



ThyssenKrupp

www.crown.co.za

FEATURES

- Waste management
- Petrochemicals
- Separation and filtration
- Supply chain management



Accurate Temperature Measurement



Course dates

- 23/24 July 2015
- 17/18 September 2015
- 19/20 November 2015

Certificate of competence with 2 CPD points upon successful completion of the course

Venue details

Endress+Hauser Pyrotemp,
Cnr. Rotterdam Rd and
Milan Place, Apex ext. 3,
Benoni

For more information on pricing, availability and registration

Contact: Cezanne Gonsior
E-mail: events@za.endress.com
Tel: +27 11 262 8097

Understanding temperature measurement principles and sensor selection

Endress+Hauser's local centre of Competence for Engineered Temperature Solutions in Benoni, with extensive manufacturing and testing facilities, gives you this unique chance to attend a 2-day course to broaden your knowledge on temperature measurement and devices. Below are some of the topics to be covered:

- Application suitability and the basic operating principles of RTDs and thermocouples will be covered
- Sensor construction, including selecting correct lengths and dimensions for inserts and thermowells, diameters or sensors, process connections, housings, terminations and many other attributes of a temperature sensor
- How the signal is transformed into an analogue or digital signal for retransmission
- "Build your own sensor" gives you the opportunity to put theory into practice, and take your finished product home with you!

Endress+Hauser (Pty) Ltd
Phone +27 11 262 8000
Fax +27 11 262 8062
info@za.endress.com
www.za.endress.com

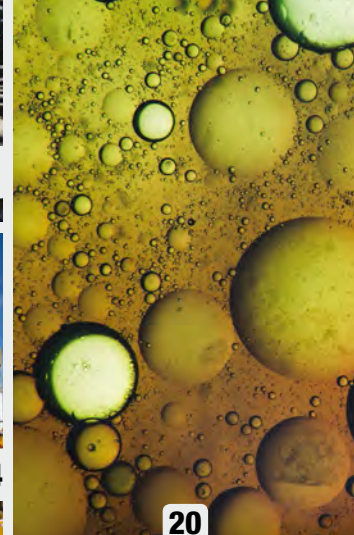
Endress+Hauser 
People for Process Automation



6



14



20



26

REGULAR FEATURES

- 3 Comment
by Geoff Maitland, IChemE Past President, 2014-2015
- 36 Et cetera/ Sudoku 106/Solution to Sudoku 105

COVER STORY

- 4 ThyssenKrupp joint venture streamlines units to create a more efficient global organisation

'ChemTech' recently visited the Sunninghill offices of ThyssenKrupp Industrial Solutions to talk with Bruce Bassett, General Manager: Special Projects and Vishal Harichund, General Manager: Business Development and Sales, about the changes that have been taking place within the ThyssenKrupp Group, in particular, two developments that especially involve the South African organisation.

WASTE MANAGEMENT

- 6 REDISA – the recycling of waste tyres in South Africa – an overview
The recycling of used tyres in South Africa was for many years a noble outcome with many promoters and detractors until the Government finally approved the Recycling and Economic Development Initiative of South Africa (REDISA), in July 2012.

- 10 Focus on waste management

PETROCHEMICALS

- 14 Design and construction of natural gas pipelines
In a previous article "Shale gas – Its preparation and transmission" the requirement to prepare shale gas for transmission was discussed. This article summarises the broad principles of constructing a natural gas pipeline from conceptual design through to construction and commissioning for any natural gas.
by Carl Schonborn, PrEng

- 18 Focus on petrochemicals

SEPARATION & FILTRATION

- 20 Hybrid flotation-filtration process for oil water separation based on ceramic membranes
Microflotation and membrane filtration are two commonly used technologies in many fields of application. This article discusses how the two technologies were integrated and modified on a lab scale using new novel ceramic materials to technically assess their joined applicability for removing oil from water or water from oil.
by Dr-Ing M Beery, Dipl-Ing, J Ludwig, Dipl-Ing, L León, all of akvolution GmbH, Berlin, Germany

- 24 Focus on separation & filtration

SUPPLY CHAIN MANAGEMENT

- 26 Exploring the challenges associated with the greening of supply chains in the South African manganese and phosphate mining industry
This article explores the challenges related to the implementation of GrSCM and provides insight into how it can be implemented in the South African manganese and phosphate industry.
by Professor David Pooe, Associate Professor, Department of Business Management, University of Johannesburg and Khomotso Mhelembe, Category Specialist, Airports Company South Africa

- 32 Focus on supply chain management



Transparency You Can See
Average circulation
(Oct – Dec 2014)
Paid: 17
Free: 3 687
Total: 3 704

Chemical Technology is endorsed by The South African Institution of Chemical Engineers



and the Southern African Association of Energy Efficiency



DISCLAIMER

The views expressed in this journal are not necessarily those of the editor or the publisher.
Generic images courtesy of www.shutterstock.com



Comparing apples with apples?



There's no comparison!

Because we are lawyers who are engineers and scientists with 60 years experience, we know how things work!

Specialising in:

- Consumer Protection Law
- Food Law
- Intellectual Property Law
- Patents and Trademarks

HH hahn·hahn
intellectual property practitioners

Hahn &Hahn Inc
222 Richard Street · Hatfield · Pretoria ·
South Africa · 0083

Tel: +27(12)342-0563

Fax: +27(12)342-3027

Email: janusz@hahn.co.za

Web: www.hahn.co.za

Using podcasts to achieve educational excellence

by Geoff Maitland, IChemE Past President, 2014-2015, posted on his blog, ChemEng365, on 29 April 2015

For an individual to excel at chemical engineering, both a good education and personal determination are needed.

Chemical engineering education must be built on a solid foundation in the fundamental principles of chemical engineering science. However, there is a need to constantly review and modernise not just our course content, but the way we deliver it as well.

The Department of Chemical Engineering at the University of Cape Town (UCT), South Africa, has a research group dedicated to engineering education. This group contributes to a wider collaboration in the Centre for Research in Engineering and Science Education (CREE).

At UCT, there is a passion to provide the best possible foundation for young chemical engineers. The research group's main objective is to understand barriers to learning. By understanding the factors that inhibit the learning of key principles and the acquisition of core skills, the education process can be enhanced. Student retention, self-sufficiency and integration all improve.

The way that students are taught today is rather different from what I experienced as an undergraduate. However, research into learning methods demonstrates that students still consider lectures as an important part of the education process.

Some of the research covered by UCT has addressed the use of podcasts – these provide additional information rather than a substitute for lectures. The researchers found that when

podcasts were provided, more than half of the students accessed them, and, contrary what people might think there was no marked decline in lecture attendance.

Feedback from UCT students indicated that it was particularly useful for those learning in their non-native language. The availability of the podcasts throughout the academic year led to an observed increase in downloads before and during exam times – as one might expect!

The development of more effective education for the next generation of scientists and engineers is always challenging, but the education development programme at UCT is striving to improve teaching methods and promote self-sufficiency of students. Taking ownership of personal and professional development is something to be encouraged throughout an entire career.

Last year, a new curriculum for chemical engineering students at UCT was launched. The aim is to improve learning and relevance. Classes are structured as 45 minute lectures followed by 45 minute mini-tutorials. Practical work is also important, as is project work. Competency and understanding is also assessed in a variety of ways.

Advances in technology are changing the way we live and the way in which we learn. I believe that these new developments at UCT are a great step forward and I look forward to hearing more about the impact they have on learning outcomes in South Africa.

Go to: www.ichemeblog.org/2015/04/29

**Published monthly by:
Crown Publications cc**

Crown House
Cnr Theunis and
Sovereign Streets
Bedford Gardens 2007
PO Box 140
Bedfordview 2008
Tel: (011) 622-4770
Fax: (011) 615-6108

E-mail:
chemtech@crown.co.za

Website:
www.crown.co.za

Consulting editor:
Carl Schonborn, PrEng

Editor:
Glynnis Koch
BAHons, DipLibSci (Unisa),
DipBal (UCT)

Advertising:
Brenda Karathanasis

Design & layout:
Anoonashe Shumba
BTech Hons Creative Art
(CUT-Zim)

Circulation:
Karen Smith

Publisher:
Karen Grant

Director:
J Warwick

Printed by:
Tandym Print - Cape Town

ThyssenKrupp joint venture streamlines units to create a more efficient global organisation

‘ChemTech’ recently visited the Sunninghill offices of ThyssenKrupp Industrial Solutions to talk with Bruce Bassett, General Manager: Special Projects and Vishal Harichund, General Manager: Business Development and Sales, about the changes that have been taking place within the ThyssenKrupp Group, in particular, two developments that especially involve the South African organisation. This is what they explained to us.

ThyssenKrupp Industrial Solutions (TKIS) is the outcome of the global merger of ThyssenKrupp Uhde and ThyssenKrupp Resource Technologies, the latter created by the 2013 amalgamation of ThyssenKrupp Fördertechnik (or Materials Handling) and ThyssenKrupp Polysius. As each company was already a global player, the combination of their plant engineering and construction expertise in the business units Process Technologies (focused on engineering, procurement and construction (EPC) for fertilizer, base chemicals, polymers, electrolysis, petroleum refinery and other industrial plants) and Resource Technologies (offering a comprehensive product portfolio and a wide sales and service network to customers in the mining, cement, mineral processing and materials handling industries), enables the company to offer its customers engineering *par excellence*, under the banner of TKIS. This merger will not only enable the resultant core company to present a single, harmonised face to the customer, but will create a much larger and more efficient organisation worldwide.

The very good news is that ThyssenKrupp Industrial Solutions South Africa (TKIS SA) is going to be establishing a leading benchmark for the rest of Africa, particularly sub-Saharan Africa, operating as a conduit in aligning with other clients and organisations in these regions. As the leading entity for the TKIS group in Africa, TKIS SA will be spearheading growth into the region and coordinating other technology providers, mobilising them to deliver into Africa. In other words, as Vishal Harichund told us, they will be providing a holistic offering of the company’s core expertise in both Process and Resource Technologies. This move will reinforce their strategy of providing all-encompassing solutions for clients in sub-Saharan Africa, as well as



locally. Furthermore, TKIS SA will have the full backing of the ThyssenKrupp Industrial Solutions Group.

Successful conclusion of joint venture

Further to the above, the joint venture between ThyssenKrupp Industrial Solutions and electrochemical technologies supplier, Industrie De Nora, was concluded successfully on April 1st, 2015. It is already operational and trading as ThyssenKrupp Uhde Chlorine Engineers. Bruce Bassett outlined for us how the new venture combines the electrolysis business of the two companies under the managerial control of ThyssenKrupp Industrial Solutions, the majority shareholder, and how this will be consolidated in the Group.

Industrie De Nora’s activities have always focused on energy reduction and increase in plant efficiency. It has always provided its customers with safe, innovative and sustainable, energy-saving electrochemical technologies and environmentally friendly solutions. Its proprietary noble metal-coated electrodes have been incorporated into a variety of industries and applications such as chlorine, chlorate and sodium hypochlorite production, water treatment, and surface finishing, amongst others.

Bruce Bassett explained that ThyssenKrupp Uhde Chlorine Engineers will continue using all the existing electrolysis processes of the two companies, including, for example, the filter press-based BiTAC® process from former Chlorine Engineers; all the various generations of the Bipolar Membrane (BM) single-element technology developed by UHDENORA/Uhde; and the HCl Oxygen Depolarized Cathode (ODC) and NaCl ODC technologies. Another key area of the activities will be the development of water electrolysis for hydrogen production for the efficient intermediate storage of renewable energy.



In the production of chlorine and caustic soda solution, ThyssenKrupp Uhde Chlorine Engineers energy-efficient and environment-friendly, 'Uhde BM Single Element' membrane technology, as well as the BITAC family electrolysers, are leaders. New plants as well as revamps or conversions, which together have a total annual capacity in excess of 40 million tonnes of caustic soda solution, provide ample proof of this.

The new global setup will be rolled out over the months to come. An increased presence worldwide will be achieved by synergising the company's worldwide capabilities for engineering, procurement and construction of high-efficiency electrolysis plants, as well as offering leading technologies, comprehensive solutions, technical support and sales. Headquartered in Dortmund, Germany, the company is also represented in locations in Okayama, Tokyo, Shanghai, Milan and Houston.

Invention that increases energy efficiency

The NaCl-ODC electrolysis technology marketed by ThyssenKrupp Uhde Chlorine Engineers offers numerous benefits including, most importantly, a reduction of energy consumption of up to 30 % compared to conventional membrane-based technology; ecologically valuable solutions because of corresponding CO₂ emission reductions; and full compatibility of electrolysis cells and the brine cycle, which allows for a combination of both technologies in one plant.

The NaCl-ODC electrolysis process differs from the conventional membrane process which results in a reduction of the cell voltage from about 3 V to 2 V. Consequently, the ODC technology cuts the energy consumption by at least 30 %; or alternatively, at constant energy consumption, a corresponding capacity increase is possible. As a result, the ODC technology is ecologically valuable and supports clients' sustainability. By saving energy, clients will indirectly realise significant CO₂ emission reductions.

In conclusion

At the close of our meeting, Vishal Harichund summed up the implications of these changes: "The successful conclusion of this latest joint venture is further indication of our commitment to supplying world class engineering and innovative solutions to our clients. The wide application of chlorine and caustic soda in pulp and paper, water treatment, inorganic chemicals, organic chemicals and detergents, along with a number of innovative target market products and services under development across the TKIS technology portfolio, strongly suggests that this industry presents attractive growth.

"TKIS SA, the local organisation of our Germany-based parent company, is well-positioned to offer this market cost-effective, high-tech solutions associated with an innovative EPC contractor."

For more information, contact Vishal Harichund on +27 11 236 1000.

1: Main image

Customer: Yantai Juli
Location: Laiyang, China
Capacity: 100 000 t/year of Cl₂
Process: HCl-ODC Electrolysis Technology

2 Customer: Bayer MaterialScience
Location: Krefeld-Uerdingen, Germany
Capacity: 20 000 mt/year of Cl₂
Process: NaCl-ODC Electrolysis Technology

3 The entire team of the Uhde Chlorine Engineers Group on April 7, 2015 outside Harpen House, their Dortmund-based headquarters. All the local organisation representatives were present for the launch of the Joint Venture, as well as all the representatives from the main Uhde Chlorine Engineers entities. Dr Sami Pelkonen, CEO, Shinji Katayama, CTO; Keisho Cho, MD-UCES are all in the front row.

