174**	144 885 763	**130 642 174**	144 885 763
Less:				
Portion of grant utilised to acquire fixed assets and set-off against infrastructure improvements	**(34 000 548)**	(42 270 933)	**(34 000 548)**	(42 270 933)
Portion of grant carried over for committed fixed asset purchases and expenses	**(115 798 203)***	(130 642 174)	**(115 798 203)***	(130 642 174)
Other revenue streams	**170 943 343**	156 604 142	**170 943 343**	156 604 142
Products and services	**122 890 150**	114 395 840	**122 890 150**	114 395 840
Contract research	**48 053 193**	42 208 302	**48 053 193**	42 208 302
	473 941 152	441 222 016	**473 941 152**	441 222 016

*Included in the carried over amount is R103,344,386 (2017: R110,940,985) that is ringfenced for specific projects relating to the rehabilitation of derelict and ownerless mines, as agreed with the Department of Mineral Resources.

14. Other Operating income

Library services	**14 000**	20 947	**14 000**	20 947
Breach of contract (employees)	**434 936**	1 304 232	**434 936**	1 304 232
Insurance claims received	**159 985**	108 258	**159 985**	108 258
Skill Development Levy refunds	**537 562**	499 037	**537 562**	499 037
Sundry income	**1 574 795**	1 497 695	**1 574 795**	1 497 695
Rental income - properties	**2 756 281**	2 622 157	**2 756 281**	2 622 157
	5 477 559	6 052 326	**5 477 559**	6 052 326

15. Investment income

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Short term deposits	**29 478 066**	31 255 632	**29 478 066**	31 255 632
Bank balances	**113 664**	68 851	**113 664**	68 851
Fair value interest on debtors	**693 250**	693 143	**693 250**	693 143
Other interest	**2**	34	**2**	34
	30 284 982	32 017 660	**30 284 982**	32 017 660

Total interest income, calculated using the effective interest rate, on financial instruments not at fair value through the Statement of Comprehensive Income amounted to R30,284,982 (2017: R32,017,660).

16. Employee Costs

Employee remuneration	**284 116 774**	273 287 651	**284 116 774**	273 287 651
Overtime	**1 946 799**	2 061 137	**1 946 799**	2 061 137
Provision for bonus expense	**4 500 000**	4 300 000	**4 500 000**	4 300 000
Training	**6 306 246**	6 948 615	**6 306 246**	6 948 615
Medical expenses	**1 784 032**	1 613 074	**1 784 032**	1 613 074
Accrued leave provision expense	**5 521 019**	6 304 718	**5 521 019**	6 304 718
Bursaries	**10 359 524**	12 264 233	**10 359 524**	12 264 233
Board member fees	**788 829**	450 293	**788 829**	450 293
Other employee costs	**1 893 068**	1 214 868	**1 893 068**	1 214 868
	317 216 291	308 444 589	**317 216 291**	308 444 589

17. Finance Costs

Trade creditors	**2 508**	6 210	**2 508**	6 210
Fair value interest on creditors	**1 126 610**	1 195 977	**1 126 610**	1 195 977
Retirement benefits	**2 200 000**	2 400 000	**2 200 000**	2 400 000
	3 329 118	3 602 187	**3 329 118**	3 602 187

18. Auditors Remuneration

External audit fees	**2 365 004**	1 895 822	**2 365 004**	1 895 822
Other audits	**451 021**	179 421	**451 021**	179 421
	2 816 025	2 075 243	**2 816 025**	2 075 243

19. Fees for Services

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Components of fees for services				
Technology services	**17 422 241**	13 839 042	**17 422 241**	13 839 042
Facility management	**8 419 162**	8 632 734	**8 419 162**	8 632 734
Legal fees	**3 695 667**	3 140 589	**3 695 667**	3 140 589
Contract services	**1 572 617**	789 416	**1 572 617**	789 416
Asbestos rehabilitation	**48 932 551**	23 328 623	**48 932 551**	23 328 623
Professional consultancy	**4 969 458**	5 148 320	**4 969 458**	5 148 320
	85 011 696	54 878 724	**85 011 696**	54 878 724

20. Depreciation, Amortization and Impairments

Buildings	**2 043 097**	2 169 996	**2 043 097**	2 169 996
Plant	**1 861 508**	620 962	**1 861 508**	620 962
Equipment	**11 594 864**	9 148 937	**11 594 864**	9 148 937
Vehicles	**148**	(148)	**148**	(148)
Furniture and fittings	**986 842**	980 183	**986 842**	980 183
Computer software (intangible assets)	**611 678**	549 902	**611 678**	549 902
	17 098 137	13 469 832	**17 098 137**	13 469 832
Reassessment of assets useful lives	**(6 496 487)**	(4 876 697)	**(6 496 487)**	(4 876 697)

Mintek reassessed the useful life of all zero value assets due to the fact that they are still in use and have future economic value. The useful lives were extended based on the assumptions that assets will be replaced in the next two years due to a capitalisation plan. The original acquisition value for these assets were R27,261,640 and the resultant depreciation write back was R6,496,487 (refer to note 2 and 3).

21. Taxation

Reconciliation of the tax expense

Reconciliation between applicable tax rate and average effective tax rate.

Applicable tax rate	**28.00 %**	28.00 %	**-**	-

No provision for income tax was made for the company during the current financial year as Mintek is exempt in terms of section 10(1)(CA)(i) of the Income Tax Act, No. 58 of 1962; and Mindev is a dormant company. Tax provisions and liabilities are with respect to Mindev and are payable through that entity.

22. Cash used in Operations

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Surplus for the year	**2 361 970**	6 017 849	**2 361 970**	6 017 849
Adjustments for:				
Depreciation and amortisation	**17 098 137**	13 469 832	**17 098 137**	13 469 832
Loss on sale of assets	**534 662**	858 478	**534 662**	858 478
Actuarial gains	**(3 528 660)**	(1 221 784)	**(3 528 660)**	(1 221 784)
Interest received - investment	**(30 284 982)**	(32 017 660)	**(30 284 982)**	(32 017 660)
Finance costs	**3 329 118**	3 602 187	**3 329 118**	3 602 187
Fair value adjustment - trade receivables	**693 250**	693 142	**693 250**	693 142
Fair value adjustment - trade payables	**(1 126 610)**	(1 195 977)	**(1 126 610)**	(1 195 977)
Assets adjustment	**(6 496 487)**	(4 876 697)	**(6 496 487)**	(4 876 697)
Changes in working capital:				
Increase in inventories	**(1 602 511)**	(968 057)	**(1 602 511)**	(968 057)
Decrease in trade and other receivables	**1 336 171**	4 948 364	**1 336 171**	4 948 364
Decrease in trade and other payables	**(996 179)**	(9 646 647)	**(996 179)**	(9 646 647)
(Decrease)/increase in deferred income	**(6 330 116)**	5 578 294	**(6 330 116)**	5 578 294
(Decrease)/increase in provisions	**(154 572)**	537 125	**(154 572)**	537 125
	(25 166 809)	(14 221 551)	**(25 166 809)**	(14 221 551)

23. Insurance and Risk Management

The insurance and risk management policies adopted by Mintek are aimed at obtaining sufficient cover at the minimum cost to protect its asset base, earning capacity and legal obligations against acceptable losses.

All property, plant and equipment are insured at current replacement value. Risks of a possible catastrophic nature are identified and insured at acceptable risks.

24. Commitments

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Authorised capital expenditure				
Authorised and contracted for				
Property, plant and equipment	**1 752 362**	16 905 140	**1 752 362**	16 905 140

This committed expenditure relates to plant and equipment and will be financed by available, existing cash resources, external grant funding.

Operational expenditure				
Contracted for	**94 816 881**	84 249 182	**94 816 881**	84 249 182
Operating leases for vehicles – as lessee (expense)				
Minimum lease payments due				
- within one year	**357 111**	503 068	**357 111**	503 068
- in second to fifth year inclusive	**237 348**	143 363	**237 348**	143 363
	594 459	646 431	**594 459**	646 431

25. Contingencies

Mintek has disputed employment contracts with former employees, the aggregate of which is not expected to exceed R679,915 (2017: R679,915). This amount includes estimated legal costs and disbursements and does not factor the success rate of the individual cases.

Cessions in favour of Absa Bank for R2,155,000 (2017: R2,155,000) to meet requirements for credit card and other banking facilities has been registered.

26. Related Parties

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017

Controlling entity

The Group comprises of Mintek and its wholly owned subsidiary Mindev (Proprietary) Limited. Mindev is engaged in the commercialisation of Mintek patents and technology through the identification of suitable partners. The Group, in the ordinary course of business, enters into various sale and purchase transactions with related parties.