REDISA – the recycling of waste tyres in South Africa – **an overview**

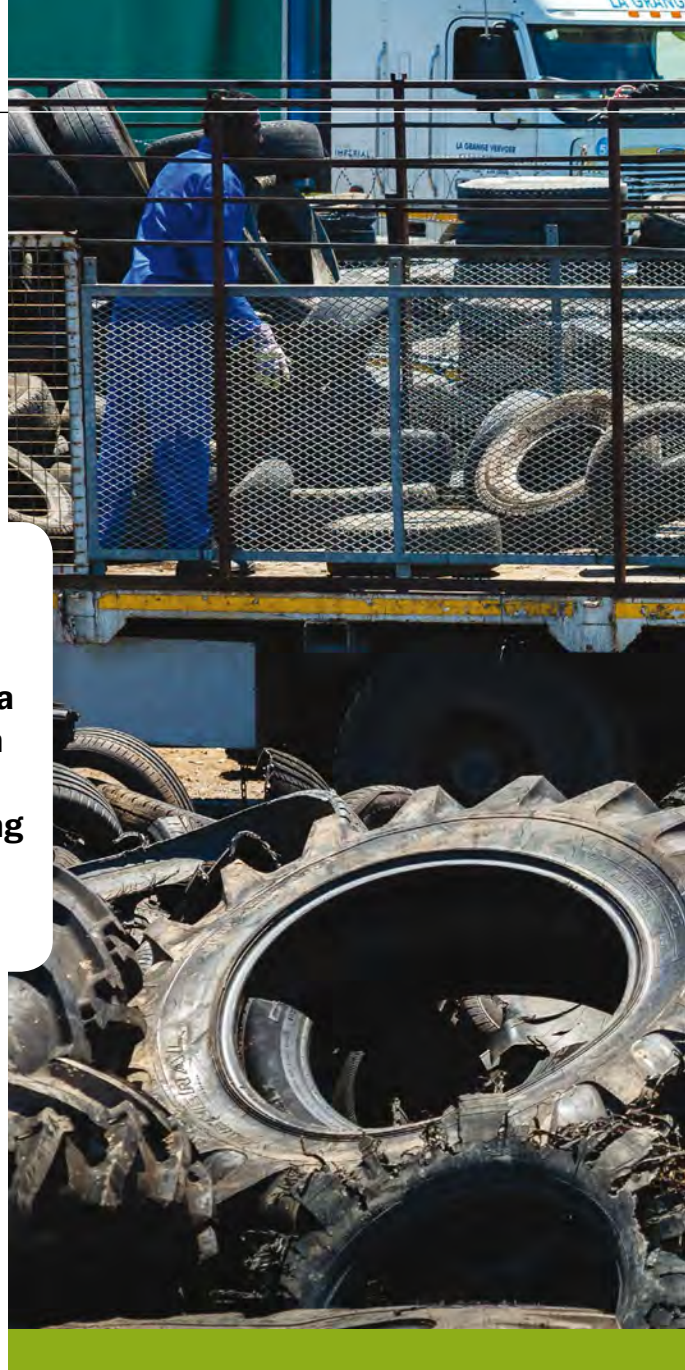
The recycling of used tyres in South Africa was for many years a noble outcome with many promoters and detractors until the Government finally approved the Recycling and Economic Development Initiative of South Africa (REDISA) [1], in July 2012.

Why does SA need a waste tyre management plan?

In South Africa, it is estimated that we have millions of waste tyres lying in dumps and stockpiles or scattered across the country in residential, industrial and rural areas. Almost 10 million waste tyres are added to this number every year. While some of these waste tyres make their way to recycling facilities via formal and informal networks of collectors, many of them are burned for their scrap metal content, releasing toxic fumes and liquids in the process. Some are re-grooved to be sold as so-called 'retreaded' tyres.

The Waste Management Act, in Section 28(1), addressed this problem and envisioned the creation of "an industry waste management plan", hence the creation of REDISA.

The concept of protecting the environment by taking care of manufactured goods from cradle to grave as encompassed in ISO 14001, if not practised, could leave nothing of value on this earth to future generations. Creating opportunities for employment was made possible by placing a monetary value on waste tyres. IT support structures have been installed in the country as a resource to the new business owners to manage the flow of tyres from dealer



to recycler. Using existing technology, especially mobile phones, it has created a virtual logistics fleet.

An investment of R50 million in research and development has been made to help stimulate the market for waste tyres and their components. New processes and technologies for reclaiming chemicals from tyres are being investigated at an unprecedented level. There is a REDISA Centre for Rubber Science and Technology at the Nelson Mandela Metropolitan University, fuelling research and providing a hub for the new recycling technologies. These will create more jobs as the market expands. REDISA has a web site for subscribers (www.rfiling.co.za) who are interested in the operations of tyre recycling.

Benefits and advantages of REDISA for importers, manufacturers and OEMs

- Collects the waste tyres at no extra charge.
- Has the responsibility of removing and dealing with the waste tyres.
- Improves the environmental and corporate carbon footprint.
- Focus on your core business.



Duties and responsibilities of tyre dealers

- They must register with REDISA.
- When waste tyres need to be collected, REDISA must be advised.
- Where and when must these waste tyres be collected by REDISA – ie, quantities and type must be specified.

Benefits and advantages for dealers

- They save because the collection of the tyres is done at no cost.
- Improves the environmental and corporate carbon footprint.
- Focus on your core business.

Some current recycling technologies

These include rubber crumbing, pyrolysis technology and tyre-derived fuels/ kilns technology.

Rubber crumbing

Rubber crumb is derived by reducing scrap tyres into uniform granules. The inherent reinforcing materials such as

steel and fibre are removed, along with any other type of inert contaminants such as dust, glass, or rock.

There is a growing demand for more and more waste tyres that can be used for end products made from the rubber, steel and textile derived from processing waste tyres. Crumb rubber is the result of processing automotive and truck scrap tyres in particular. During this process the steel and tyre cord (fluff) is removed, leaving tyre rubber with a granular consistency. This rubber crumb is often used in astro-turf as cushioning (where it is sometimes referred to as astro-dirt), asphalt for tarring the roads, floor mats, carpet padding, vehicle mudguards and adhesives.

Currently REDISA works with about 12 recyclers. As the plan continues to roll out over the next five years, more recyclers and processors will be supported nationally. In addition, REDISA is currently paying recyclers and processors an infrastructure development grant (based on the tonnage of tyres delivered). The R310 per tonne grant REDISA pays is used to improve infrastructure at the factories so that output can be increased.



Table 1.1: Limits on releases to air from Elm Energy and Recycling Ltd tyre-fuelled power station Pollutant Concentration Annual

Pollutant	Concentration Limit (mg/m ³)	Annual Release Limit (tonnes / year)
sulphur dioxide	300 ¹	650
Oxides of nitrogen	150 ¹	350
Total particulate matter	30 ¹	75
cadmium	0.2 ²	-
mercury	0.2 ²	-
nickel and arsenic	1.0 ²	-
lead, chromium, copper and manganese	5.0 ²	-
hydrogen chloride	20 ²	-
carbon monoxide	50 ³	-
Volatile organic compounds	20 ²	-

¹ No seven-day rolling average to exceed the limit, and no daily average to exceed 1.3 times the limit.

² No average results for duplicate measurements to exceed the limit.

³ No hourly average to exceed the limit, and not more than 10 per cent of the short term values to exceed the limit.

Source: Her Majesty's Inspectorate of Pollution, 1992

Pyrolysis technology

Pyrolysis is being used to process waste tyres into fuel gas, fuel oil, solid residue (steel wire) and carbon char.

Gauteng-based Milvetix is one of South Africa's first fully functional pyrolysis plants. At this processor, tyres are transformed into smaller and simpler compounds. These compounds can then be turned into various products including carbon char, oil, and may also be used to generate electricity. Currently Milvetix supplies its products to an organisation that further purifies the oil and sells it into the market. In addition, carbon char is supplied to interested parties who in turn re-process and refine the product, which again is sold off to the market.

All processors involved in the REDISA Plan are required to meet stringent criteria, and are subject to a vetting process. Setting up a pyrolysis plant is an incredibly technical and expensive exercise notwithstanding the infrastructure development grant of R310 per tonne of waste tyres delivered to the processor.

Energy recovery The United Kingdom

The main methods used in the UK for converting tyres to energy [2] are incineration with energy recovered as electricity, direct use as a fuel in cement kilns, and pyrolysis (thermal degradation in the absence of oxygen). Technology

Table 1.2: Emissions to air from conventional and tyre-fuelled power stations, 1995

Pollutant	Tyre Fuelled
	Tyres (grammes per gigajoule)
sulphur dioxide	350
nitrogen oxides	130

Source: Elm Energy and Recycling Ltd and Department of Trade and Industry, 1997

also exists to use microwaves to break down tyres into oil, steel and carbon black, but this has not had much impact on the market.

Tyres have a high energy content compared with other wastes and fossil fuels. They have an average calorific value of 32 GJ per tonne, which is greater than coal. Tyres have been burnt for energy recovery in the UK for more than 20 years. In 1996 it was estimated that 27 % of used tyre arisings were used for energy recovery (Scrap Tire Working Group, 1997).

Limits are set for the quantities of sulphur dioxide, oxides of nitrogen, particulate matter, volatile organic compounds, certain metals and other substances that are released to the air (see Table 1.1).

The majority of the tyres are not from local sources, but are transported by lorry from all over the country. Most of the by-products are recycled, but the residual ash is disposed of in a landfill site.

A comparison of the emissions of sulphur dioxide and nitrogen oxides from conventional and tyre-fuelled power stations is given in Table 1.2. This shows that the emissions are comparable to oil-fired power stations, and somewhat lower than coal-fired power stations.

Tyres as a fuel in cement kilns

Cement manufacture is an energy-intensive process. Typically 30 to 40 % of the production cost is spent on energy. Traditionally the main fuel is coal, although petroleum coke is widely used. The high energy use has been an incentive for the industry to explore substitute fuels, including tyres, waste paper, waste oils, waste wood, paper sludge, sewage sludge, plastics and spent solvents. In Europe, the use of substitute fuels was equivalent to 2,5 million tonnes of coal, or 10 % of the total fuel consumption in 1995 (The European Cement Association, 1997).

Cement is usually made from limestone or chalk, and



Conventional Power Station		
Natural gas (grammes per gigajoule)	Oil (grammes per gigajoule)	Coal (grammes per gigajoule)
0	590	940
65	140	270

Table 1.3: Emissions from Blue Circle Cauldon cement kiln during tire burning trial

Pollutant	Usual Fuel (Coal & Coke) milligrams/ m ³	Usual Fuel with 15% tyres milligrams/ m ³	Percentage Change
particulates	60	60	No change
oxides of nitrogen	1180	800	-32
sulphur dioxide	500	500	No change
carbon monoxide	985	948	-4
chlorine and fluorine	1.13	1.0	-12
volatile organic compounds	129	68	-47
dioxins	0.12 nanogrammes per metre cubed	0.03 nanogrammes per metre cubed	-75

Source: Blue Circle Industries plc

clay or shale, mixed with other materials to form clinker. Temperatures in excess of 1 400 °C are required to produce the cement clinker. The following characteristics make cement kilns suitable for burning tyres:

- high temperature;
- long residence time;
- oxidising atmosphere;
- high thermal inertia;
- alkaline environment;
- no ash residue;
- continuous fuel requirement.

Organic constituents are destroyed due to the high temperatures, long residence time and oxidising conditions in the cement kiln, and produce carbon dioxide and water. The majority of the inorganic constituents combine with the raw materials in the kiln and leave the process as part of the cement clinker. Heavy metals remain bound in the cement and in its subsequent use. The remaining inorganic constituents are expelled to the chimney where 99,9 % should be captured through the use of electrostatic precipitators or filters (Parker, 1987).

Tyres are used, either chipped or whole, to replace part of the conventional fuel. They are treated in a different way depending on the type of cement kiln. At 'wet' kilns, whole tyres are dropped into the kiln about halfway along its length, and shredded tyres are added at the fuel end of the kiln. The tyres are subject to the very high temperatures inside the kiln and any residues left after burning combine with the final product. In 'dry' kilns the tyres are added

either to the precalciner or into the kiln at the same end as the feed.

If cement kiln operators want to use substitute fuels they must apply to the Agency for permission to undertake a trial. A full assessment is made of the possible environmental impacts of burning substitute fuels on a case-by-case basis. Following a trial, the operator must then apply to the Agency for permission to carry out continuous burning of a substitute fuel.

The Agency is committed to full public consultation before and after trials. In January 1998 the Agency published a draft protocol on the use of substitute fuels in kilns for public consultation (Environment Agency, 1998a). The Substitute Fuels Protocol updates the Bedford Protocol which was issued by the former Her Majesty's Inspectorate of Pollution in 1994.

In most cases, the trials have shown either no change in the concentration of pollutants or a decrease when burning tyres (Table 1.3). The emissions of nitrogen oxides are reduced by up to 40 % due to staged combustion effects in which less thermal nitrogen oxides are generated. Because tyres contain iron, using them as a fuel reduces the amount of iron oxide added to the process. An additional benefit is that no residual ash is produced from the cement process.

Tyres are already used as a fuel in cement kilns in many countries. The British Cement Association estimates that the UK cement industry can potentially recover up to 190 000 tonnes of used tyres, which is equivalent to 50 % of the annual arising of used tyres in the UK .



South Africa

In South Africa key players in the cement industry are currently receiving waste tyres for use in cement kilns from REDISA. Waste tyres can be utilised as a substitute (through co-processing) for up to 20 % of current coal usage. At PPC, indications are that waste tyres will replace 20 % of coal usage at its De Hoek plant alone, where Management has stated that “the co-processing of waste in cement kilns not only reduces cost, but also reduces carbon emissions from cement manufacture and reduces the need for non-renewable energy.”

There are other cement producers who are also investigating the burning of waste tyres to reduce the cost of fuel,

eg, Natal Portland Cement (NPC-InterCement), AfriSam and La Farge. The users have benefited from the lower cost of the substitution of a portion of their traditional fuels and find that the tyre delivery system is well coordinated and know in advance when their delivery will be made and how many tonnes they will receive, therefore making planning easier.

REDISA supports sound waste management recycling technologies through the conversion of waste tyres into social, economic and environmental benefits.