None of the directors, officers or major shareholders of the Mintek Group or, to the knowledge of Mintek, their families, had any interest, direct or indirect, in any transactions which has affected or will materially affect Mintek or its investment or subsidiary.

Related party transactions

Related party transactions exist within the Group. During the year all sales transactions were concluded at arm's length. Details of material transactions with related parties not disclosed elsewhere in the financial statements are as follows:

Related party balances

Loan accounts - Owing to related parties				
Mindev (Pty) Ltd	-	-	**39 515 043**	39 515 043
Amounts included in Deferred Income regarding related parties				
Department of Mineral Resources	**115 989 068**	130 642 174	**115 989 068**	130 642 174
Mining Qualification Authority	**1 130 048**	1 701 425	**1 130 048**	1 701 425
Department of Science and Technology	**40 780 456**	34 041 447	**40 780 456**	34 041 447
National Lotteries Board	**1 111 993**	-	**1 111 993**	-
National Research Foundation	**549 285**	1 125 108	**549 285**	1 125 108
Technology Innovation Agency	**71 657**	71 657	**71 657**	71 657
Amounts included in Trade receivables regarding related parties				
Mining Qualification Authority	**877 202**	2 994 454	**877 202**	2 994 454
Department of Mineral Resources	**190 866**	-	**190 866**	-
Water Research Council	**-**	622 686	**-**	622 686
Department of Science and Technology	**1 281 987**	81 348	**1 281 987**	81 348
National Research Foundation	**2 792 937**	10 520	**2 792 937**	10 520
CSIR	**3 078**	296 800	**3 078**	296 800
Sales to related parties				
Department of Mineral Resources	**302 997 809**	279 995 878	**302 997 809**	279 995 878
Department of Science and Technology	**47 750 698**	39 708 603	**47 750 698**	39 708 603
Department of Energy	**975 000**	-	**975 000**	-
National Research Foundation	**3 356 452**	1 517 116	**3 356 452**	1 517 116
Council of Geoscience	**540 911**	737 593	**540 911**	737 593
Technology Innovation Agency	**74 272**	-	**74 272**	-
Mining Qualification Authority	**4 904 050**	9 726 076	**4 904 050**	9 726 076

Notes to the Financial Statements

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Sales to related parties *(continued)*				
CSIR	**39 965**	689 235	**39 965**	689 235
Water Research Council	**1 046 500**	1 638 650	**1 046 500**	1 638 650
National Lotteries Board	**896 779**	-	**896 779**	-
The South African Medical Research Council	**170 192**	170 192	**170 192**	170 192

Relationships

Subsidiary	Mindev (Pty) Limited
Parent National Department	Department of Mineral Resources
Other Government Science Departments	Department of Science and Technology and its Entities
Other Government Departments and Entities	Department of Health and its Entities
	Department of Higher Education and Training and its Entities
	Department of Water and Sanitation and its Entities
	Department of Energy and its entities

27. Board Members and Executive Management Remuneration

2018

Executive Management	Basic Salary	Performance Bonuses and other Expenses	Total
Mr MA Mngomezulu (Contract ended 03/09/2017)	**1 270 293**	**417 853**	**1 688 146**
Mr DM Msiza (Acting from 14/09/2017)	**423 165**	**27 095**	**450 260**
Mr AD McKenzie	**1 902 401**	**137 738**	**2 040 139**
Mr SA Simelane	**2 089 800**	**41 129**	**2 130 929**
Ms FG Nyanda	**1 829 617**	**36 229**	**1 865 846**
Dr M Makhafola	**1 902 401**	**222 931**	**2 125 332**
Dr DM Powell	**1 695 891**	**51 053**	**1 746 944**
	11 113 568	**934 028**	**12 047 596**

Non-Executive Board members

	Fees for services as Directors	Other expenses	Total
Mr ND Masemola (Appointed 01/06/2017)	**137 573**	**10 863**	**148 436**
Mr MJ Rachidi	**163 307**	**7 055**	**170 362**
Mr DS Dlamini	**97 226**	**4 559**	**101 785**
Ms CKN McClain	**57 849**	**3 796**	**61 645**
Dr MS Mohlala	**93 647**	**4 559**	**98 206**
Dr S Simayi	**62 802**	**3 797**	**66 599**
Ms SS Ngwenya	**78 462**	**3 796**	**82 258**
Mr PL Mkhombo	**88 033**	**3 796**	**91 829**
	778 899	**42 221**	**821 120**

FIGURES IN RAND	GROUP		COMPANY	
	2018	2017	**2018**	2017
Travel	**348 929**	40 646	**348 929**	40 646
Recruitment services - CEO position	**21 316**	-	**21 316**	-
Independent committee members - fees and travel costs	**-**	27 666	**-**	27 666
Other expenses	**50 397**	19 507	**50 397**	19 507
	420 642	87 819	**420 642**	87 819

Mr. A Moatshe and Mr. D du Toit were not paid any directors' emoluments during the year under review as they are serving as government employees.

Notes to the Financial Statements

2017

Executive Management	Basic Salary	Performance Bonuses and other Expenses	Total
Mr MA Mngomezulu	2 927 783	136 030	3 063 813
Mr AD McKenzie	1 776 827	100 325	1 877 152
Mr P Craven (Retired 31/12/2016)	1 395 859	94 866	1 490 725
Mr SA Simelane	1 951 857	77 663	2 029 520
Ms FG Nyanda	1 708 848	67 892	1 776 740
Dr M Makhafola	1 776 827	126 109	1 902 936
Dr DM Powell (Appointed 01/11/2016)	686 040	-	686 040
	12 224 041	602 885	12 826 926

Non-Executive Board members

	Fees for Services as Directors	Other Expenses	Total
Dr L Konar (Resigned 31/03/2017)	56 212	-	56 212
Mr MJ Rachidi	72 616	-	72 616
Adv D Block (Contract ended 31/05/2016)	10 976	315	11 291
Mr DS Dlamini	58 204	-	58 204
Dr V Toni Penxa (Contract ended 31/05/2016)	8 000	1 187	9 187
Dr NS Nhlapo (Contract ended 31/05/2016)	3 408	-	3 408
Ms K Mthimunye (Contract ended 31/05/2016)	7 568	-	7 568
Ms CKN McClain	44 342	-	44 342
Dr MS Mohlala	57 432	-	57 432
Dr S Simayi	23 384	-	23 384
Ms SS Ngwenga	49 048	-	49 048
Mr PL Mkhombo	31 437	-	31 437
	422 627	1 502	424 129

FIGURES IN RAND	GROUP		COMPANY	
	2017	2016	2017	2016
Travel	40 646	152 086	40 646	152 086
Independent committee members - fees and travel costs	27 666	16 072	27 666	16 072
Other expenses	19 507	13 547	19 507	13 547
	87 819	181 705	87 819	181 705

Mr. A Moatshe and Mr. D du Toit were not paid any directors' emoluments during the year under review as they are serving as government employees.

28. Financial Instruments

Foreign currency risk

Foreign currency risk is the risk that the fair value or future cash flow of a financial instrument will fluctuate because of changes in foreign exchange rates. The group undertakes certain transactions denominated in foreign currencies hence exposure to exchange rate fluctuations arises. Exchange rate exposures are managed by operating a US Dollar based bank account within approved policy parameters and the group does not use derivatives to hedge its exposure.

Credit risk management

Financial assets that could subject the group to credit risk consist principally of bank balances and cash, deposits, trade and other receivables, and short-term investments. The Group bank balances and short-term investments are placed with several financial institutions with at least BBB credit ratings as rated in terms of the Fitch Global Rating system (note 7). The Group reviews its trade and other receivables at each balance sheet date to ensure adequate allowances for doubtful receivables or loan write-offs are made, the level of this provision is disclosed in note 6. Credit risk with respect to trade receivables is limited to the large number of customers comprising the Group's customer base and their dispersion across different industries and geographical areas. Accordingly the Group does not have significant concentration of credit risk.

The Group considers its short-term investments to be secured and readily available as cash should the need arise for the conversion of the investments (note 7).

The carrying amounts of financial assets included in the balance sheet represent the Group's exposure to credit risk in relation to these assets (note 6). The Group does not have any significant exposure to any customer or counter party.

Liquidity risk

Prudent liquidity risk management implies maintaining sufficient cash resources to meet cash flow requirements. Management monitors forecasts of liquidity reserve on the basis of expected cash flow. Analysis of the various requirements is disclosed in note 7 of the financial statements.

Fair values

As at 31 March 2018 the carrying amount of bank balances and cash, deposits, trade and other receivables, trade and other payables, contracts in progress, advances received and short-term borrowings approximated their fair values due to the short-term nature of these assets and liabilities.

The group does not hedge foreign exchange fluctuations.

Interest rate risk

The valuation of interest rate exposure and investment strategies is done on a regular basis. The risk arises from substantial interest-bearing assets at variable interest rates. To minimise exposure to this risk, the Group uses a mixture of variable and fixed interest rates. Refer to note 7.