References

- REDISA plan, September 2012
- Waste Tyre Experience in the UK

118 075
TONNES COLLECTED

1851
DEALER'S SERVICED

2102
JOBS CREATED

183
SMME'S CREATED

42
DEPOTS OPENED

We're in the business of positively changing lives and creating opportunities via an award-winning Waste Tyre Management Plan. By efficiently managing the process of turning waste into worth, we can aid employment, businesses, communities and the environment. Our 'win-win' approach has already made a difference and we look forward to the tremendous potential it has to create a sustainable future for all.

For a look at our latest achievements, statistics and positive stories worth celebrating, please visit our website.

JOIN THE JOURNEY | www.redisa.org.za | [f/wasteintoworth](https://www.facebook.com/wasteintoworth) | [@wasteintoworth](https://twitter.com/wasteintoworth)

WASTE INTO WORTH

REDISA
RECYCLING AND ECONOMIC DEVELOPMENT
INITIATIVE OF SOUTH AFRICA

*ALL FIGURES ESTIMATED AS OF END APRIL 2015

FOCUS ON WASTE MANAGEMENT

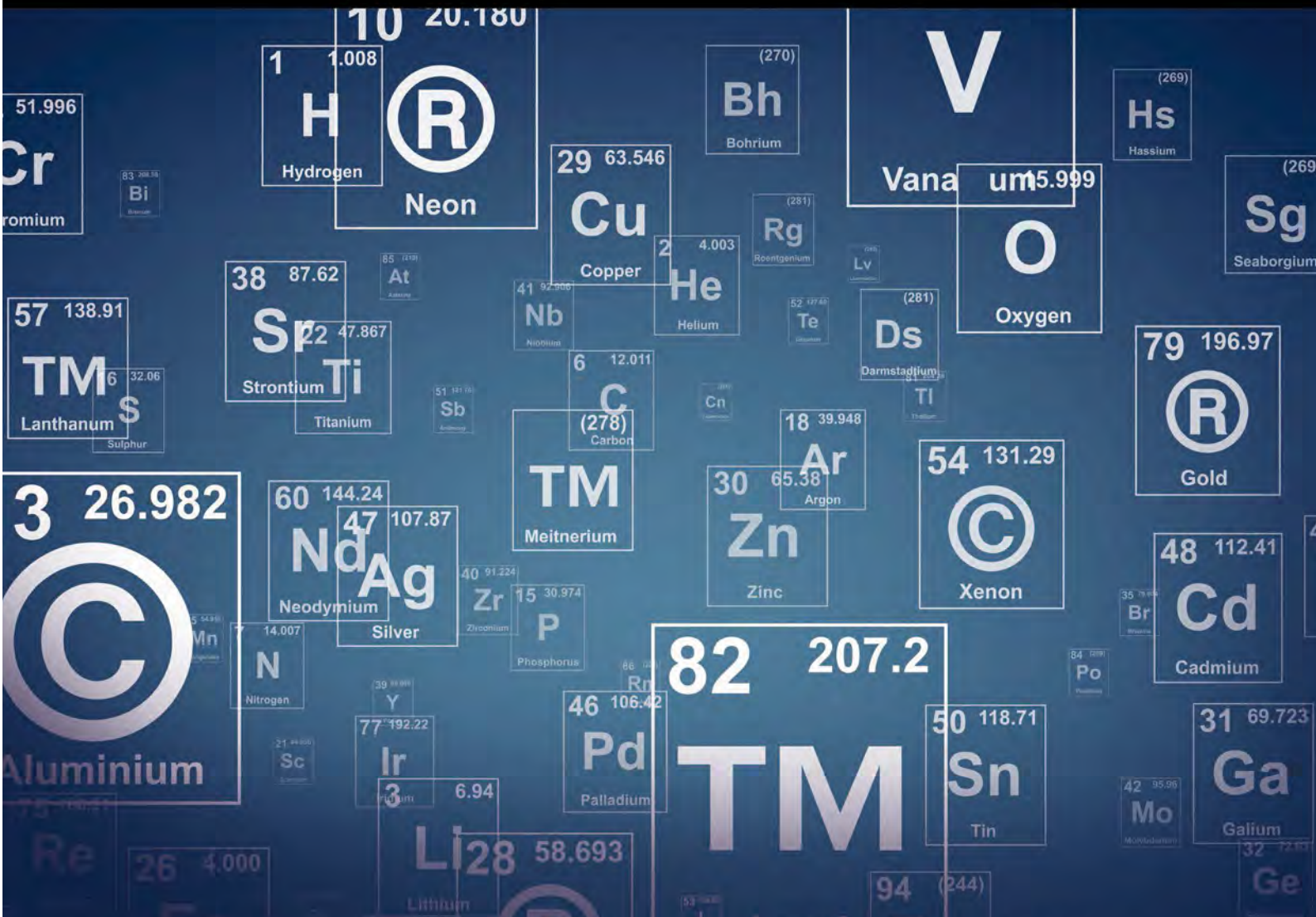


Hefty fees and penalties await consignors of cargo who do not adhere to the new Container Packing Code of Practice and the verification of Container Weight Regulations for transport. Consignors will be liable for all costs associated to any damage incurred to property and the environment due to non-compliance of the new regulations. Local

and International industry leaders and regulators from the South African Maritime Safety Authority (SAMSA) and the National Department of Transport, gathered in Durban recently for the third International Cargo Transport Units (CTU) Packing Roadshow, where the importance of complying with the new CTU codes and weight verification Regulations were addressed and discussed. The new IMO/ILO/UNECE Code of Practice for CTU Packing is available and can be downloaded from the UNECE website. http://www.unece.org/fileadmin/DAM/trans/doc/2014/itc/id_07_CTU_Code_January_2014.pdf

For more information about RPMASA contact +27 32 947 1145, email: info@rpmasa.org.za or visit www.rpmasa.org.za.

ARE YOU NEGLECTING A VITAL ELEMENT IN YOUR R&D PROCESS?



With the largest Chemistry and Chemical Engineering practice group in Africa, Adams & Adams can make sure your products and processes stay yours. We can assist with every aspect of Intellectual Property Rights including Patents, Trade Marks and Copyright.

Our specialist areas include Chemical Processes, Biotechnology, Mining, Metallurgy, Explosives, Polymers, Plastics, Energy (including renewable and nuclear energy), Software Inventions as well as Mechanical, Civil, Electrical and Electronics Engineering. So, if you're in any of these fields, or others related thereto, make a call to Adams & Adams: the first step in your R&D process.

Evaporation – the future of wastewater treatment according to I-CAT

Evaporation is a quicker and more cost-effective alternative to reverse osmosis, chemical dosing and desalination in wastewater treatment applications, according to Morné van Wyk, Technical Manager at I-CAT, because it “offers innovative evaporation solutions for all industrial applications, including the removal of excess tailing dam water.”

Van Wyk indicates that the innovative evaporation system design incorporates proprietary water purification systems and misting canon technology. “Our systems have been well received by the local market, and trials prove that the concept is feasible,” he said. He also pointed out that the evaporation process can be carried out naturally in solar evaporation ponds, a slow process that requires a large surface area, or by mechanical evaporation machines. “Natural solar evaporation is often limited by land availability and the cost of constructing additional storage ponds, not to mention the added cost of clean-up and re-vegetation,” he continued.

According to van Wyk, evaporation machines can rapidly increase the evaporation process, with minimal footprint. “Space can be utilised up to 14 times more efficiently than ponds, as evaporation machines are compact, reliable and efficient, and can be transported to numerous sites.”

The evaporation machines can also be used as a low-cost addition to enhance evaporation on existing containment ponds, or to minimise new pond surface area.



DustMonster boasts a throw of more than 100 m

I-CAT currently offers two different types of evaporation solutions, namely:

1. Water atomising evaporators: Van Wyk explained that air is compressed via a fan through a tapered barrel, and propels controlled-sized water droplets that are created via nozzles. “This is best for larger areas where wastewater contains lower dissolved solids or minimal particulates. I-CAT has spent a considerable amount of time in research and development on evaporation solutions, and we are in the process of introducing this option to industrial clients, as part of our value-added service offering.”

2. Water fracturing evaporators: Through this process, water is fractured through a high-speed fan and propelled into the

air. Van Wyk stated that this solution is best-suited for smaller areas where wastewater contains high volumes of solids and large particulates. “We are currently in the process of supplying this solution to two large projects in South Africa, both of which commenced in early 2015. I believe that this could lead to considerable growth for I-CAT in the future, as we continue to develop practical and cost-effective solutions for specific challenges experienced by our clients,” he concluded.

For more information contact

Morné van Wyk on tel: +27 12 349 1441, email: reception@i-cat.co.za, or go to www.i-cat.co.za.

IMDG & Dangerous Goods Awareness for IMDG Compliance

This one-day workshop took place on 22 May 2015, in Durban, South Africa.

IMDG Code training has been mandatory since January 2010 for all shore side staff involved in dangerous goods transport by sea. The International Maritime Organization, through the IMDG Code, requires personnel to be trained in the contents of dangerous goods provisions commensurate with their responsibilities.

It is essential for those responsible for operations and workers involved in various activities, as well as personnel performing the work, to ensure familiarisation with dangerous goods (DG) transport regulations, awareness of the duties that arise from them, and the consequences of non-compliance.

All personnel involved in the shipment of DG are required to undergo General Awareness Training to be familiar with the contents of the IMDG Code. Function-specific training is required for staff that have a hands-on role in the transport of DG by sea, which is

applicable to the function the person performs.

Periodic refresher training is also required to take account of changes in regulations and practice, for example when new amendments are published such as the current Amdt. 37-14, which can be used voluntarily from 1 January 2015 and comes into force on 1 January 2016.

Job-specific training focuses on specified job categories, eg, consignors, packers, booking office and clerical staff, freight forwarders, cargo handlers, loading and unloading operations, etc.

Course content included:

- Overview of the IMDG Code and contents
- The link between the IMDG Code and the UN Model Regulations for transport of dangerous goods, ADR Regulations, RID



RPMASA

Regulations and Air Transport Regulations

- Amendment 37-14 – key changes
- Training requirements for different types of personnel
- Responsibilities in the Supply Chain
- Classification of dangerous goods
- Containment of DG – Packaging selection & UN certification of packaging
- Use of the dangerous goods list
- Marking and Labelling requirements
- Documentation requirements
- Operational issues
- Loading of CTU's and placarding
- New CTU pack requirements and Container weighing.

For more information email info@rpmasa.org.za or mavee@mweb.co.za.

An effective solution to ensure waste management compliance: GreenSolution

Local businesses are being placed under an increasing amount of pressure to comply with more stringent environmental laws, such as the National Waste Information Regulations. Under the law, all companies must apply to the Department of Environmental Affairs for registration on the South African Waste Information System (SAWIS).

Once registered, companies are required to submit a quarterly report on their waste and recycling activities, and are compelled to keep all records of submitted waste management information for a period of at least five years. To ensure compliance, commercial and industrial solutions specialist, Pandae, offers its innovative new GreenSolution.

Pandae CEO, Ryk Coetzee, notes that GreenSolution is a complete onsite waste management programme that assists companies in complying with new waste disposal laws and government regulations. "As part of the offering, GreenSolution experts assess a company's waste stream and develop an appropriate, customised waste diversion programme," he explained.

An optimal waste collection station is designed and onsite waste management equipment – such as waste stands, mini steel skips, sorting tables, coloured wheelie bins and waste sheds – is supplied on a rental basis. Trained Pandae personnel are stationed onsite to collect and sort all waste into various categories, ready to be collected and disposed of by approved recycling and waste removal companies.

Pandae ensures best pricing is received for all its clients' recycled waste and, according to Coetzee, the resultant income generated often pays for the facility. "While positively assisting businesses and ensuring peace-of-mind, Pandae is also able to provide a substantial number of much-needed jobs for general work-



An optimal waste collection station is designed as well as onsite waste management equipment.

ers and supervisors in South Africa through the GreenSolution offering."

Value-added GreenSolution services include;

- Pest control
- Disposal of fluorescent tubes
- Monthly warranty parts disposal
- Independent special tool audit
- Onsite paper shredding – Protection of Personal Information (POPI) Act compliant
- Tyre disposal – Recycling Economic Development Initiative of SA (REDISA) compliant
- Removal of wet waste
- Removal of hazardous waste.

What's more, an auditable monthly management report is compiled by GreenSolution as part of Pandae's service level agreement – detailing the volumes of waste collected from all businesses. Coetzee indicates that the waste results are recorded on the SAWIS website, thereby ensuring full adherence by the client company to the specified regulations.

"Pandae's GreenSolution is designed to assist any company, regardless of sector,



The company is compliant with the new waste disposal laws and government regulations.

to effectively manage their entire waste management and recycling requirements in a sustainable manner, while generating the relevant reports to fulfil their legal obligation," he concluded.

For more information contact Ryk Coetzee on tel: 0861 PANDAE (726 323), email: ryk@pandae.biz, or go to www.pandae.co.za

Canada Fibers to open plastics material plant in Toronto

Canada Fibers will open a plastics recycling plant called Urban Polymers, which will focus on developing pure, homogeneous plastic materials from post-consumer and post-industrial waste, using modern equipment and additive formulations sourced globally.

Operations at Urban Polymers are scheduled to commence in spring 2015 at a 160 000 ft² facility located in North Toronto.

The new venture will initially focus on production of polyethylene terephthalate (PET) flake material, as well as production of compounded polyethylene (PE) and polypropylene (PP) in pellet form.

PET is the primary source of material for beverage bottles and single serving food containers, while PE and PP are used to produce packaging for other liquids including household detergents.

During its initial phases of development, Urban Polymers will be capable of processing £25 million per year of PET and £11 million per year of PP/PE, representing a significant increment to recycling infrastructure in the country.

Urban Polymers executive Mark Badger said: "We simply aim to provide plastics processors with a sustainable complement to prime materials. "Urban Polymers has assembled an experienced technical team which is targeting industry segments not yet penetrated in North America."

Badger was formerly the CEO of the Canadian Plastics Industry Association where he facilitated programmes to advance recovery of plastic materials post-use, having served in senior executive capacities in the plastics industry for three decades.

Canada Fibers CEO Joe Miranda said: "Urban Polymers represents another step with Canada Fiber's forward integration strategy. "Forward integration will help recovered solid waste remain domestic, providing an edge for industrial customers in North America."

Source: <http://www.chemicals-technology.com/news/newscanada-fibers-to-open-plastics-material-plant-in-toronto-4529879/>

Design and construction of natural gas pipelines

by Carl Schonborn, PrEng

In a previous article “Shale gas – Its preparation and transmission” [1] the requirement to prepare shale gas for transmission was discussed. This article summarises the broad principles of constructing a natural gas pipeline from conceptual design through to construction and commissioning for any natural gas.

South Africa will have to construct a number of pipelines to enable the optimum use of this valuable energy source. Nigeria has the same problem.

Data obtained from the official US Government website [2] for pipeline safety and awareness of the network of pipelines in the USA includes 3 300 000 km of natural gas distribution mains and service pipelines. Most Americans are unaware that this vast network even exists. This is due to the strong safety record of pipelines and the fact that most of them are located underground. The majority of natural gas transmission pipelines are in rights-of-way (ROW). The ROW is negotiated with the landowners and consists of consecutive property corridors acquired by, or granted to, the pipeline company. This provides sufficient space to perform pipeline maintenance and inspections, as well as a clear zone where encroachments can be monitored and prevented.

Contracting for the natural gas pipeline

The EPC, Engineer-Procure-Construction contract, was the common method for an owner to procure a major construction project [3]. It was usually based on a fixed lump sum price. In response to market conditions, EPC contractors have secured alternative contracting methods; for example, the EPCm reimbursable contract. The EPCm model is fairly common in the petrochemical contracting field where the Cm (or Construction management) is carried out by the contractor for and on behalf of the owner. The NEC3 (or New Engineering Contract) with its many options, has become a more common form of EPCm contract.

The major supply and installation contracts are negotiated by the EPCm contractor and, after adjudication, the contrac-

tor will make a recommendation to the owner who will make a final decision as to whom will receive the final contract.

A consultant will produce a Conceptual Engineering Package (CEP), of the project which will enable budget quotes on bulk items and installation costs to be obtained, usually on the basis of Bills of Quantities. This CEP is often referred to as a FEED or Front End Engineering Design package and with its Total Installed Cost, or TIC, Estimate, enables the owner to assess the economic viability of the project. Should the owner now decide to continue with the project, the conceptual package will be issued to further tender as an RFP or Request for Proposal to Consulting Engineers.

The EPCm contractor has liabilities in the form of breach or negligence of performance of the design work, the budget cost, the schedule, the management of the procurement and administration of the contract and the management of the trade or installation contractors.

Safety is of paramount importance on a project and the EPCm contractor will ensure that the trade contractors abide by all the safety rules and regulations in particular the OSHACT.

The EPCm contract with the owners will cover all aspects of contractual liability.

The successful consultant will, 'kick off', the project with the owner and will submit a high level schedule to execute the work. The consultant will then produce a Basic Engineering Package (BEP) which will be used to produce the cost estimate which acts as a gate for the owner to decide on the path forward. A typical Table of Contents for the BEP would be as follows.

- Scope of work
- Project schedule/Execution plan





- Environmental, health and safety (HSE) requirements
 - Local content, community relations and training of the local workforce
 - Security
 - Detailed engineering
 - Coordination and cooperation with other company contractors
 - Management of changes
 - Project controls and administration
 - Quality management
 - Contractor-provided offices, facilities and services to company's project team
 - Procurement, sub-contracts and material management
 - Construction
 - Contract work phases
 - Phase 1 – detailed engineering design
 - Phase 2 – procurement
 - Phase 3 – construction
 - Phase 4 – pre-commissioning, commissioning, testing, start-up and handover to owner
 - Pre-commissioning general
 - Commissioning and start-up assistance
 - Support requirements for commissioning
 - Level and quantities of personnel for commissioning
 - Performance guarantee
 - Interface responsibility definition
 - As-built documentation
 - Final documentation and asset register
 - Completion of work.
- If the decision is to move ahead, the consultant will start the engineering phase and issue contracts to the sub-contractors to produce:
- Topographical and land surveys of the proposed pipeline route
 - Geotechnical investigations to map the subsoil conditions along the route
 - Final environmental impact and regulatory assessments of the route
 - Submit drawings for the regulatory approvals required
 - Assist with the land acquisitions, expropriations of the Rights of Way or servitudes required for the proposed route.
- The BEP will specify the standards and procedures to be used on the project. For a pipeline and compression stations the following are relevant:
- ASME B31.8 – 2014 Edition “Gas Transmission and Distribution Piping Systems” as well as ISO 13623 -2009 – Petroleum and Natural Gas Industries, Pipeline transportation systems.
 - ASME B31.3 – 2014 – “Process Piping”
 - API 5L – 45th Edition “Specification for Line Pipe”
 - API 1104 – 2013 21st Edition “Standard for Welding Pipelines and Related Facilities”
 - API 6D – 24th Edition “Specification for Pipeline Valves”
 - ASME B16.5 – 2013 Edition “Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24”
 - ASME B16.9 – 2012 Edition “Factory-Made Wrought Butt-welding Fittings”
 - NACE SP0169-2013 (formerly RP0169) “Control of External Corrosion on Underground or Submerged Steel Pipelines”
 - Electrical Codes – British Standards, CENELEC, IEC, ISO, NEMA
 - Instrument Codes – ISA, API RP 551, IEC, NEMA

The BEP or Basic Engineering Package is probably the most important document the Owner will receive from the Consultant

- API Standard 617 – 8th Edition Sept 2014 “ Axial and Centrifugal Compressors for Petroleum, Chemical, and Gas Service Industries”
- API Standard 616 5th Edition- “Gas Turbines for the Petroleum, Chemical and Gas Industry Services”
- API MPMS 14.3.3–4th Edition Nov 2013 “Orifice Metering of Natural Gas and other related Hydrocarbon Fluids – Concentric and square edged Orifice Meters” - Part 3 Natural Gas Applications
- API RP 14C – 7th Edition “Recommended Practice for Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms”
- ASME Sec VIII D1 – 2015 Edition “BPVC SECTION VIII Rules for Construction of Pressure Vessels DIVISION 1”
- Industrial Risk Insurers spacing recommendations.
- National Fire Protection Association (NFPA) requirements.
- Owner General Engineering specifications.
- Project Specific Engineering specifications.

The pipe used in natural gas pipeline systems is carbon steel and can range in size from 50 mm to 1 000 mm (2” to 40”) in diameter and usually API 5L Gr. X42/46/52, high yield ERW/SAW Pipe (produced by Electric Resistance Weld, Submerged Arc Weld). The two digit number following the “X” indicates the Minimum Yield Strength (in 000’s psi) of pipe produced to this grade. A 25 is 25 400 A is 30 500 and B is 35 500. Wall thicknesses - Schedule 10 through 160, STD, XS, XXS.

Routing

To establish a pipeline route requires the combined efforts of the various disciplines, in particular, valuator/estate agents who will negotiate with the landowners for the Rights of Way, the construction managers who will look at the topography and decide whether the proposed route is technically feasible from a constructability point of view. The environmental consultants need to present the findings in an Environmental Impact Assessment or EIA to obtain regulatory approval for the route. There are advanced software platforms available which connect all this data in real time [4]. Before modern, web-based technology was available, pipeline routes were identified using topographical quadrant maps, survey maps and a number of site visits. Today with mobile computers, cloud servers, web maps, GIS Data, free aerial and satellite imagery and 4G connectivity, these tools can be harnessed to cut the time spent on routing the pipeline to weeks rather than months.

Design

The EPCm contractor will proceed with the process design of the pipeline which will include the hydraulic calculations of the compressor and pipeline system to finalise the number and size of the compressor stations and the pipeline sizes. The results will be detailed on the Process and Instrumentation Diagrams (P&IDs) and the equipment list. Data sheets for each of the equipment items are generated by the process engineers and will become part of the Request for Quotes or RFQs. The RFQs will typically cover:

1. Gas turbine driven centrifugal compressors
2. Metering stations
3. Separators, filters

4. Pig launchers and receivers
5. Air cooled heat exchangers
6. Carbon steel pipes and fittings
7. Carbon steel valves
8. Instrumentation
9. Electrical infrastructure including sub stations.
10. Mechanical & Piping (M&P) installation contract
11. Electrical & Instrumentation (E&I) installation contract including SCADA system
12. Civil works contract.

Stress design and calculation [5]*

Complete stress evaluations are performed on high criticality piping. This is broken up into PRIMARY and SECONDARY evaluations. Primary evaluations are performed within comprehensive piping analysis software (eg, Bentley’s AutoPIPE, Intergraph’s CAESAR, etc).

In PRIMARY evaluations, the overall pipe behaviour (movement during expansion and contraction, stresses, strains, etc) are evaluated under all relevant process scenarios expected during operation, eg, design temperatures and pressures, pressure-testing, pig-cleaning, purging, steaming, surging, etc. Parameters include material properties, corrosion allowances, etc. Geotechnical information can be integrated, for example, soil stiffness, buried depth, etc, which would all relate to how the piping would move within the soil. Where necessary, pipe anchorage may be required to redirect expansion and contraction away from sensitive areas, especially in long pipe runs. CAD software packages have integrated compliance checks to codes, like ASME B31.8, etc, which would report on comparisons between estimated stresses with allowable stresses.

SECONDARY evaluations consist of supporting calculations that are done separately by hand, spreadsheets and other software packages. Local-stress calculations are usually required at and around pipe attachments, supporting and anchoring locations. Loading to flanges are also checked for potential leakage during operation. Additional scenarios are evaluated, eg, pipe-collapse where piping could experience crushing loads from above, eg, at road crossings, and so on. In some standards and client specifications, ovalisation (buckling during installation, making pipe more oval) are restricted to within certain tolerances.

Galvanic corrosion

Common industry practice is to effectively tie all equipment into the grounding system which also enhances safety. The problem is that this can cause rapid corrosion of piping. The only safeguard is adequate pipe and equipment protective coating procedures and an effective cathodic protection system.

SCADA Supervisory Control and Data Acquisition

The SCADA system is the heartbeat of the pipeline owner’s business [6], providing around-the-clock operational monitoring and control indicating real time operations, control room management, leak detection and also measurement of gas flows for accounting, decision support and daily logistics.

*Personal communication - J.H.Roux – Piping Stress Engineer, BSc Mechanical Hon., SailMechE

Construction

The first works will be civil works in the form of base camps, access roads, and laydown areas for materials. The Construction Management team will act for and on behalf of the owner and the team will usually consist of a Site Construction Manager an HSE Manager, a Quality Control Manager and numerous Site Craft Supervisors and a site Planner.

Quality Management System

Construction quality systems usually follow the International Standards Organisation (ISO) 9001:2008 format [7]. The owners demand written documentation defining quality requirements of every aspect of the new pipeline.

Scheduling of packages

Contractor personnel will maintain a status of the progress on the completion of package activities when overall construction progress reaches the 50 % milestone. These system handover packages will be used to track the completion of various construction, inspection, or mechanical completion activities in order to be able to quickly determine the completion status of any given system.

Punchlists

System punchlists will list items that are incomplete, not in conformance with the construction documents, or that require modification.

Contractor will sign-off and advise owner to verify that the punchlist items have been completed in accordance with the construction documents.

Handover /Mechanical completion

Handover is the sequence of events leading to transfer of custody of a system from contractor to owner. It is the demarcation between the construction phase and commissioning/Start-up operations.

Pre-commissioning [8]

Pre-commissioning activities are associated with making the system ready for operation and will include the following:

- De-watering of residual hydrostatic test water in the pipeline
- Flushing and dry air blowing of above ground piping and valve and pigging stations.
- Swabbing of pipeline
- Low pressure leak check (with air) for the above ground section of the pipelines.

Commissioning procedure [9]

Instrument controls and interlocks are functional as per the normal operating conditions.

Utilities - Utilities such as power, UPS, water, air, instrument air and HVAC will be checked.

Alarm systems - Setting off alarms and their functioning will be ensured.

Safety- Identification of possible emergencies and preparedness for its mitigation will be checked.

To clear the pipeline of metallic particles, magnetic cleaning will be carried out using a train of brush magnetic pigs. An intelligent pigging survey will be carried out recording the

entire length in one single run. The report will include a detailed description of the type, size and location of individual mechanical defects. The repair of defects will be carried out in accordance with that specified in IS 15663 (Part 1) [9].

The pipeline system needs to be rendered inert using nitrogen.

The system will be considered to have been commissioned successfully when the pipeline system has run successfully for a minimum period of 72 h at stable operating conditions and instrumentation/control systems, process utilities and support systems taken on line. Commissioning documentation records must be kept by the contractor.

Start-up/Runtest

Start-up begins when all system pre-commissioning and commissioning are completed and accepted by the owner.

Performance guarantee

Contractor will guarantee the performance of all equipment and material in his supply, based on the ability of the complete system to be able to flow the design volume of gas, at the design pressure to the discharge location

Challenges involved in constructing a pipeline

There are a significant number of challenges in the construction of a pipeline [9], in particular:

- Sustaining the project with the number of resources required over a long period of time
- Permission from local authorities and construction notifications
- EIA assessment approvals, in particular wildlife conservation areas and mitigation plans
- Different sections of a pipeline will have particular issues, eg, conservation areas
- Pipeline safety can have special conditions that have to be agreed to as part of the EIA
- During construction, local authorities need to be kept abreast of any issues that may arise
- Directional drilling at water or road crossings will be necessary and can be difficult
- Safety in the design of the pipeline is paramount and needs acute attention
- Trained artisans can be a problem to locate but proper skills development is essential
- Multiple construction offices and laydown areas along the pipeline are necessary
- Vendors need to be aware of the importance of materials and equipment deliveries on time and at the right location.
- Experienced project managers, engineering managers, construction managers and craft supervisors are essential to enable a pipeline to be constructed under budget and on time.

References

A list of references for this article is available from the editor at chemtech@crowm.co.za.

Advanced Software Platforms reduce time spent on routing the pipeline to weeks rather than months.

Cutting fossil fuels and promoting renewable investments in Africa

The Africa Progress Panel (<http://www.africaprogresspanel.org>) welcomes the commitment made by the G7 to make deep cuts in emissions and to phase out of fossil fuels by the end of the century.

In this year's Africa Progress Report, "Power, People, Planet: Seizing Africa's Energy and Climate Opportunities", the Panel calls on the countries that emit the most to raise their level of ambition and implement their promises at the December climates summit in Paris. With its 2015 summit communique, the G7 has signaled its collective intention to do just that.