Audited Financial Statements (Mindev)

Mindev (Pty) Ltd Statement of Financial Position as at 31 March 2018

FIGURES IN RAND	NOTE(S)	2018	2017
Assets			
Current Assets			
Loans to shareholders	2	**39 514 943**	39 514 943
Equity and Liabilities			
Equity			
Share capital	3	**100**	100
Retained income		**39 514 843**	39 514 843
		39 514 943	39 514 943

Mindev (Pty) Ltd Statement of Changes in Equity an on 31 March 2018

FIGURES IN RAND	SHARE CAPITAL	RETAINED INCOME	TOTAL EQUITY
Balance at 01 April 2016	100	39 514 843	39 514 943
Balance at 01 April 2017	**100**	**39 514 843**	**39 514 943**
Balance at 31 March 2018	**100**	**39 514 843**	**39 514 943**

Accounting Policies

1. Significant accounting policies

The principal accounting policies applied in the preparation of these financial statements are set out below. These accounting policies are consistent with the previous period.

1.1 Financial instruments Loan to shareholder

These financial assets are classified as loans and receivables.

1.2 Taxation

Current tax assets and liabilities

Current tax for current and prior periods is, to the extent unpaid, recognised as a liability. If the amount already paid in respect of current and prior periods exceeds the amount due for those periods, the excess is recognised as an asset.

Current tax liabilities/(assets) for the current and prior periods are measured at the amount expected to be paid to/(recovered from) the tax authorities, using the tax rates (and tax laws) that have been enacted or substantively enacted by the end of the reporting period.

Tax expenses

Current and deferred taxes are recognised as income or an expense and included in profit or loss for the period, except to the extent that the tax arises from:

- a transaction or event which is recognised, in the same or a different period, to other comprehensive income, or
- a business combination.

Current tax and deferred taxes are charged or credited to other comprehensive income if the tax relates to items that are credited or charged, in the same or a different period, to other comprehensive income.

Current tax and deferred taxes are charged or credited directly to equity if the tax relates to items that are credited or charged, in the same or a different period, directly in equity.

1.3 Financing costs

Financing costs are recognised in the statement of comprehensive income in the period in which they are incurred.

1.4 Investment income

Interest is recognised, in profit or loss, and is recognised on the accrual thereof, on a time proportionate basis.

2. Loan to Shareholder

FIGURES IN RAND	2018	2017
Mintek	**39 514 943**	39 514 943

The loan is interest free and has no repayment terms.

3. Share Capital

Authorised		
1,000 Ordinary shares of R1 each	**1 000**	1 000
Issued		
Ordinary	**100**	100

4. Directors' Emoluments

No emoluments were paid to the directors or any individuals holding a prescribed office during the year.

5. Related Parties

Controlling entity

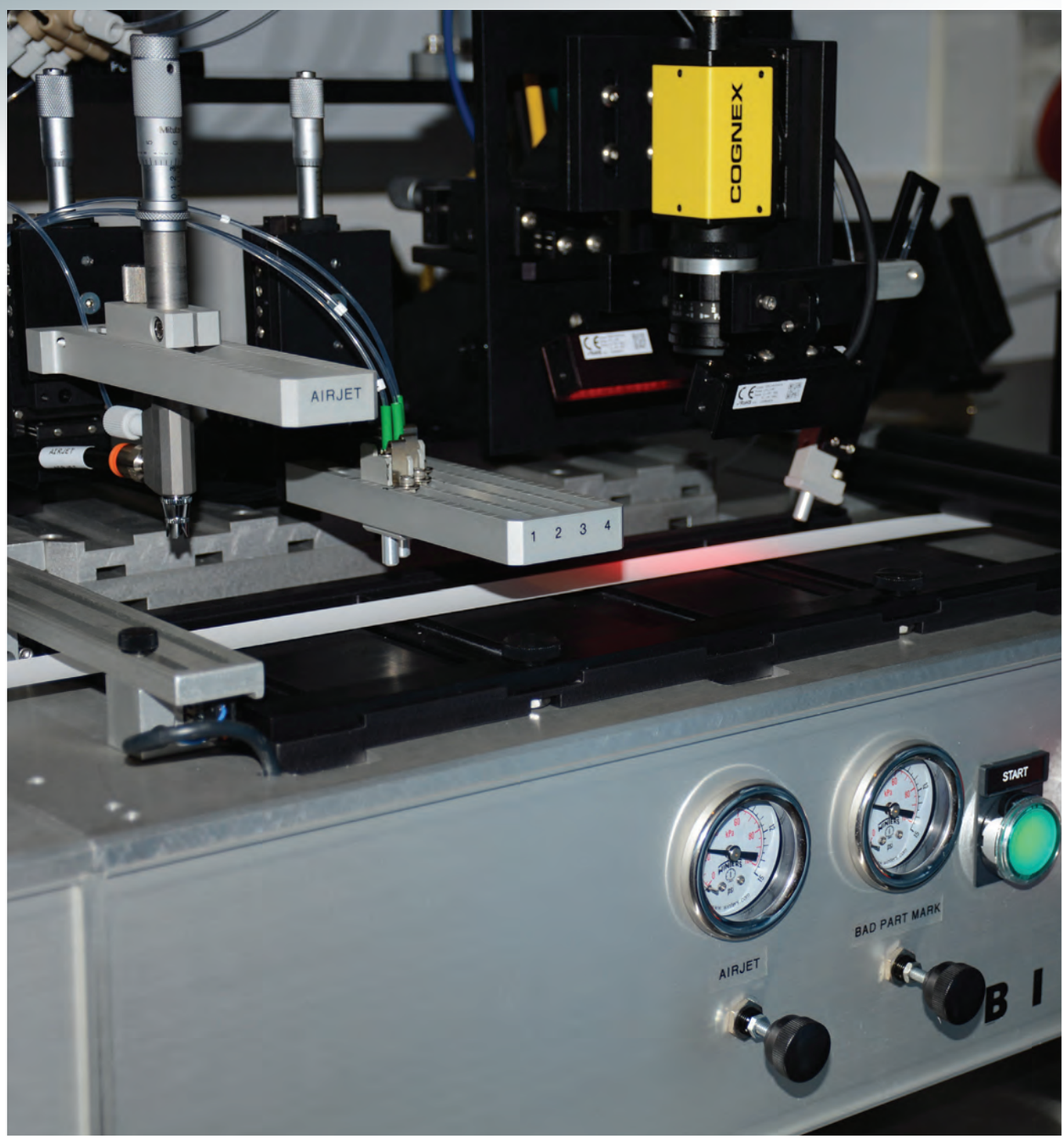
The Group comprises of Mintek and its wholly owned subsidiary Mindev (Proprietary) Limited. Mindev is engaged in the commercialisation of Mintek patents and technology through the identification of suitable partners. The Group, in the ordinary course of business, enters into various sale and purchase transactions with related parties.

None of the directors, officers or the shareholder of the Mintek Group or, to the knowledge of Mintek, their families, had any interest, direct or indirect, in any transactions which has affected or will materially affect Mintek or its investment or subsidiary.

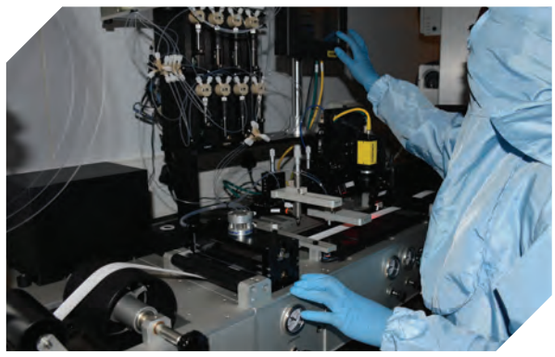
Related party transactions

Related party transactions exist within the Group. During the year no sales transactions were concluded. Details of material transactions with related parties not disclosed elsewhere in the financial statements are as follows:

Relationships		
Holding company	**Mintek**	
Related party balances		
Loan accounts - Owing by related parties		
Mintek	**39 514 943**	39 514 943

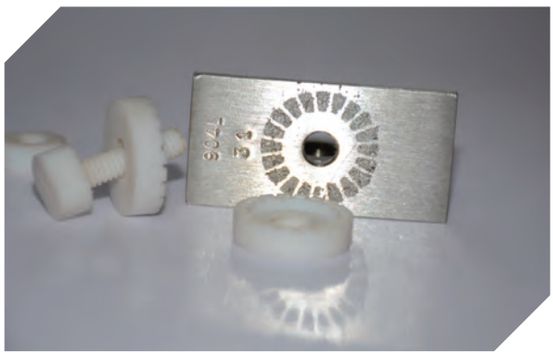


Top and left: Monitoring the process of dispensing bio-molecules onto nitrocellulose membranes, a process which takes place in the Mintek/ DST Nanotechnology Innovation Centre (NIC) Cleanroom.