Governments in the major emitting countries must now place a stringent price on emissions of greenhouse gases by taxing them, instead of continuing effectively to subsidise them, for example by spending billions on subsidies for fossil-fuel exploration. The G7's reaffirmation of its pledge to work for the elimination of inefficient fossil fuel subsidies is thus notable.

Africa is well positioned to play a leading role in the global low-carbon transition, and will be able to do so fast, if significant investments are made now. Much of this

financing will need to come from rich nations. International climate financing is chronically underfunded and uncoordinated and must improve.

At the Financing Development Summit in Addis Ababa next month, G7 countries can set a clear timetable for the previously agreed US\$100 billion in annual climate finance each year. At the G7 summit, leaders reaffirmed their strong commitment to mobilising this financing. This should be used to generate clean power. Germany as the leader in clean energy globally, and current Chair of the G7, can spearhead this process. In that context, the Panel also warmly welcomes the G7 commitment to assist in the acceleration of access to renewable energy in Africa.

The latest G7 communique is a clear statement of ambition and leadership from the world's richest countries, which the Africa Progress Panel fully supports. Future generations, however, will judge this generation of leaders not solely by the principles they set out in communiqués, but by their actions. The Panel looks forward to the timely honouring of these pledges.



Kofi Annan, Chair of the Africa Progress Panel



For further information, contact: Max Bankole Jarrett, Deputy Director of the Africa Progress Panel on tel: 41 22 919 75 31 or email Max.Jarrett@africaprogresspanel.org.

A composite background image for a Festo advertisement. It features a laboratory setting with glass beakers and a funnel on the left, and an industrial refinery or chemical plant with tall distillation columns and piping on the right. The overall color scheme is dark with blue and white highlights.

FESTO

Got something in the pipeline?

Festo is your complete process automation supplier.

Enter our world of superior products, endless solutions and proven results that have made us the partner to trust.

08600 FESTO / www.festo.co.za

Stafsjö expands range with the new high pressure slurry valves

Stafsjö continues to focus on engineering and manufacturing of high pressure valves and introduces the SLH and SLX for really demanding applications with slurry and other abrasive media.

Since the introduction of Stafsjö's first slurry valve, the SLV, in 2009, applications requiring extreme performance requirements at really high pressures have become common. In order to win large slurry projects, Stafsjö realized that it needed to have high pressure slurry valves in its product range. Now that it has them available, Maria Persson, Sales and Marketing Director at Stafsjö says she is looking forward to bidding on upcoming projects.

Stafsjö's SLH is able to cope with pressures up to 20 bar, while the SLX can cope with pressures as high as 50 bar. Just like Stafsjö's other slurry valves, the SLH and the SLX are designed to give a tight shut-off, independent of pressure direction. The flow capacity is maximized with a full bore and minimal seat cavity, and at the same time, stresses and wear on the equipment are minimized, resulting in long service life of the valve and related process equipment.

The SLH and SLX have epoxy-coated fully lugged valve bodies in nodular iron with integrated purge ports. The reinforced seats are flexible in an axial way and seals towards each other in the bore when the valve is in the open position, thus protecting internal parts and the gate from the abrasive high pressure media. Upon closure, the seats are displaced axially, forming a seal with the gate until it forms a complete closure of the bore and gives a bi-directional tight shut-off. The seats also form a sealing face on the valve flanges saving the need for gaskets. The gate is supplied in high strength stainless steel, coated to give a hard and high wear and corrosion resistance surface. For security reason the valves are always supplied ready to be locked in either opened or closed position. The gland box, with three layers of TwinPack™ and a box bottom scraper, gives the gate guidance during operation and makes sure that a first-rate sealing is preserved.

Both SLH and SLX have solid top works to give excellent stability during operation. In the standard collection of actuators and accessories there are several types to choose

from and regardless of what was originally supplied with the valve, any exchange of actuator and/or accessories can easily be performed on site.

For more information contact Fred Venter, on tel: +27 11 397 2833, email: fred.venter@valve.co.za, or go to www.valve.co.za.



Total Valve & Control Solutions®



RICHTER FULLY LINED VALVES FOR THE CHEMICAL PROCESS INDUSTRY

- Ball valves
- Butterfly valves
- Globe control valves
- Non return valves
- Safety / Relief valves
- Sampling valves
- Sight glasses



**Valve
& Automation**

Total Valve & Control Solutions®

VEREENIGING

Tel : 011 397-2833
Fax : 011 397-4700
E-mail : sales@valve.co.za
Exports : africaexports@valve.co.za

DURBAN

Tel : 031 579-2593
Fax : 031 579-2562
E-mail : sales@valve.co.za

TECHNICAL SALES & SUPPORT

Richards Bay : 083 320-0393
Rustenburg : 083 227-7722
Sasolburg : 083 321-4960
Secunda : 083 656-4254 /
082 495-3751



www.valve.co.za

Hybrid flotation- **filtration process for oil water separation based on ceramic membranes**

by Dr-Ing M Beery, Dipl-Ing, J Ludwig, Dipl-Ing, L León, all of *akvolution* GmbH, Berlin, Germany

Microflotation and membrane filtration are two commonly used technologies in many fields of application. This article discusses how the two technologies were integrated and modified on a lab scale using new novel ceramic materials to technically assess their joined applicability for removing oil from water or water from oil.

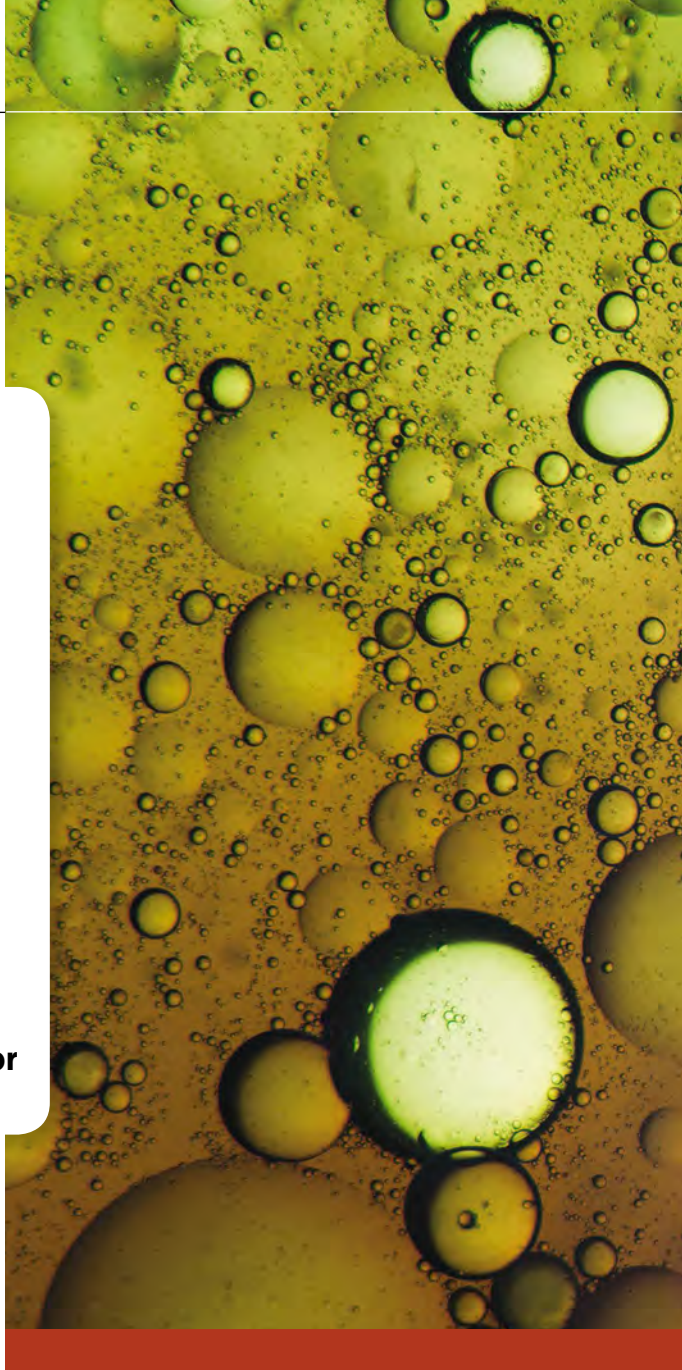
Abstract

Removing oil from water or water from oil is a challenging task which is relevant in many fields of applications such as food processing, pharmaceuticals, coatings, petrochemicals and oil and gas extraction. Two commonly used technologies, microflotation and membrane filtration were integrated and modified on a lab scale (10 l/h) using new novel ceramic materials to technically assess their joined applicability. In this article we present the results from testing this hybrid technology using produced water coming from both an onshore oil field and a refinery in Germany. The results are analysed in terms of both separation efficiency as well as market viability.

The use of advanced water treatment separations technologies for the removal of oil from water is becoming increasingly important in several industrial sectors. Especially in the oil and gas industry, the extraction and production of oil and gas is co-producing increasing amounts of oily industrial wastewaters commonly referred to as 'produced water'. This hydrocarbon-rich water must be sufficiently treated before being disposed of or reused in the production process. After a basic, gravity-based, three-phase-separation commonly referred to as 'primary treatment' the water is typically processed by a secondary (flotation/hydrocyclones) and possibly a tertiary (filtration by means of nutshell, cartridge or

ceramic filters) treatment, in order to reduce the oil and suspended solids concentration before disposal or reuse. This article introduces and tests the concept of intensifying and integrating these processes for increased efficiency, low energy, compact solution, akvoDeOil (Figure 1).

The only way of successfully integrating the two processes requires the use of ceramic membranes for filtration (due to their robustness and high flux) and induced gas flotation (IGF). The use of IGF instead of dissolved gas flotation (DGF) in produced water treatment is beneficial in terms of energy consumption. Produced water is typically saline (100-300 000 ppm Total Dissolved Solids are possible ([1])) and warm (40-70 °C are common) and since the solubility



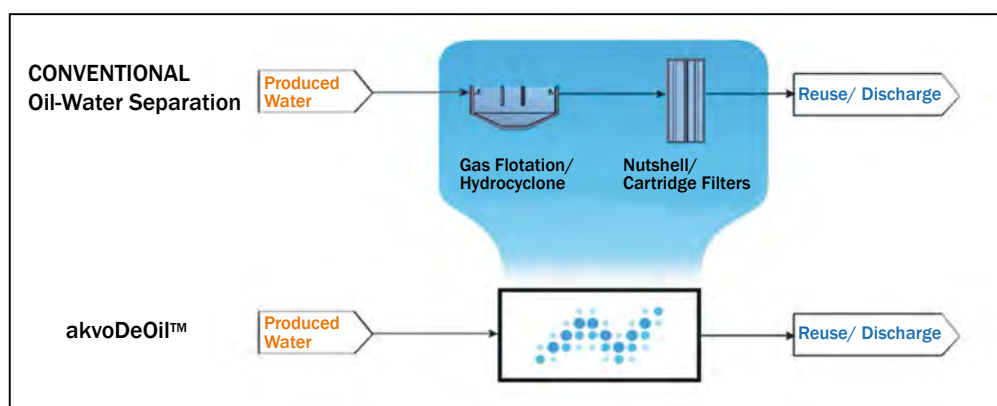


Figure 1: Integrating flotation and filtration for substitution of the secondary and tertiary treatment.

of gas in water decreases with increasing salinity and temperature, the energy required to recycle and introduce gas into a stream increases.

At the same time the use of cartridge filters and nutshell filters in the tertiary treatment step does not fully remove suspended solids, especially in the critical range of 1-10 micron that could cause formation damage and permeability issues in the reservoir when the water is re-injected

for reuse ([2]). Therefore the use of porous ceramic membranes (pore size <1 micron) is preferred. The potential of ceramic membranes for produced water treatment is well documented in [3].

Materials and methods

Different fine bubble diffusers were screened for their microbubble generation efficiency. The use of flotation for

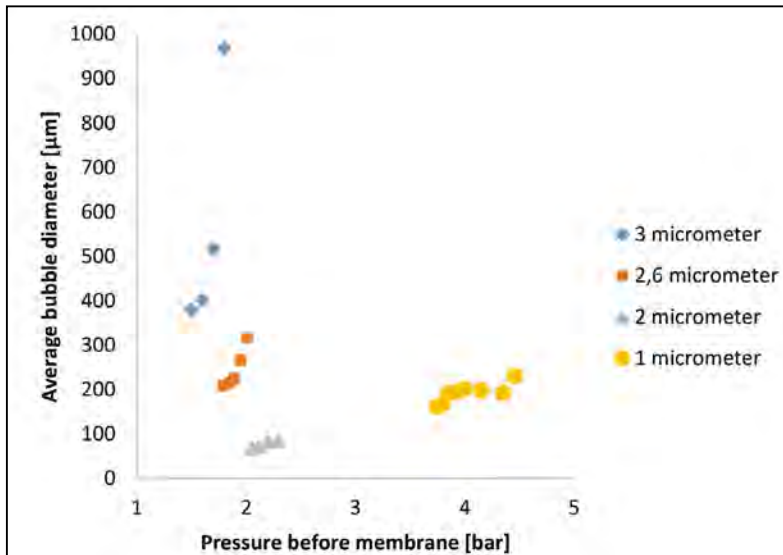


Figure 2: Average bubble diameter as function of the pressure drop for different diffuser pore sizes

oily water treatment typically requires fine bubbles (<100 micron) and the needed chemical resistance called for the use of ceramic materials. Four different pore-sized ceramic diffusers were tested in a bubble column setup equipped with a CCD high-speed camera and automated image analysis software calculating the bubble size distribution. The relation between the required pressure (p), pore diameter (D), the contact angle (θ) and surface tension of the liquid (σ) is described by equation 1 with K as a correction factor for non-cylindrical pore shape:

$$\Delta p = K \frac{4\sigma \cos\theta}{D} \quad (1)$$

Decreasing the required bubble size generally means reducing the diffusers' pore size down to a point where bubble coalescence begins playing a role and the overall pressure drop becomes too high. The effects of the applied pressure and pore size on the bubble size were measured (Figure 2). The ideal pore size was found to be 2 microns operating at a pressure of 2 bar producing an average bubble size below 100 micron.

Saline water, having higher density, viscosity and surface tension than fresh water has an effect on the bubble generation and formation. This effect is positive in the sense of producing finer, more narrowly size-distributed bubbles (Figure 3).