RESEARCH OUTPUTS

7



An analysis sample from the Advanced Materials Division (AMD): Type 904L stainless steel coupon exposed under simulation leach conditions, showing severe crevice corrosion.

7.1 Poster Presentations

1. **Baloyi J & Ntho T.** Highly active and stable Al/Fe pillared South African bentonite clay: synthesis, characterization and application for CWAO of phenol under mild conditions. 8th World Congress on Oxidation Catalysis, 3-8 September 2017. Krakow, Poland.

2. **Cwasi N, Mukwevho N & Sikhakhane K.** Lean management: Analytical Service Division. 7th Annual Mintek and SASS Analytical Science Symposium, 03 November 2017, Mintek, Randburg, South Africa.

3. **Graham S.** Environmental monitoring at Mintek. SAIMM Water Conference. 10–11 July 2017 Emperors Palace, Hotel Casino, Convention Resort, Midrand, South Africa.

4. **Mhlambiso Z & Matabane Z.** Waste management: A compliance to globally harmonized system. 7th Annual Mintek and SASS Analytical Science Symposium, 03 November 2017, Mintek, Randburg, South Africa.

5. **Mhlanga N, Domfe T & Skepu A.** Self-assembly of Ag nanostructures on supports. 8th Annual DST/NIC 2018 workshop, 26-28 March 2018. Mintek, Randburg, South Africa.

6. **Moeletsi R & Tesfamichael S. 2017.** Change detection within granite quarries between Rustenburg and Brits. The 37th International Symposium on Remote Sensing of Environment 8-12 May 2017. Tshwane, Pretoria, South Africa.

7. **Moeletsi R.** Quantifying land cover changes caused by granite quarries from 1973-2015 using landsat. International Conference on Geographical Information Systems Theory, Applications and Management (GISTAM), 17-19 March 2018, Funchal, Madeira, Portugal.

8. **Mxinwa S, Landu L & Bazhko O.** Potential impact of uranium in dumps on local communities. Mine Safe 2017: Striving for Zero Harm Driving Excellence through Compliance. 30–31 August 2017. Emperors Palace Casino, Midrand, South Africa.

9. **Mnculwane H.** The Determination of iodine number of activated carbon. 7th Annual Mintek and SASS Analytical Science Symposium, 3 November 2017; Mintek, Randburg, South Africa.

10. **Nemadodzi L & Sikhwivhilu K.** Removal of metal ions from mine effluent using adsorbent resins. SAIMM Water 2017, 10-11 July, Emperors Palace, Midrand, South Africa.

11. **Nongauza S, Matabola P & Sikhwivhilu K.** Influence of polystyrenesulfonate (PSS) on the performance and fouling properties of the polyvinylidene fluoride (PVDF) based ultrafiltration membranes. The 11th International Congress on Membranes and Membrane Processes (ICOM 2017). 29 July-04 August 2017. San Francisco, CA, USA.

12. **Sindane Z & Sehlotho N.** Process Flowsheet Development for Rosh Pinah. Flotation '17, 13-16 November 2017, Vineyard Hotel, Cape Town, South Africa.

13. **Teme K, Strydom H.** Processing strategies for various fluorite ores. Flotation '17, 13-16th November 2017, Vineyard Hotel, Cape Town, South Africa.

14. **Tlhabane D, Legoale T, Sosibo N & Singh N.** Investigation of environmental impacts of small scale production of road aggregates from ferrochrome slag. 9th International Conference on Advances in Science, Engineering, Technology and Waste Management, 27-28 November 2017, Parys, South Africa.

7.2 Oral Presentations

1. **Abrahams S, Fish Q & Mosebi S**. ALLINIs modulate the interaction between HIV 1 Rev and Integrase. The 8th SA AIDS Conference. 13 - 15 June 2017. Inkosi Albert Luthuli International Convention Centre, Durban, South Africa.

2. **Abrahams S, Fish Q & Harrison A.** Decoding discrepancies in allosteric inhibition of HIV 1 integrase. Smart Sensing: Quantum Investigations in Living Systems, 11 - 12 May 2017.Rome, Italy.

3. **Auchterlonie, A.** Annual Strategy Discussion. Lekgotla 2017 Mineral Economic Summary. Executive Lekgotla November 2017. Johannesburg, South Africa.

4. **Baloyi J & Ntho T.** An effective pillared South African bentonite clay: synthesis and application as green chemistry catalyst for wastewater treatment. 9th International Conference on Advances in Science, Engineering, Technology and Waste Management (ASETWM-17), 27-28, November 2017, Parys, South Africa.

5. **Baloyi J & Ntho T.** Synthesis of low-cost Al/Zr pillared from South African natural clay: application for catalytic wet air oxidation of phenol. Catalysis Society of South Africa (CATSA 2017), 19-22 November 2017, Kwa Maritane Bush Lodge, Pilanesberg, North-West Province, South Africa.

6. **Baloyi J & Ntho T.** Synthesis of novel AL/Cr pillared clays catalysts for oxidation of phenol. 8th World Congress on Oxidation Catalysis, 3-8 September 2017, Krakow, Poland.

7. **Banda W.** Chemical wear of carbon and silicon carbide-based refractory materials by silicomanganese alloy. Student Seminar MINTEK / NTNU / SINTEF, 18th May 2017. Trondheim, Norway.

8. **Banda W & Lagendijk H**. Metallothermic production of cement extender from manganese waste slags. 5th International Slag Valorisation Symposium, 3-5 April 2017, Leuven, Belgium.

9. **Banda W.** Tenets of project management (the Mintek way) in planning and executing research. Wednesday Lunch Seminar 2017. 3 May 2017. Witwatersrand School of Chemical and Metallurgical Engineering Johannesburg, South Africa.

10. **Banda W.** Chemical wear of carbon and silicon carbide-based refractory materials by silicomanganese alloy. Student Seminar MINTEK / Elkem Carbon Kristiansand, 15–16 May 2017. Norway.

11. **Bazhko O & Yahorava O.** Process for the recovery of gold from uranium resin. The 22nd Annual ALTA conference. 20-27 May 2017. Pan Pacific Hotel, Perth, Australia.

12. **Bergmann C & Thiele H.** FLS Open day presentation. FLSmidth and MMMA function - Reflux classifier. 8 August 2017. Mintek, Randburg, Johannesburg, South Africa.

13. **Bergmann C.** Lecture 1 - gravity separation. 59th Lecture for ChemEng 3rd year students at Stellenbosch. 19 September 2017. University of Stellenbosch, Cape Town, South Africa

14. **Bergmann C.** Lecture 2 - DMS jigging and sorting. Second lecture to 3rd year ChemEng students at Stellenbosch. 20 September 2017. University of Stellenbosch, Cape Town, South Africa.

15. **Bergmann C, Moloane T & Powell D.** Pilot dense medium separation of Fe ore fines. Physical Separation 2017, 16 June 2017, Falmouth, England.

16. **Bergmann C.** Particle tracking analysis and modelling. Chrome Colloquium 2017, 19-20 June. Mintek, Randburg, South Africa.

17. **Bisaka K, Theobald I, Mokoena S, Pawlik C & Erwee M.** Flowsheet development for the extraction of rare earths using Mintek's Pyearth™ Process. Nickel-Cobalt 2017 Conference. 27-30 August 2017, Hyatt Regency Vancouver, British Columbia, Canada.

18. **Brill S & Negota N.** Diamonds suspected to have origins in the Central African Republic: fingerprinting results. Kimberley Process Plenary Meeting, 9-14 December 2017, Brisbane, Australia.

19. **Carelse C, Chetty D and Corfield A.** Quantification of PGE in alteration silicates in chromitite layers from the Bushveld Complex using LA-ICP-MS. Minerals Research Showcase 2017. 03-04 August 2017. Philippi Village, Philippi, Cape Town.

15. **Nyembe S, Sikhwivhilu L, Ndlovu G, Shumbula P & Ntho T.** Gas sensing potential of indium phoshide nanowires. TechConnect World Innovation Conference and Expo 2017. 16 May 2017. USA, Washington DC, Gaylord National Hotel and Convention Centre

20. **Chetty D, Mogoru J, Bergmann C, Ngoasheng M, Pebane M, Masikhwa S, Carelse C & Selepe K.** The impact of mineralogy on processing for the recovery of chromite and PGE from the Thaba Mine. Joint AMREP and DST-CIMERA Symposium, 14-15 March 2018, Mintek, Randburg, South Africa.

21. **Chetty J & Steenkamp J.** Excavation method for 2.4m diameter pilot-scale furnace. UNITECR 2017. 26 - 29 September 2017. Santiago, Chile.

22. **Chetty D & Gutzmer J.** Quantitative mineralogy to address energy consumption in smelting of ores from the Kalahari Manganese Field, South Africa. In: Jones, R.T., den Hoed, P. & Erwee, M.W. (Eds) Infacon XV, SAIMM, 25–28 February 2018. Cape Town, South Africa.

23. **Cobongela S, Nemadodzi L, Mphuthi N & Nyembe S.** Nanotechnology at the leading edge National Science Week Exhibition, Sci-Bono, 7-10 August 2017. Newtown, Johannesburg, South Africa.

24. **Coetzee L.** Nonlinear – It really is better. The Control Conference Africa 2017, The A-Z of APC Workshop, 5 - 6 December 2017, Sandton, South Africa.

25. **Coetzee L.** Using StarCS Automodeller to model Pilanesberg Platinum Mine Primary UG2 Milling Circuit. The Control Conference Africa (CCA 2017), 7-8 December 2017, Sandton, South Africa.

26. **Cornelissen H.** Site risk ranking presentation ICEPR June 2017. Proceedings of the 3rd World Congress on New Technologies (NewTech'17). 6 – 8 June 2017. Rome, Italy.

27. **Coyanis M, Saku D & Abrahams S.** From e-waste smelting to the implementation of CALUX® bioassay. 37th International Symposium on Halogenated Persistent Organic Pollutants (POPs) DIOXIN 2017, 20 – 25 August, 2017. Sheraton Wall Centre, Vancouver.

28. **Da Corte C & Singh A.** Pre-concentration of fluorspar using DMS. SME 2018 Annual Conference & Expo. 25-28 February 2018. Minneapolis, USA.

29. **Erwee M.** Fluxing of South African chromite using colemanite. Infacon XV: International Ferro-alloys Conference, 25-28 February 2018, Century City Conference Centre, Cape Town, South Africa.

30. **Erwee M & Reynolds Q.** Open source software and hardware in the lab. OpenSim 2017: from spark to fire. openSim conference, 1 December 2017. University of Pretoria, Pretoria, South Africa.

31. **Ford E.** Using DEM in support of a laboratory stirred media mill test work programme. Computational Modelling 2017, 13 - 14 June 2017. Falmouth, UK.

32. **Ford E & Sithole V.** Maximising data generation for fine screening modelling and simulation. Physical Separation 2017, 15 - 16 June 2017. Falmouth. UK.

33. **Gericke M & Neale J.** The Mondo Minerals Nickel Sulfide Bioleach Project: from test work to early plant operation. 22nd International Biohydrometallurgy Symposium. 24-27 September 2017, TU Bergakademie, Freiberg/Germany.

34. **Gericke M.** The EU INTMET project to exploit the Iberian pyrite belt polymetallic ores. 17-19 October 2017. Metallic Mining Hall, Seville Spain.

35. **Govender V, Corfield A, Chetty D & Clark W.** The importance of mineralogical characterisation in chromite fines processing. SAIMM Chrome Colloquium 2017, 19-20 June 2017, Mintek, Randburg, Johannesburg, South Africa.

36. **Govender Y.** Mintek technology demonstration showcase. Water Conference 2017. 10-11 July 2017. Emperors Palace, Midrand, South Africa.

37. **Harrison A & Mosebi S.** Comparison of HIV 1 IN_LEDGF_p75 inhibitors through hydrogen amide exchange. The International Conference on Clinical and Basic Sciences Research. 27 - 29 November 2017. Cape Town Lodge Hotel, South Africa.

38. **Hockaday C & Ramparsad Y.** Considerations regarding electrode metering prior to start up. Infacon XV, 26-28 February 2018, Cape Town, South Africa.

39. **Hockaday L, Reynolds Q G, Dinter F & Harms M.** The Solar thermal treatment of manganese ore fines. SolarPACES Conference. 26-29 October 2017. Santiago, Chile.

40. **Jones R & Erwee M.** Northam Platinum's new furnace (Keynote: Northam Platinum - Operational Update). Nickel-Cobalt 2017 Conference. 27-30 August 2017, Hyatt Regency Vancouver, British Columbia, Canada.

41. **Jones R, Erwee M.** Improved knowledge sharing to break down barriers to innovation. Nickel-Cobalt 2017 Conference. 27-30 August 2017, Hyatt Regency Vancouver, British Columbia, Canada.

42. **Jones R.** The early history and current state of industrial smelting in South Africa. European Metallurgical Conference (EMC2017), 25 - 28 June 2017, Leipzig, Germany. (Plenary Lecture).

43. **Kgaria M & Yahorava O.** Uranium from AMD. Southern African Institute of Mining and Metallurgy Uranium 2017 International Conference: Extraction and Applications of Uranium: Present and Future. 12-13 September 2017. Swakopmund, Namibia.

44. **Langa S.** Statistical analysis of low Au in dump material. 7th Annual Mintek and SASS Analytical Science Symposium, 03 November 2017, Mintek, Randburg, South Africa.

45. **Legodi W & Yahorava O.** The destruction of nickel cyanide. ALTA 2017. 20 - 27 May 2017, Perth, Australia.

46. **Legoale T.** An investigation on the gold hyper-accumulatory ability of wheat and its possible application in the environmentally sound exploitation of gold-bearing substrates. Annual International Current and Future Trends in Technology Innovation and Engineering Research (FTIE), 06-07 March, 2018. Cape Town, South Africa.

47. **Maharajh D, Grewar T, Neale J & van Rooyen M.** Mine impacted water: A resource for the circular economy and sustainable development for mining communities. 2nd International Peri-Urban Conference 2017, 26 - 29 November 2017, Century City, Cape Town, South Africa.

48. **Makhado G.** Implementation of an advanced thickener underflow density control at Loulo Gold Mine, Mali. 7th International World Gold Conference. 27-30 August, Vancouver, Canada.

49. **Makhafola M, Mantyi H, Mwamba A & Papo J.** Development of a lean rare earth permanent magnet for renewable energy applications. 12th Energy Harvesting Workshop (EHW). 11-14 September 2017. The Westin Tysons Corner, Falls Church, VA, USA.

50. **Makhafola M & Coyanis M.** Uses and application of mass spectrometry in chemical synthesis and biochemical analysis. 5th International Conference on Current Trends in Mass Spectrometry & Chromatography. 25 - 27 September 2017. Atlanta, Georgia, USA.

51. **Makhalemele N, Powell D, King I & Bergmann C.** Dry XRT sorting of coal-demonstration plant level. Southern African Coal Processing Society Conference (SACPS). 21-24 August 2017, Secunda Graceland Hotel, Mpumalanga, South Africa.

52. **Mantyi H & Mwamba A.** Magnets the vitamin of a modern economy: a review. AMI Precious Metals 2017, Precious Metals Development Network (PMDN). 17-19 October 2017. Protea Hotel Ranch Resort, Polokwane, Limpopo, South Africa.

53. **Marape G, Thiele H, Mathebula S & Bergmann C.** Magnetic properties of chromite spinels from various reefs in the Bushveld Complex. SAIMM Chrome Colloquium 2017, 19-20 June 2017. Mintek, Randburg, Johannesburg, South Africa.

54. **Matabola P.** Electrospinning activities at the DST/Mintek Nanotechnology Innovation. Electrospin 2018 International Conference, 16-18 January 2018, Stellenbosch, South Africa.

55. **Matabola P, Sikhwivhilu K & Mlasi B.** Assessment of in-house developed CUF membranes on treatment of AMD Effluent. SAIMM Water Conference 2017, 10-11 July 2017, Emperors Palace Convention Centre, Midrand, South Africa.

56. **Mbambo M.** Nanotechnology: innovative research for advanced development at Mintek. National Science Week. 7 August 2017. Tembisa, Midrand, South Africa.

57. **McKenzie A.** Mintek's work at Robinson Lake. Rehabilitation of mine contaminated eco-systems. 19 July 2017. Braampark, Johannesburg, South Africa.

58. **Mdluli J.** Lean implementation in the analytical services: assessment of progress. 7th Annual Mintek and SASS Analytical Science Symposium, 3 Nov 2017, Mintek, Randburg, Johannesburg, South Africa.

59. **Mlasi B.** Applicability of CUF membranes in the treatment of acid mine drainage. DST/Mintek Nanotechnology Innovation Centre Water Unit's Postgraduate Students' Workshop. University of Johannesburg, 24 May 2017. Doornfontein, Johannesburg, South Africa.

60. **Mnculwane H.** Sequential Cu analysis of a Tschudi sample. 7th Annual Mintek and SASS Analytical Science Symposium, 03 November 2017, MINTEK, Randburg, Johannesburg, South Africa.