The experimental setup consisted of a continuously stirred feed tank with a valve and a pump feeding oil-water emulsion to the flotation-filtration unit. The unit consisted of a single ceramic diffuser fed by compressed air (2 bar) in a contact zone and a small 0,06 m² submerged ceramic membrane made of either Al₂O₃ or SiC run by an external gear pump in a vacuum driven mode (Figure 4). A weir collected the float hydraulically.

The air bubbles and oil droplets in the emulsion were analysed using optical methods (Figure 5).

Results

The setup was first tested with a mixture of motor oil and water at different concentrations and an alumina 0,2 micron filtration membrane. Each run lasted 6 hours with the goal

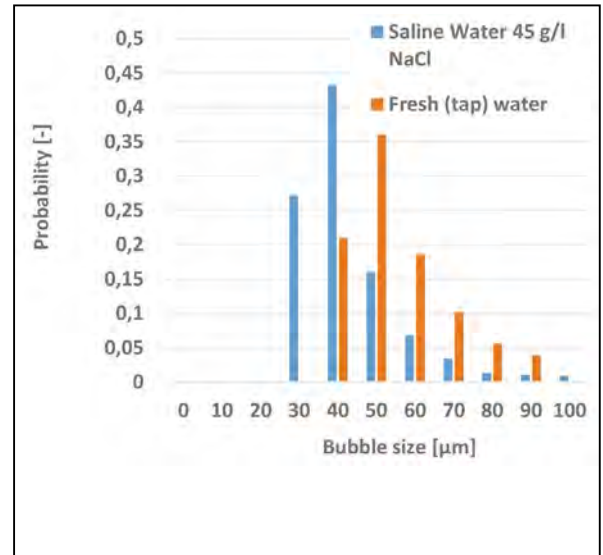


Figure 3: Difference in produced bubble size distribution resulting from increased water salinity

of reaching steady state and preparing the system for 'real' produced water emulsions.

The results are shown in Table 1. It is clear to see that the higher the concentration of motor oil in the feed the lower the overall flow that one could reach (reduced permeability of the membrane). The oil concentrations in the filtrate were relatively high at 63-81 ppm practically independent of the feed concentration, which may indicate the formation of a stable emulsion that was not efficiently removed by the membrane. Nevertheless the removal efficiency increased with rising feed concentration. This trend must, however, be treated with caution as the fouling effects (higher transmembrane pressure (TMP), lower fluxes) also increase.

The actual produced water used in this study came from an onshore oil well in the centre of Germany characterised by a low oil-in-water content and high suspended solids concentration ('Feed A') and diluted crude oil dewatering wastewater coming from a refinery in Germany ('Feed B').

Feed A was processed at a filtration flux of 100 l/m²/h using alumina membranes with a pore size of 0,2 micron. The transmembrane pressure remained low during the entire duration of filtration at < 0,1 bar reducing the oil content to 9,5 mg/l and the suspended solids to 4,5 mg/l. A constant removal of the float layer could be hydraulically realized throughout the run. After the run the membrane surface showed a dark brown residue and an oily layer. Both could be removed by the use of a water jet.

Feed B was filtered by a SiC membrane with a 0,04 micron pore size and a flux of 100 l/m²/h. The pressure drop increased during the run from 0,2 to 0,4 bar. The filtrate quality and removal efficiencies were high showing almost no traces of organics or solids.

The results are summarized in Table 2. Figure 6 shows a qualitative comparison between feed, filtrate and float in A.

Conclusions and outlook

The results show that using a single ceramic flotation-filtration integrated unit (akvoFloat) results in an effective reduction of both suspended solids and oil from real produced water. As a result this integrated process could potentially

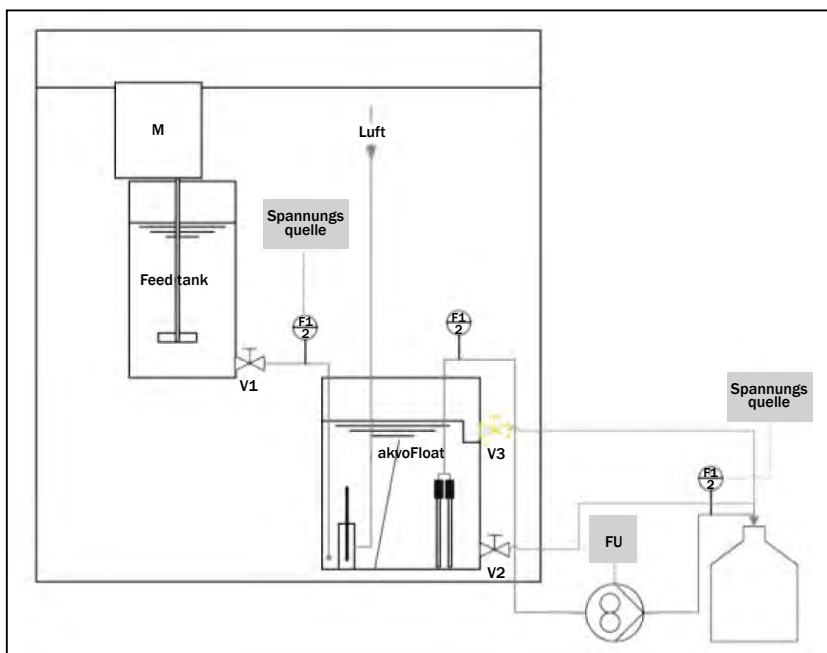


Figure 4: The small scale (20 l/h) flotation-filtration laboratory setup

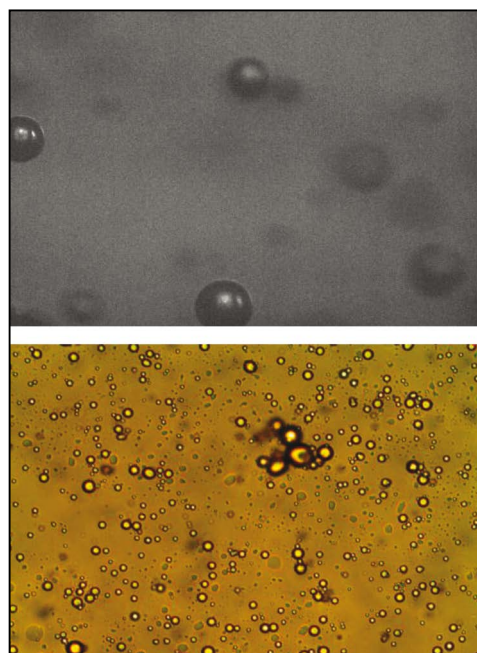


Figure 5: Microbubbles captured by a high speed camera (top) and oil droplets in an emulsion caught in a light microscope (bottom)

Feed (ppm)	Filtrate (ppm)	Removal (%)	TMP (bar)	Average Flow (l/h)
284	80	71.82	-0.2	22.5
457	81	82.22	-0.3	17
660	63	90.92	-0.4	16

Table 1: preliminary experimental results using motor oil in water emulsions

Parameter	Unit	Feed A	Filtrate A	Feed B	Filtrate B
Turbidity	NTU	335	0.4	-	-
Organic carbon	mg/l	20	9.5	253	0.5
TSS	mg/l	100	4.5	39	0

Table 2: Water quality parameters of feeds A and B and their corresponding filtrates

replace the two process step currently used, yielding water that could be used for either discharge or reuse (Figure 7). The low pressure levels required both for flotation and for ceramic membrane filtration indicate a low energy consumption that fits well with the global water-energy-nexus agenda and could offset the higher capital costs associated with ceramics. Continuous field tests using a larger system accompanied by an exact cost analysis will follow later this year giving proof to these claims.

Literature

- [1] M Stewart and K Arnold, Produced Water Treatment Field Manual, Gulf Professional Publishing, 2011.
- [2] Personal communication, Baker Hughes Water Management 2014.
- [3] S Alzahrana and AW Mohammad, Challenges and trends in membrane technology implementation for produced water treatment: A review, Water Process Engineering, 4, 2014, 107–133.

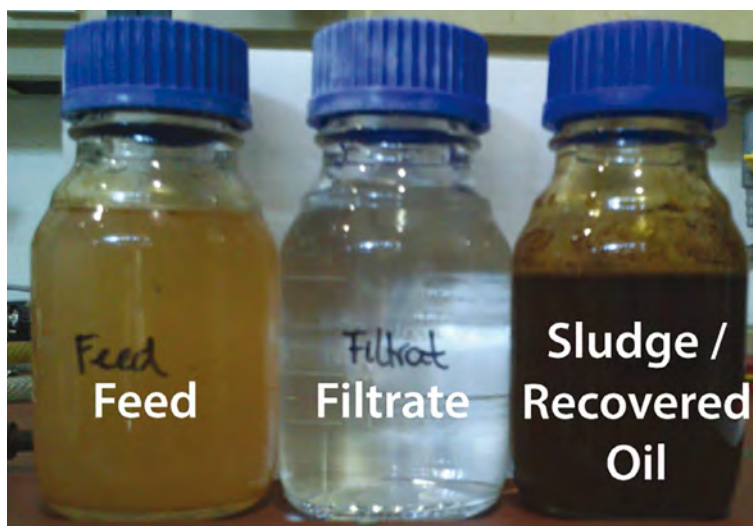


Figure 6: Feed A, permeate A and float A samples side by side.

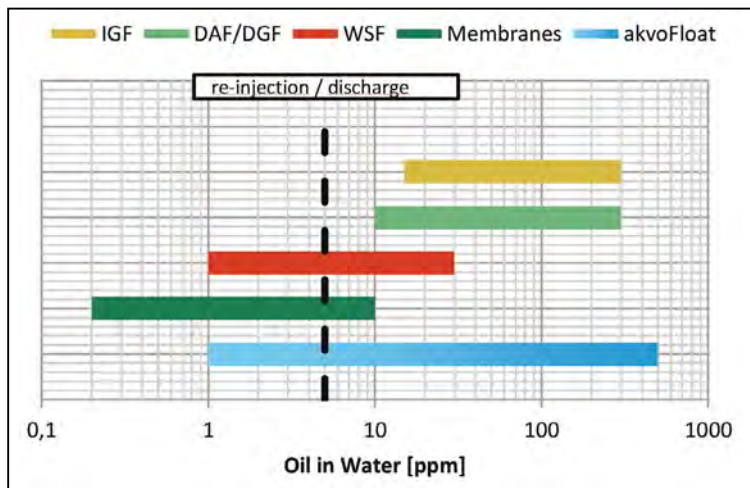
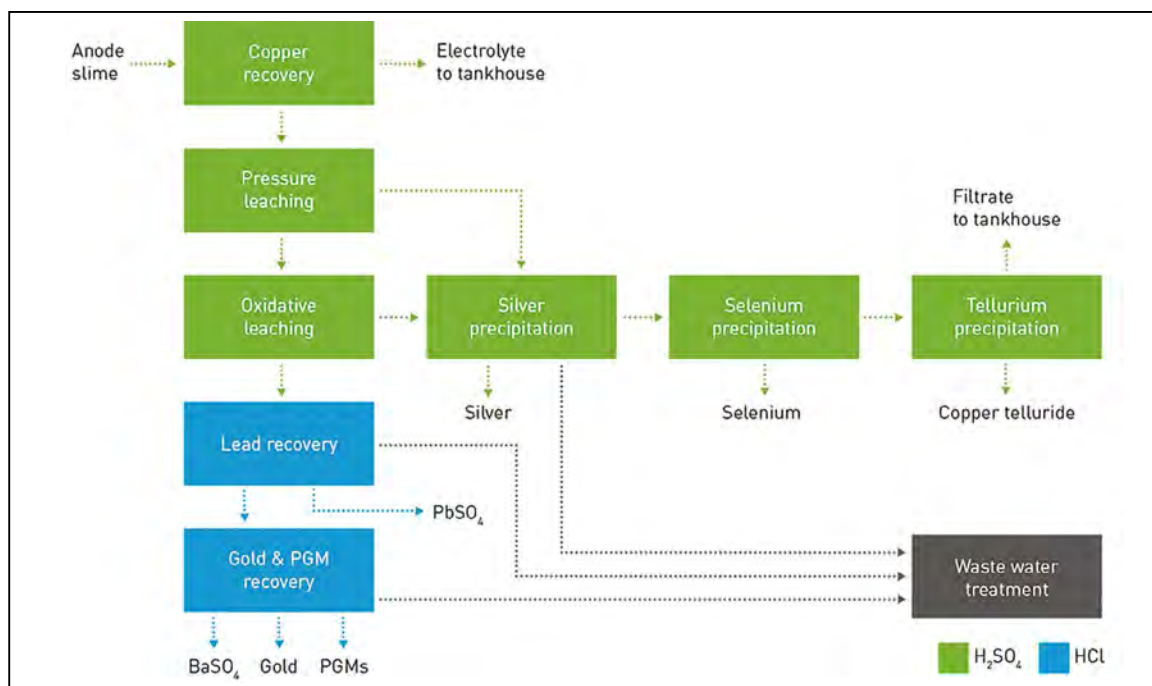


Figure 7: Operating Range (Feed to Effluent organics level) of different common technologies: Induced Gas Flotation (IGF), Dissolved Air/Gas Flotation (DAF/DGF), Walnut Shell Filters (WSF), Membranes and akvoFloat

Cost-effective, flexible, and sustainable production with Outotec



The Outotec modular process enables high direct recoveries with low inventory, has a low environmental impact, and can be adapted for a wide variety of applications.

The result of decades of experience and continuous development in precious metals processing technology, the Outotec Hydrometallurgical Precious Metals Process was originally developed for the treatment of anode slime generated in copper electrorefining. Its cost-effective, modular approach can be adapted for a variety of different applications and can also be combined with other precious metals technologies such as the Outotec Selenium Roasting Furnace, Outotec TROF, or Kaldo Furnace.

The process ensures effective separation of impurities with high recovery. Impurities can be converted into saleable products such as selenium, copper telluride, and lead sulfate to improve operational profitability. The recovered silver and gold are of a high grade and are melted and cast into ingots or granules.

Operation is straightforward, with the process comprising simple leaching, filtration,

and precipitation steps that are either sulfuric or hydrochloric acid based. The chemicals used do not form highly toxic compounds and can be mostly recycled for reuse within the process. This reduces both waste water volumes and fresh water consumption.