61. **Modiga A, Sosibo N, Singh N & Marape G.** A feasibility study evaluating the efficiency of fine coal washing using gravity separation methods. Al Azhar's 14th International Conference on: Engineering, Architecture and Technology (AEIC 2017), 12-14 December 2017. Cairo, Egypt.

62. **Moema J.** MSc presentation on effect of retained austenite on grinding balls. One day Colloquium Bainite in Steels. 04 December 2017. University of Pretoria, Pretoria, South Africa.

63. **Moeletsi R.** Comparison of Landsat and ASTER in land cover change detection within granite quarries. International Conference on Geographical Information Systems Theory, Applications and Management (GISTAM), 17-19 March 2018. Funchal, Madeira, Portugal.

64. **Moeletsi R.** Utility of remote sensing in monitoring environmental impacts associated with granite quarrying. Conference: 2018 International Women in Science without Borders Indaba (WISWB). University of Johannesburg, School of Tourism and Hospitality. 21-23 March 2018. Johannesburg, South Africa.

65. **Moila AV.** Process mineralogy and extraction of rare elements from beach placer deposits. Wits University, School of Chemical and Metallurgical Engineering Postgraduate Research Seminar. 23 November 2017. Wits University, Johannesburg, South Africa.

66. **Mosebi S, Abrahams S, Fish Q & Harrison A.** Decoding discrepancies in allosteric inhibition of HIV1 integrase. Smart Sensing: Quantum Investigations in Living Systems. 9 – 20 May 2017. University of Rome, Tor Vergata, Italy.

67. **Mnisi M.** Method development: workability of tap-hole clay. Student Seminar MINTEK / Elkem Carbon Kristiansand, 15-16 May 2017. Norway.

68. **Mnisi M.** Method development: workability of tap-hole clay. Student Seminar MINTEK / NTNU / SINTEF. 18 May 2017. Trondheim, Norway.

69. **Mothapo M.** Sustainability of bamboo species as potential cover on asbestos mine waste in semi-arid regions. Fossil Fuel Presentation, 4 July 2017. Glenhove Conference Centre. Johannesburg, South Africa.

70. **Mothapo M.** Realising the African mining vision. GlobalIndustriall. African Mining Vision NUM Conference Centre, 26 July 2017. Midrand, South Africa.

71. **Ndlovu G, Nyembe S & Shumbula P.** DST-MINTEK NIC external review preparatory meeting, Nanominerals Unit. 11 April 2017. Continuing Education Centre, Rhodes University, Eastern Cape, South Africa.

72. **Ndlovu G.** Joint workshop on nanotechnology between SA and Algeria. SA Algeria Workshop. 12 - 13 July 2017, Oran, Algeria.

73. **Neale J, Muller H & Gericke M.** Low-cost biological treatment of metal-and sulphate-contaminated mine waters. 13th International Mine Water Association Congress 2017. 25-30 June 2017. Lappeeranta, Finland.

74. **Neale J.** The Acqueau Project. WRC Symposium 2017. 18-20 September 2017. OR Tambo Conference Centre, Boksburg, Ekurhuleni, Johannesburg. South Africa

75. **Nemadodzi L, Sikhwivhilu K & Mlasi B.** Styrene-based adsorbent resins for the removal of metal ions in mine wastewater, 8th Annual DST/Mintek Nanotechnology Innovation Centre Workshop, 26-27 March 2018. Johannesburg, South Africa.

76. **Nemadodzi L & Sikhwivhilu K.** Removal of ions from mine discharge using styrene based adsorbent resin. 8th International Young Water Professionals Conference, 10-13 December 2017, Cape Town International Convention Centre. Cape Town, South Africa.

77. **Nyembe S & Ndlovu G.** United Kingdom- South Africa workshop on low-dimensional nanomaterials. UK-SA Workshop. 3 May 2017, Cape Town, South Africa.

78. **Ntho T.** CO oxidation over AuPd doped graphene: A first principles study. AMI Precious Metals 2017 Conference, 17-19 October 2017, Protea Hotel Ranch Resort, Polokwane, Limpopo, South Africa.

79. **Oosthuizen K.** On the current state of flotation modelling for process control. The Control Conference Africa (CCA 2017), 7-8 December 2017, Sandton, Johannesburg, South Africa.

80. **Papo J.** Exposure time and corrosion behaviour of typical South African railway axle steel. AMI Precious Metals 2017, Precious Metals Development Network (PMDN), 17-19 October 2017. Protea Hotel Ranch Resort, Polokwane, South Africa.

81. **Papo J.** Mintek DRC overview. DRC Technical Meeting and Institutional Visit to Mintek. 5 September 2017. Mintek, Randburg, South Africa.

82. **Pillay S & Dlame M.** The separation of carbonates from uranium by flotation for the Karoo deposit. Southern African Institute of Mining and Metallurgy. Uranium 2017 International Conference: Extraction and Applications of Uranium – Present and Future. 12-13 September. Swakopmund, Namibia.

83. **Powell D.** Dry sensor-based sorting of coal at demonstration plant level. 34th Annual International Pittsburgh Coal Conference. 5-8 September 2017. Sheraton Pittsburgh Hotel, Pittsburgh, PA, United States.

84. **Powell D.** Leadership from a metallurgy point of view. Southern African Institute of Mining and Metallurgy Young Professional Conference Career and Leadership Conference 2017. 5 August 2017. University of Pretoria, Pretoria, South Africa.

85. **Reynolds Q & Erwee M.** Multiphase flow modelling of furnace tapholes. 12th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries. 30 May - 1 June 2017, Trondheim, Norway.

86. **Reynolds Q & Erwee Q.** Computational modelling of fluid flow through a PGM furnace matte taphole. SAIMM Symposium Series S95: 7th International Platinum Conference 2017. "Platinum: A Changing Industry" in association with AMI Precious Metals 2017, 18-19 October 2017, Protea Hotel Ranch Resort, Polokwane, Limpopo, South Africa

87. **Reynolds Q & Erwee M.** Computational modelling of furnace tapholes: a case study in life at the interface between academic and industrial research. 2017 CHPC National Conference, Velmore Hotel Estate, 3-7 December 2017, Erasmia, Pretoria, South Africa.

88. **Reynolds Q.** Work at Mintek on taphole and phase research. Taping Workshop, Controlled Tapping project. NTNU, 12 October 2017. Trondheim, Norway.

89. **Reynolds Q.** Modelling the plasma arc in electric furnaces: an illustrated primer. SAIMM Chrome Colloquium. 19-20 June 2017. Mintek, Randburg, Johannesburg, South Africa.

90. **Reynolds Q.** Influence of the power supply on the behaviour of DC plasma arcs: a modelling study. Infacon XV: International Ferro-Alloys Congress. 25-28 February 2018. Century City Conference Centre, Cape Town, South Africa.

91. **Ross R.** Improved flotation of PGM fines. Flotation '17. 13-16 November 2017. Vineyard Hotel, Cape Town, South Africa.

92. **Russell A.** Automated control of gravity spiral concentrators. SAIMM Chrome Colloquium. 19-20 June 2017. Mintek, Randburg, Johannesburg, South Africa.

93. **Segapela N.** Study of tap-hole clay erosion wear mechanisms in ferrochrome slag, using static and dynamic wear tests. Student Seminar MINTEK / Elkem Carbon. 15-16 May 2017. Kristiansand, Norway.

94. **Segapela N.** Study of tap-hole clay erosion wear mechanisms in ferrochrome slag, using static and dynamic wear tests. Student Seminar MINTEK / NTNU / SINTEF. 18 May 2017. Trondheim, Norway.

95. **Selepe K.** Experience in the development of flowsheet options for BRPM's Styldrift. 7th International Platinum Conference 2017. 18-19 October 2017. Protea Hotel, The Ranch Resort, Polokwane, South Africa.

96. **Shipman W & Chetty D.** Machine learning and X-ray micro-tomography: learning from the mineralogist. 3rd Conference on Imaging with Radiation (Imgrad2017), 14-15 September 2017, University of the Witwatersrand, Johannesburg, South Africa.

97. **Sikhwivhilu K.** Development of renewable energy supported water purification system for peri-urban communities in Africa: a feasibility study. LIRA 2030 Africa Project Scoping Workshop. 03-05 May 2017. Copperbelt University, Kitwe, Zambia.

98. **Sikhwivhilu K.** LIRA 2030 Africa Project addressing the energy health water nexus. LIRA 2030 Africa Project Stakeholders' Workshop. 05 June 2017. Mintek, Randburg, Johannesburg, South Africa.

99. **Sikhwivhilu K.** The Water Nanotechnology Unit overview: past, present and future. DST/Mintek NIC Steering Committee Meeting: External Review Preparatory Meeting. 11 April 2017. Rhodes University, Grahamstown, Eastern Cape, South Africa.

100. **Sikhwivhilu K.** The DST/Mintek Nanotechnology Innovation Water Unit Overview. DST/Mintek Nanotechnology Innovation Centre Water Unit's Postgraduate Students' Workshop. 24 May 2017 University of Johannesburg, Doornfontein, Johannesburg, South Africa.

101. **Sikhwivhilu K.** Biogas-supported decentralized water treatment system. LIRA 2030 Annual Research Forum, 14-15 November 2017. Abuja, Nigeria.

102. **Sikhwivhilu K.** Biogas-supported decentralized water treatment system: a feasibility study. LIRA 2030 GR06/17 Project 2nd Stakeholders' Workshop, 13 December 2017, Mintek, Johannesburg, South Africa.

103. **Sikhwivhilu K.** LIRA 2030 Africa Project: Addressing the Energy-Water-Health Nexus. Meeting with City of Johannesburg and Johannesburg Water, 29 August 2017, Braamfontein, Johannesburg, South Africa.

104. **Sikhwivhilu K.** Mintek acid mine drainage treatment solutions. A Meeting with the Department of National Treasury, 05 September 2017, Pretoria, South Africa.

105. **Sikhwivhilu K.** DST/Mintek NIC Programme Review Meeting. DST/Mintek NIC Steering Committee Meeting: External Review Preparation Meeting. 11 April 2017, Rhodes University, Grahamstown, Eastern Cape South Africa.

106. **Sikhwivhilu L, Ndlovu G, Shumbula P & Nyembe P.** Indium phosphide nanowires in gas sensing. Low Dimensional Nanomaterials: UK-SA Workshop. 02 May 2017.

107. **Sikhwivhilu K & Ndlovu G.** Development of renewable energy-supported water purification systems for peri-urban communities in Africa: A feasibility study. Visit to MINTEK by the Zambian Joint Committee Delegation. 29 March 2017, Mintek, Randburg, Johannesburg, South Africa.

108. **Singh N.** Imperatives of small scale minerals processing in economic development. Plenary Presentation: 5th Raw Materials Research & Development Council (RMRDC) International Conference on Natural Resources Development & Utilization. 11 July 2017. Abuja, Nigeria.

109 **Singh N.** Prospects in the industrialisation of mineral related SMEs in SA. Engineering Institution of Zambia Annual Symposium. 7 April 2017, Livingstone, Zambia.

110. **Singh N & McKenzie A.** Mintek SAWIMA Presentation on small scale technology. Mintek-SAWIMA Workshop on Small Scale Mining & Mineral Beneficiation. 19-20 October 2017. Mintek, Randburg, Johannesburg, South Africa.

111. **Sithole A.** Comparing electrical and carbon combustion based energy technologies for the production of high carbon ferromanganese: a literature review. The 15th International Ferro-Alloys Congress (Infacon XV). 25-28 February 2018. The Century City Conference Centre, Cape Town, South Africa.

112. **Steenkamp J.** Overview of furnace tapping research conducted at MINTEK. Elkem Carbon, 15-16 May 2017. Kristiansand, Norway.

113. **Steenkamp J.** Carbonaceous reductants and fuels in pyrometallurgical applications. Guest Lecture to Students attending TMT4306 - Metal Production - Ferroalloys, Iron and Steel. Norwegian University of Science and Technology. 4 September 2017. Trondheim, Norway

114. **Steenkamp J.** MINTEK: an introduction. Process Metallurgy and Raw Material. Research Group of SINTEF. 11 September 2017. Norway.

115. **Steenkamp J.** Overview of furnace tapping research conducted at MINTEK. NTNU, 18 May 2017. Trondheim, Norway.

116. **Steenkamp J.** Factors to take into account when designing a furnace containment system for ferrochromium production. Chrome Colloquium 2017. 19-20 June 2017. Mintek, Randburg, Johannesburg, South Africa.

117. **Steenkamp J.** Summary of furnace tapping 2014 conference. Taping Workshop, Controlled Tapping Project. NTNU, 18 May 2017. Trondheim, Norway.

118. **Steenkamp J.** Development of method to assist in excavation of industrial-scale furnace tap-holes. SAIMM Chrome Colloquium 2017. 19-20 June 2017. Mintek, Randburg, Johannesburg, South Africa.

119. **Stevenson M.** Alternative carbon materials as practical and more durable fuel cell electrocatalyst supports than conventional carbon blacks. AMI Precious Metals 2017. 17-19 October 2017 Polokwane, Limpopo, South Africa.

120. **Steenkamp J & Mnisi M.** The workability index of three tap-hole clays. Infacon XV: International Ferro-Alloys Congress. 25-28 February 2018. Century City Conference Centre, Cape Town, South Africa.

121. **Steenkamp J, Mushwana M, Hockaday L & Sithole A.** Working towards an increase in manganese ferroalloy production in South Africa – a research agenda. Infacon XV: International Ferro-Alloys Congress. 25-28 February 2018. Century City Conference Centre, Cape Town, South Africa.

122. **Strauss J.** Pressure oxidation in gold circuits: basic ferric arsenate sulphate and basic ferric sulphate behaviour in downstream processing. World Gold 2017, Proceedings of the 56th Annual Conference of Metallurgists. 29 August 2017. Vancouver, Canada.

123. **Thobadi I.** Characterisation of tap-hole clay wear mechanisms using static wear tests under ferrochrome alloy and slag conditions. Student Seminar, Elkem Carbon, 15-16 May 2017. Kristiansand, Norway.

124. **Thobadi I.** Characterisation of tap-hole clay wear mechanisms using static wear tests under ferrochrome alloy and slag conditions. Student Seminar, NTNU - SINTEF, 18 May 2017. Trondheim, Norway.

125. **Van Rooyen M.** Economic evolution of the SAVMIN process for treatment of acid mine drainage. SAIMM Water 2017 Conference. 10-11 July 2017, Emperor's Palace, Midrand, South Africa.

126. **Van der Walt, Skepu A & Sikhwivhilu K.** What value can the NicTox™ facility add to research? 8th DST/Mintek NIC Workshop, 26-28 March 2018. Mintek, Randburg, Johannesburg, South Africa.

127. **Van der Walt H.** Nanosafety practices at Mintek. South Africa European Union Workshop in Nanosafety, 04 December 2017, CSIR, Pretoria, South Africa.

128. **Van Staden P.** HeapSim modelling of high temperature heap bioleaching data. ALTA 2017. The 22nd annual ALTA conference. 20-27 May. Pan Pacific Hotel, Perth, Australia.

129. **Van Staden P.** SAIMM Uranium 2017 Presentation. SAIMM Uranium 2017 International Conference. 11-13 September 2017. Swakopmund, Namibia.

130. **Yahorava O & Bazhko O.** Evaluation of polythionate formation during uranium recovery from sulphide flotation concentrate. SAIMM Uranium 2017 International Conference, 11-13 September, 2017. Swakopmund, Namibia.

131. **Vilakazi S.** Sensor unit 2007 to 2016: reflections. External Review. 27 October 2017. Mintek, Randburg, Johannesburg, South Africa.

7.3 Conference Papers

1. **Baloyi J & Thabang N.** An Effective pillared South African bentonite clay: synthesis and application as green chemistry catalyst for wastewater treatment. Proceedings of 9th International Conference on Advances in Science, Engineering, Technology and Waste Management. (ASETWM-17), 27-28 November 2017. Parys, South Africa.

2. **Bazhko O & Yahorava O.** Process for the recovery of gold from uranium resin. ALTA 2017 Nickel-Cobalt-Copper, Uranium-REE and Gold-PM Conference & Exhibition 20–27 May 2017. Perth, Australia.

3. **Bergmann C, Moloane T & Thiele H.** Pilot dense medium separation of Fe-ore fines. Physical Separation 2017. 15-16 June 2017. Falmouth, England.

4. **Bisaka K, Thobadi I, Mokoena S, Pawlik C & Erwee M.** Flowsheet development for the extraction of rare earths using Mintek's PyEarth™ Process. Nickel-Cobalt 2017, Conference of Metallurgists (COM) 2017. 27-30 August 2017, Hyatt Regency Vancouver, British Columbia, Canada.

5. **Chetty D & Gutzmer J.** Quantitative mineralogy to address energy consumption in smelting of ores from the Kalahari Manganese Field, South Africa. In: Jones, R.T., den Hoed, P. & Erwee, M.W. (Eds) Infacon XV, 25–28 February 2018, SAIMM, Cape Town.

6. **Chetty J & Steenkamp J.** Excavation Method for 2.4m Diameter Pilot-Scale Furnace. UNITECR 2017, 26-29 September 2017, Santiago, Chile.

7. **Coetzee L.** Using StarCS Automodeller to model Pilanesberg Platinum Mine Primary UG2 Milling Circuit. The Control Conference Africa (CCA 2017), 7-8 December 2017, Sandton, South Africa.