Effective off-gas cleaning not only improves working conditions and reduces environmental impact, it also improves precious metals recovery by allowing any metal traces that remain as droplets in off-gases to be captured.

Key benefits include:

- High direct recovery and high end-product quality with low inventories
- Quick process with high level of automation to enable consistent end-product



The process ensures effective separation of impurities.

quality and smooth operation

- Flexible and cost-efficient modular process design
- Recovered impurities can be sold as by-products instead of being disposed of
- Low environmental impact with no flue dust or slag generation.

For more information, email hydro@outotec.com, or go to www.outotec.com.

PLEASE SEE OUR FEATURES FOR THE NEXT TWO MONTHS, NAMELY:

JULY

- WATER TREATMENT
- CONTROL AND INSTRUMENTATION
- PLANT MAINTENANCE, HEALTH, SAFETY AND QUALITY
- NANOTECHNOLOGY

AUGUST

- CORROSION AND COATINGS
- PUMPS AND VALVES
- DESIGN AND MATERIALS OF CONSTRUCTION
- PETROCHEMICALS

FOR ALL YOUR ADVERTISING QUERIES PLEASE CONTACT:

Brenda Karathanasis
on +27 11 622 4770
or email brendak@crown.co.za

Sales of Dolomite's Micro Droplet Systems reach record high

Dolomite Microfluidics, the world leader in innovative microfluidic products, has seen significant growth in the sale of its Micro Droplet Systems, particularly for cell encapsulation applications. The only commercially available complete solution for cell encapsulation, microparticle production and nanoparticle synthesis, these systems are modular, scalable and easy to use, offering reliable production of identically sized droplets, particles, emulsions, double emulsions and bubbles, typically with a coefficient of variation of 1 %.

"We are delighted to see such a rapid rise in interest in the benefits of using microfluidic technology for applications in biology, food, cosmetics, drug discovery and chemistry," commented Mike Hawes, Chief Commercial Officer for Dolomite. "The ability to precisely engineer the size and contents of particles, droplets, foams and emulsions means that novel, reproducible and highly controlled formulations can be achieved, as well as allowing unique biochemical reactions to be performed. For example, by encapsulating individual cells into millions of droplets, our Micro Droplet Systems enable researchers to isolate monoclonal antibodies from blood samples or profile correctly-paired Tcell receptors. Other applications include fast and powerful directed evolution – encapsulating libraries of mutants with fluorogenic reagents for FACS analysis – and the encapsulation of cells in hydrogels for cell therapy. No other technology can achieve this type of droplet formation with such volume and consistency."

For more information on Dolomite's portfolio of microfluidic systems, pumps, chips, connectors, temperature controllers,



sensors and custom-made devices, visit www.dolomite-microfluidics.com <<http://www.dolomite-microfluidics.com>>.

Modularity, ease of use, innovation and scalability are common to all Dolomite products, which are used across a broad range of applications in biology, drug discovery, chemistry, food, cosmetics and academia.

Dolomite is a part of the Blacktrace group of companies, a world leader in Productizing Science®, and has offices in the USA, Japan, India and Brazil, as well as a worldwide network of distributors.

For further information or follow-up contact Sarah Khan at kdm communications limited, on tel. +44 (0)1480 405333, or email ideas@kdm-communications.com.

COMPRESSED AIR FILTER SOLUTIONS!

Atlas Copco offers a complete range of filtration solutions engineered to efficiently reduce all types of contamination. Backed by years of experience and application knowledge our filters cost effectively provide the best quality air to protect your investment.

www.atlascopco.co.za



Atlas Copco



Exploring the challenges associated with the greening of supply chains in the South African manganese and phosphate mining industry

by Professor David Pooe, Associate Professor, Department of Business Management , University of Johannesburg and Khomotso Mhelembe, Category Specialist, Airports Company South Africa

This article explores the challenges related to the implementation of GrSCM and provides insight into how it can be implemented in the South African manganese and phosphate industry.

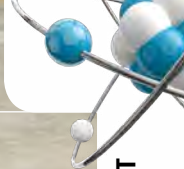
Until the late 1980s, when the notion of 'sustainable development' surfaced as noted in the 1987 World Commission on Environment and Development's publication, *Our common future*. Annex to the General Assembly document A/42/427, [66], it was generally held that economic growth would inevitably lead to environmental degradation through the consumption of non-renewable resources, the overuse of renewable resources and the production of waste and pollution [13]. This thinking was out of sync with the principles underpinning the notion of sustainable development, defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs [66]. Environmental impacts resulting from industry are represented by emission inventories of chemical release to the air, water and soil [25].

The environmental degradation resulting from economic activities led some policymakers and scholars, such as Beamon [1], to join in calls for a need to change manufac-



turing philosophy. Inevitably, this would have a bearing on supply chain management. For many years, the concept of supply chain management focused on enhancing operational efficiency and minimising waste – not so much for environmental reasons, but for economic reasons [59]. Essentially, the goal of supply chain management was about cost reduction, transportation and storage efficiencies, whilst service enhancement came from better delivery performance and fewer stock-outs for the retailer [17]. According to Ganeshan and Harrison [19], the supply chain is a network of facilities and distribution options that perform the function of procurement of materials, transportation of these materials into intermediate and finished products to customers and also involves extraction and exploitation of natural resources [57]

The environment has now become critical in the management of supply chains; leading to acceptance of the notion of green supply chain management (GrSCM). Hui, Chan and Pun [28] indicate that government policies and pressure



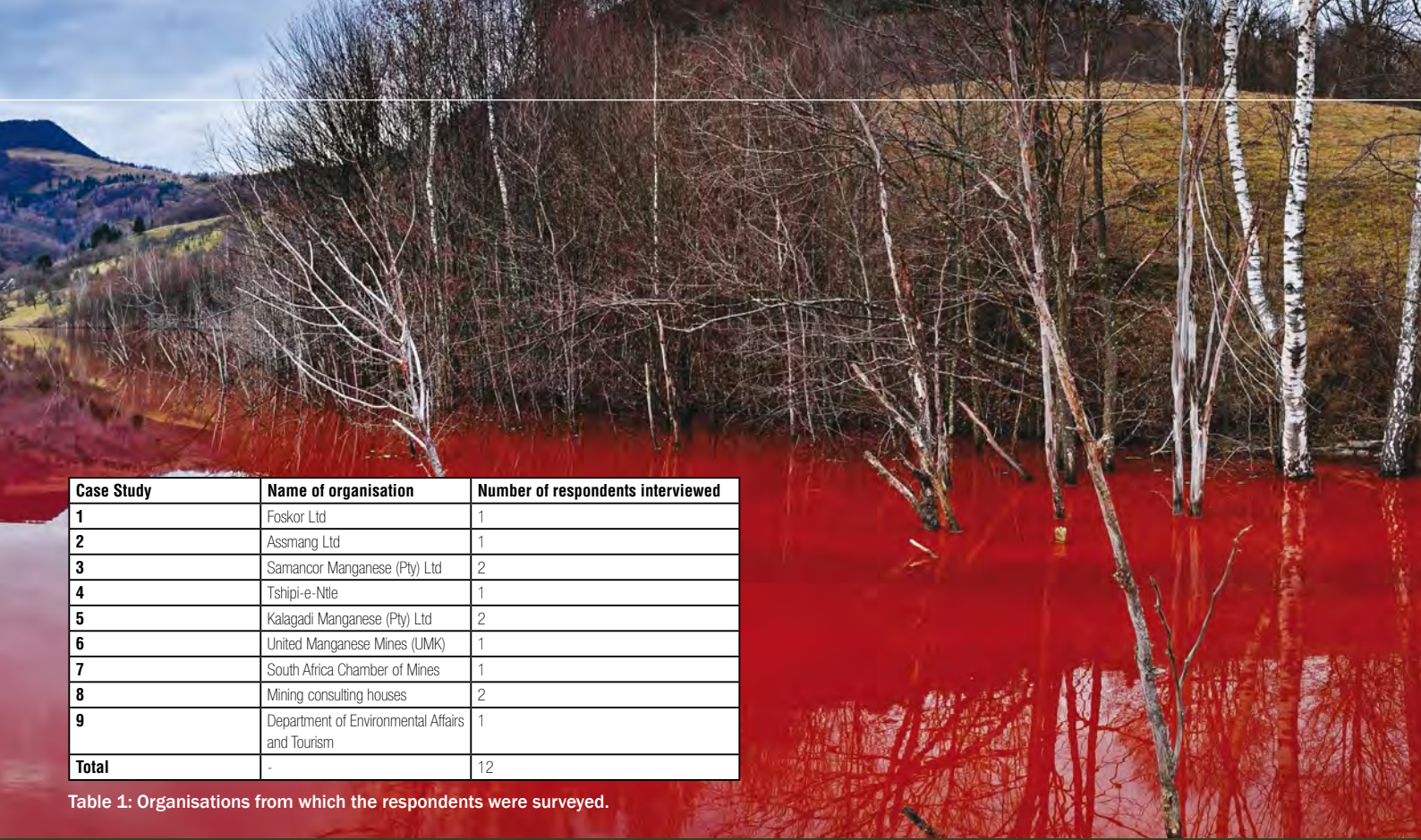
from groups fighting for the protection of the environment are some of the factors that induce business enterprises to adopt a green manufacturing or environmental system policy. This issue is setting guidelines for healthy living, doing business, generating products, extracting raw materials, recycling and reusing materials and reducing waste and energy, thus reducing the use of virgin materials and saving them for future generations [38]. Organisational sustainability involves ‘a wise balance among economic development, environmental stewardship, and social equity’ [ibid]. Amongst other things, environmental stewardship involves effective management of sewage effluents, sedimentation of river and other stored water bodies, leachates from wash-off from dumps, solid waste disposal sites, broken rocks, cyanide and other toxic chemicals waste release, salinity from mine fires and acid mine drainage.

Srivastava [57] defines GrSCM as “the integration of environmental thinking and supply chain management, including product design, material sourcing and selection,

manufacturing process, delivery of the final product to the consumer and the end-of-life management of the product after its useful life”. According to Gilbert [21], GrSCM is the process of incorporating environmental criteria or concerns into purchasing decisions and long-term relationships with suppliers. In this regard, Engel [16] observed that, in general, South Africa had made significant progress with environmental management since the late ‘90s, by implementing laws and strategies that focus on sustainable development and green issues.

Research approach

Owing to its exploratory nature, a qualitative approach was chosen for this study, the intention of which was to provide an in-depth understanding of the implementation of GrSCM in the South African manganese and phosphate mining industries. In order to meet the study’s objectives, exploratory and descriptive design strategies were used. The 12 participants were selected using purposive sampling.



Case Study	Name of organisation	Number of respondents interviewed
1	Foskor Ltd	1
2	Assmang Ltd	1
3	Samancor Manganese (Pty) Ltd	2
4	Tshipi-e-Ntle	1
5	Kalagadi Manganese (Pty) Ltd	2
6	United Manganese Mines (UMK)	1
7	South Africa Chamber of Mines	1
8	Mining consulting houses	2
9	Department of Environmental Affairs and Tourism	1
Total	-	12

Table 1: Organisations from which the respondents were surveyed.

These participants were selected on the basis of their positions and expert knowledge within the manganese and phosphate industry [12].

According to Neuman [39], purposive sampling is based on the researcher's knowledge of a research area and the important opinion-makers within it, whilst relying on the researcher's ability to make a sound judgement on which of these opinion-makers to approach.

Primary data were collected using semi-structured interviews, whilst secondary data constituted the literature reviewed throughout the study, internal publications provided by participants and publicly available data relevant to the topic being observed.

Regarding data treatment, in qualitative research, recording of data can be performed in various ways, including taking notes and using electronic devices, eg, digital voice recorders. The data were then analysed until certain themes continued to emerge repeatedly from the transcripts.

In qualitative research, trustworthiness consists of four elements: credibility, transferability, dependability and confirmability. In this study, credibility and dependability were chosen as the key measures of the study's trustworthiness.

Discussion of the results

The results indicated that whilst there is recognition of the need to implement GrSCM practices within the manganese and phosphate mining industry, there remain challenges associated with the implementation of such practices. These challenges are discussed below.

Operationalisation of environmental issues

Mining practices will remain for as long as there are minerals available for extraction. The long-held view has been that economic growth would inevitably lead to environmental degradation [13]. According to the literature, economic

and social development is in the interests of the mining industry, but the third pillar of sustainable development, namely environmental protection, appears to be of least importance [38]. The respondents indicated that they are aware of the environmental concerns associated with their mining operations, such as the toxins that are released from the air, water and soil during their mining operations. The respondents further indicated that as long as the environmental concerns are not incorporated as part of the scope at the level of specifications by the users, it is difficult for procurement to buy green. Thus, the main challenge for respondents seems to be the lack of operationalisation of environmental issues in areas such as procurement.

Lack of collaboration and knowledge sharing

The industries require the commitment of all stakeholders to enhance environmental management capabilities by providing training programmes and sharing their green system. Knowledge sharing in a green supply chain leads stakeholders to develop new capabilities for effective actions. Training and education are the prime requirements for achieving successful implementation of GrSCM in any organisation, whilst informal linkages and improved communication help the organisations to adopt green practices [42].

Information technology has made possible the sharing of large amounts of information along the supply chain, including operations, logistics and strategic planning data. This has enabled real-time collaboration and integration between supply chain partners, providing organisations with forward visibility, improving production planning, inventory management and distribution [50]. All operating manganese and phosphate mining companies have adopted one form of enterprise resource planning system or another. These include SAP, JD Edwards, Pastel and Syspro.

It was found from the respondents' comments that



users prefer to use suppliers with which they have always worked and they are reluctant to use new suppliers who might comply better with the environmental requirements. Hence, users are not exposed to fresh ideas in terms of more improved product offerings. Thus, lack of collaboration in sharing knowledge amongst the stakeholders is another challenge in the implementation of a green supply chain in the industries. The respondents are convinced that should they collaborate amongst themselves so that they can share information from their respective competencies about new processes, plants introduced in the market and the ever-changing technologies.