8. **Da Corte C & Singh A.** Pre-concentration of fluorspar using DMS. SME 2018 Annual Conference & Expo; 25-28 February 2018, Minneapolis Convention Center, Minneapolis, Minnesota.

9. **Erwee M, Geldenhuys I & Sitefane M.** Fluxing of South African chromite using colemanit. Proceedings of the Fifteenth International Ferro-Alloys Congress, edited by R.T. Jones, P. den Hoed, & M.W. Erwee, 25-28 February 2018, Cape Town, South Africa, SAIMM.

10. **Ford E & Sithole E.** Using DEM in support of laboratory stirred media milling testing. Computational Modelling 2017, 13 - 14 June, Falmouth, UK.

11. **Ford E & Sithole V.** A test work approach aimed at maximising data generation for fine screening circuit design and simulation. Physical Separation 2017. 15 - 16 June 2017, Falmouth UK.

12. **Gericke M.** Developing a roadmap for e-waste management in South Africa. Proceedings Sardinia 2017, Sixteenth International Waste Management and Landfill Symposium, 2 - 6 October 2017, S. Margherita di Pula, Cagliari, Italy.

13. **Gericke M.** Recovery of critical metals as a service: advanced treatment of e-waste as a model for emerging economies. Going Green EcoDesign 2017. 10th International Symposium on Environmentally Conscious Design and Inverse Manufacturing - New Technologies and Eco-innovation Towards Sustainability, November 29 - December 1 2017, Taiwan.

14. **Grewar T.** How South Africa's acid mine drainage dilemma can positively impact the water-energy-food nexus. SAIMM Water Conference, 10-11 July 2017, Emperor's Palace, Midrand, South Africa.

15. **Grewar T, Gericke M, Salo M, Bomberg M, , Seepei L, & Arnold M.** Compositions of microbial consortia present in biological sulphate reduction processes during mine effluent treatment. 13th International Mine Water Association Congress, IMWA 2017, Mine Water and Circular Economy, 25 - 30 June 2017, Lappeenranta, Finland.Congress 2017, Mine Water and Circular Economy, 25 - 30 June 2017, Lappeenranta, Finland.

16. **Hockday C & Ramparsad Y.** Considerations regarding electrode metering prior to startup. Infacon XV: International Ferro-Alloys Congress, 25-28 February, Cape Town, South Africa,

17. **Hockaday L, Reynolds Q, Dinter F & Harms TM.** Solar thermal treatment of manganese ores. SolarPACES 2017, Solar Power and Chemical Energy Systems, 26 – 29 September 2017, Santiago de Chile.

18. **Kgaria M & Yahorava O.** Uranium recovery from acid mine drainage polluted water. SAIMM URANIUM 2017 International Conference, 11 – 13 September 2017, Swakopmund, Namibia.

19. **Legodi W & Bazhko O.** The destruction of nickel cyanide. ALTA 2017 Nickel-Cobalt-Copper, Uranium-REE and Gold-PM Conference & Exhibition, 20–27 May 2017, Perth, Australia.

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7.6 Glossary

AEMFC	African Exploration Mining and Finance Corporation
ALF	Advanced Leach Facility
AMD	Advanced Materials Division
AMI	Advanced Metals Initiative
ARC	Audit and Risk Committee
ASSM	Artisanal and Small Scale Mining
AVE	Advertising Value Equivalent
BEE	Black Economic Empowerment
CANSA	Cancer Association of South Africa
CEO	Chief Executive Officer
CoEW	Cobalt Electrowinning
CRM	Certified Reference Materials
CSFR	Client Satisfaction Frequency Rate
CSR	Corporate Social Responsibility
DMR	Department of Mineral Resources
DRC	Democratic Republic of Congo
DST	Department of Science and Technology
DTI	Department of Trade and Industry
e-Waste	Electronic Waste
EAP	Employee Assistance Programme

EI	Environmental Incidents
EWIT	E-waste Implementation Toolkit
GAAP	Generally Accepted Accounting Practice
GDP	Graduate Development Programme
HIFR	Health Incidence Frequency Rate
HMD	Hydrometallurgy Division
HRC	Human Resources Committee
HRD	Human Resources Division
HSS	High Speed Steel
HySA	Hydrogen and Fuel Cells Programme
IA	Internal Audit
IMS	iNgcaphephe Metallurgical Services
IP	Intellectual Property
ICT	Information and Communications Technology
KPIs	Key Performance Indicators
LTIFR	Lost Time Injury Frequency Rate
MaC	Measurement and Control
MESU	Mineral Economics and Strategy Unit
METF	Minerals Education Trust Fund
MHP	Mixed Hydroxide Product
MoU	Memorandum of Understanding
MQA	Mining Qualifications Authority
MTC	Metals Technology Centre
MTEF	Medium Term Expenditure Framework
NIC	Nanotechnology Innovation Centre
NIM	National Institute for Metallurgy
NRF	National Research Foundation
PCB	Printed Circuit Boards
PDFR	Public Dissatisfaction Frequency Rate
PDP	Professional Development Programme
PFMA	Public Finance Management Act
PGMs	Platinum Group Metals
PLP	Preform Line Products
PMDN	Precious Metals Development Network
R&D	Research and Development
REE	Rare Earth Elements
RMC	Risk Management Committee
RSC	Risk Steering Committee
SACREF	South African Centralised Refinery
SADC	Southern African Development Community
SAF	Submerged-arc furnace
SAQA	South African Qualifications Authority
SASSETA	Safety and Security SETA
SEDA	Small Enterprise Development Agency
SETA	Sector Education and Training Authority
SHEQ	Safety, Health, Environment and Quality
SMMEs	Small, Medium and Micro Enterprises
SPEs	Screen Printed Electrodes
SPPIA	Standards for the Professional Practice of Internal Auditing
SSMB	Small Scale Mining and Beneficiation
STEM	Science, Technology, Engineering and Mathematics
TC	Technical Committee
TCTC	Total Cost to Company
ToR	Terms of Reference
UCT	University of Cape Town
WIL	Work Integrated Learning
XRT	X-ray Transmission

Auditor

Auditor-General South Africa, Pretoria,
South Africa

Mintek Address Details

MINTEK
200 Malibongwe Drive, Randburg 2194, South Africa
Private Bag X3015, Randburg 2125, South Africa
Tel: +27 11 709 4111 Fax: +27 11 793 2413
Website: www.mintek.co.za

Company Secretariat

Ms. Gugulethu Nyanda

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CONTACT DETAILS

CEO's Office	Ms. Lucy Legodi	011-709 4959
Internal Auditor	Ms. Nosipho Mthalane	011-709 4796
External Auditors	Auditor General South Africa (AGSA)	012-426 8000
GM's Secretary	Ms. Christa Scheepers	011-709 4908
GM's Secretary	Ms. Evah Motsego	011-709 4906
Mintek Switchboard		011-709 4111

General Managers	Contact Person	Tel. No.
Business Development	Dr. David Powell	011-709 4620
Research & Development	Dr. Makhapa Makhafola	011-709 4906
Technology	Mr. Alan McKenzie	011-709 4959
Finance	Mr. Sakhi Simelane	011-709 4906
Corporate Services	Ms. Gugulethu Nyanda	011-709 4908

Divisions	Contact Person	Tel. No.
Advanced Materials	Dr. Jones Papo	011-709 4471
Analytical Services	Mr. Joe Baloyi	011-709 4368
Biotechnology	Ms. Mariekie Gericke	011-709 4442
Engineering & Maintenance Services	Mr. Boni Hewu	011-709 4781
Finance	Ms. Hester Pretorius	011-709 4698
Human Resources & Training	Mr. Hendrick Morobane	011-709 4373
– Bursars & SET promotions	Mr. Hendrick Morobane	011-709 4373
Hydrometallurgy	Dr. Leon Krüger	011-709 4656
Information & Communications	Mr. Haveline Michau	011-709 4256
Information Communications Technology	Mr. Hennie Venter	011-709 4103
Measurement & Control	Mr. Paul Brereton-Stiles	011-709 4355
Mineral Economics & Strategy Unit	Mr. Godfrey Mothapo	011-709 4304
Minerals Processing	Mr. Bernard Joja	011-709 4295
Mineralogy	Ms. Nosiphiwo Mzamo	011-709 4163
Mintek Conferences Centre	Mr. Elvis Tshweneyame	011-709 4275
Mintek Library	Ms. Maphefo Maleto	011-709 4435
Pyrometallurgy	Ms. Isabel Geldenhuys	011-709 4622
Safety, Health, Environment & Quality	Ms. Mpendulo Ginindza	011-709 4330
Small-Scale Mining & Beneficiation	Mr. Nirdesh Singh	011-709 4335

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