Proper application of monitoring and control systems

Respondents see pollution as an inherent part of doing business in the mining industry. One respondent went as far as saying that in order to stop pollution the mine might as well close. Waste and pollution in a production process can be a sign that the process is not as efficient as it could be. Besides, it costs money to generate and dispose of waste. The respondents confirmed that the industries do have systems in place that monitor levels of pollution and contamination of the environment, yet these are not 100% effective and are implemented only to comply with the set government regulations in the industries. This is supported by Morrow and Rondinelli [37], who state that although business enterprises in most industrialised countries have adopted environmental protection practices required by government agencies since the early 1970s, these regulations largely focus on control of water and air emissions and waste disposal. The introduction of green manufacturing will necessitate the elimination of current monitoring systems in favour of more holistic ones. Hence, proper use of monitoring and control systems remains a challenge.

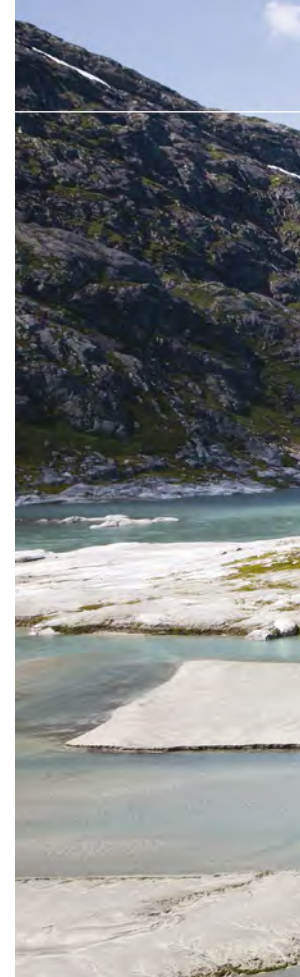
Lack of clear policy and legislative direction

Government regulation usually requires business enterprises to reduce or eliminate their toxic air and water pollution by using technologies that control or clean emissions at the 'end of the pipe' [ibid]. The respondents recommend that the revision of current policies and legislations to be stricter and more severe where there is no compliance; that is, the penalty fee for non-compliance must be higher than the cost of initiating GrSCM. The respondents compared the green issue with safety and feel that environmental protection is not emphasised enough. The respondents and the literature agree that unless GrSCM is effectively implemented and properly enforced, the solid framework for governance remains a mere intention [10].

The respondents also indicated that there is no clear policy direction when it comes to environmental issues from government. They believe that policies and regulation set by government are not explicit and do not address prevention to environmental risks, but the cure, which is to monitor and then correct. Furthermore, the respondents stated that the government does not see environmental risk as a priority, unlike in the case of safety issue, for instance. They believe the government needs to make it a priority so that management can adapt and make it a policy within the industries. Hence, the lack of clear policy and legislative direction emerged as an important theme that respondents also raised as a challenge.

Cost of implementing green supply chain practices

Extending the supply chain to include issues such as remanufacturing, recycling and refurbishing adds an additional level of complexity to existing supply chain design, in addition to a new set of potential strategic and operational issues, which, in turn, can increase costs, at least in the short term. [35].



Luthra *et al* [36] concede that, usually, high cost is a big pressure in GrSCM as compared to conventional supply chain management (SCM). The respondents strongly supported this observation and highlighted cost as a major constraint in the implementation of GrSCM. The respondents are convinced that should money be allocated, the implementation of GrSCM would be possible. However, the Department of Minerals and Energy [11] also posit that GrSCM can cut the cost of materials purchasing and energy consumption, reduce the cost of waste treatment and discharge and avoid a fine in the case of environmental accidents.

In this regard, the respondents remarked that leaders of the supply chain department should balance low cost and innovation process whilst maintaining good environmental performance. The respondents acknowledged that the implementation of GrSCM requires capital initially, but it is a long-term investment. They indicated that cost is a major challenge in the implementation of a green supply chain in the industries, as GrSCM requires new world-class technologies that will detect and control the waste generated. The greener you become, the more costly it is. Therefore, costs emerged as another critical theme.

Leadership and managing change

Beamon [1] posits that the current state and trend of environmental degradation calls for a need to change manufacturing philosophy. Respondents are also convinced that the implementation of GrSCM requires a change in management strategy. They further elaborated by saying management should bring about this change. According to Tsoulfas and Pappis [61], the main environmental emphasis has been on the manufacturing phase and, to some degree,

on the disposal phase. This revelation is confirmed by the respondents as they noted that workers in the plant play an important role in environmental protection. They believe that many workers are used to the way of doing things in a particular manner, and are reluctant to try new ways of doing things. Hence, management needs to commit to environmental issues by enforcing a culture that promotes flexibility and encourages change amongst the staff. Leadership and managing change continues to hinder progress in many organisations.

Recommendations and conclusion

Hilson ([27] observed that challenges of implementing of a Green Supply Chain manifest themselves in the following ways:

- a lack of clear, continuous policies to support waste minimisation and cleaner production
- incomplete regulatory frameworks and uneven enforcement
- ignorance of the characteristics of industrialised production processes
- no clear understanding of the difference between compliance investments and cleaner technologies
- inefficient coordination amongst different government agencies at different levels.

Not surprisingly, Ravi and Shankar [42] believe that training and education are critical requirements for achieving successful implementation of GrSCM. These authors also suggest informal linkages and improved communication as helpful for organisations to adopt green practices, which requires capital. In this article, lack of clear policies, legislative issues, technological constraints and inefficient coordination amongst different government agencies have been identified as major barriers to the implementation of



a green supply chain in the South African manganese and phosphate mining industries.

Although few mines have adopted processes of minimising environmental risk, the implementation of a green supply chain remains an option and it is not generally embraced because of the notion that it is costly. Government needs to play an expanded role in enforcing legislation and set harsh penalties for non-compliance by the mines. But it also needs to support more consciously the manganese and phosphate mines more with an appreciation of the need to implement GrSCM. At a policy level, it is recommended that the adoption of cleaner production practices become standard for all manganese and phosphate mining houses in South Africa.

At a managerial level, top management in the various mines needs to take the initiative of increasing awareness amongst the supply chain stakeholders. This can be achieved by holding environmental awareness seminars for suppliers and vendors, undertaking programmes to inform stakeholders on the benefits and relevance of green supply chain initiatives, providing platforms for information and offering rewards to stakeholders for pursuing the initiative. Owing to the fact that supply chain practitioners are custodians of the supply chain process, policies must be introduced where sourcing strategies are only approved if green issues are considered. Furthermore, management needs to develop a GrSCM adoption strategy which enables the mines to handle, minimise and anticipate problems with waste. The critical elements of this strategy should cover:

- use of cleaner technologies
- training for stakeholders
- inclusion of environmental aspects in the sourcing strategy
- redesigning of plants to better accommodate wastes

- funding for environmental awareness and change management
- collaboration between stakeholders (internal and external) to encourage knowledge sharing.

It is apparent that the mines have limited knowledge of cleaner technologies and cleaner production practices. Firstly, given the fact that the study sheds light on the challenges of the implementation of GrSCM in the manganese and phosphate mining industry, it is recommended that further research be undertaken to develop a green supply chain implementation model for the industry. Secondly, a study needs to be conducted on the perceptions and expectations of South African policymakers in this industry. Thirdly, a feasibility study needs to be undertaken on the link between the implementation of a green supply chain, cost saving and competitive advantage.

References

A list of references for this article is available from the editor at chemtech@crowm.co.za.

ECSA and municipalities: closer collaboration essential to ensure constitutional rights

The opportunity exists for closer collaboration between municipalities and ECSA, the body regulating the engineering profession, in order to ensure that the constitutional right to service delivery of every South African is met. This has stemmed from the challenges faced by municipalities in ensuring a seamless flow of service delivery and an ongoing focus on quality infrastructure development.

This was outlined during the panel discussion around municipal service delivery challenges. Speaking on behalf of the people, Advocate Malunga indicated that the bulk of queries coming to the office of the Public Protector in the last financial year have been targeted at municipalities. Out of the complainants received, the highest number was against municipalities, with the top five complaints being:

- Poor service delivery
- Land and housing
- Billings and service delivery
- Tender process irregularities
- Housing delivery gone wrong.

“The number of requests we have received indicates to the public’s frustration in the ability of the state to provide public services to its residents,” said Advocate Malunga.

With a mandate which speaks to ensuring a democratic and accountable local government for communities, SALGA has a vital role to play in ensuring that the lost faith is restored. In outlining some of the challenges experienced by local government in its 15 year trajectory, Cllr Baloyi indicated that in some instances, unregistered engineers had delivered unacceptable work, resulting in a municipalities being unable to provide some critical services to its constituents. “Our primary objective is to ensure the provision of services to communities in a sustainable manner, with our residents as the primary focus of our work,” said Cllr Baloyi.

The first 15 years of local government’s existence has seen some significant suc-



cesses, although there is room for improvement. “We have seen great achievements in the last 15 years, but we still need to do more work. It may appear as if we have not met all of our targets. However, as you can imagine, the population has grown, and this has meant that we need to keep improving our delivery to meet the growing demands of the communities we serve,” Baloyi added.

Speaking specifically about the Ekurhuleni Municipality, Cllr Gungubele said that their ability to provide quality service has been impaired by poor standards of work. “It costs our municipality more to fix engineering work that has not been executed professionally in the first place. In Ekurhuleni, the focus is on how we can make the entire value chain of service delivery simpler, better and faster,” he added.

Ekurhuleni, through the construction of the OR Tambo Cultural Precinct, has demonstrated that there is local engineering expertise that can offer specialised services to its community, such as a solar farm producing 200 KW of energy; and efficient technologies such as rain water harvesting and waste water management. “This facility generates its own resources and recycles the waste as well,” added Gungubele.

In outlining the solutions to some of these challenges, ECSA recommended the professionalisation of systems at municipal level, which would ensure that professionals are empowered to do their jobs through an appreciation by administrators, of the nature and value of engineering. ECSA stressed the need for consideration to be given to creating a central tender-awarding system at a national level which must then be supported by professional assessment and consultation.

There are also challenges at an operational level for engineers working within local government, and ECSA recommends greater delegation of tasks, as technical staff is not given the authority to make importance decisions – with decision-making being an integral part of the engineering process. Engineers working in local government are often not in a position to sign off their projects and make decisions. “The need to return authority to line management cannot be over-emphasized,” said John Cato of ECSA.

For more information contact Edgar Sabela on tel: +27 11 607 9500 or email: edgar@ecsa.co.za.



Ready for business? We are...

Two in-line arranged thermal transfer print units for simultaneous two-color printing on one label with a ribbon saver at one print unit. The XC series meets the conditions for the Classification and Labeling chemical products according to the Globally Harmonized System of labeling standards.

cab
we identify more
+27 11 886 3580
cab.de/za

The financial benefits of green business: improving an organisation's green scorecard



<http://www.asiagreenbuildings.com/indonesia-rising-number-green-certification-higher-level/>

According to Edward O Wilson: "The great challenge of the twenty-first century is to raise people everywhere to a decent standard of living while preserving as much of the rest of life as possible." With unemployment at a record high of 26,4 percent, and with constant price hikes and electricity shortages stifling the South African economy, how can going green benefit business, decrease costs and, coincidentally, save the planet?

While big business might not be overly concerned about the effect that its actions has on the environment, it does care about its bottom line – so why not implement eco-friendly practices that will protect the environment and enhance profits? Many green practices save businesses money by reducing overall operational costs, such as the decreased use of water and electricity or the use of green cleaning products, which are highly concentrated and more effective than traditional products.

In an ongoing effort to thwart climate change, the South African legislature has passed carbon emissions tax legislation. As was confirmed in the National Budget speech delivered earlier this year, this

legislation will require that all corporate businesses pay carbon tax as from January 2016. Businesses that do not prepare for this reality will face severe taxation, negatively impacting on the profitability of the business. Formulating sustainability plans, and implementing sustainable practices now will ensure that the level of taxation is minimised in the future.

Going green in the office also has the added benefit of creating a healthier work environment for staff. This encourages a healthier workforce, meaning less absenteeism and increased productivity. In turn, again, this positively affects the business' financial performance.

While decreasing operational expenses alleviates some pressure, increasing income would facilitate greater business success. By repositioning a company as a sustainable organisation, greater market share can be achieved. It must, however, be ensured that the organisation does not sell itself as green, while it is really only 'green-washing'. Should the company's non-effective 'green' practices be exposed, the negative effect on the reputation of the business will be devastating.

How can businesses go green? Purchase from green suppliers, instil an organisation-wide energy and water saving culture, recycle, use environmentally friendly cleaning products, decrease paper usage, update office equipment with greener options and consider alternative energy options, to name but a few green avenues. A great way to determine the best approach is to hire the expertise of a consultant to conduct an energy audit. Although the business may not be able to implement all of the suggested aspects immediately, the data could assist in formulating a plan of action.

It is possible to improve an organisation's green scorecard, without compromising on profitability. In fact, in practice, using the balanced scorecard to ensure sustainability shows great benefits, after all: "Every profession bears the responsibility to understand the circumstances that enable its existence." - *Robert Gutman*

For more information please contact Green Worx on +27 11 708 6626, at info@green-worxcs.co.za or visit www.green-worxcs.co.za.

Learning versus Training: The Power of know how

Process engineering is anything but simple. How can we impart information that is hard to digest in an easily accessible manner?

South Africa's jobless rate increased to 26,4 % in the first three months of 2015 from 24,3 percent in the previous quarter. For the Process Automation sector, the unemployment figures may not be as high, but this sector demands high technology specialisation and with high technical competence as a main requirement of the instrumentation personnel.

For the process automation sector it is not only hard to get new fully qualified staff, but the ones who are available are probably not the most experienced having just completed their studies at the universities or technology centres. Even in other parts of the world, where it is much easier to find new staff, the requested qualification combined with required process experience remains an issue.

But what happens to the existing staff? The life cycle of technology is getting shorter and shorter. How does a technical person stay up to date? As for the process plants and factories, how can they be sure that they exploit the options of the technology and field instruments you are using today? Today's constraints mean that cost cutting, efficiency requirements; plant availability, product quality and safety are becoming key – with the instrumentation technician or engineer needing to understand the complete life cycle of a plant in ensuring that these changes in technology are introduced to maximise the sustainability of a process plant. This change is no longer merely just a question of maintenance.

Apart from hiring of new staff and bringing these members on-board, another

aspect that needs attention is the ensuring further education for the staff. This raises questions of the financial implications of further training. How much does a company invest in further education and do they have any idea if the money is well invested? It is no longer a matter of 'just attending' training, but of learning and comprehending, while being able to utilise these skills the very next week in plant conditions.

In the past the focus was on the delivery of training which means a check mark was made after a person attended a course and it was assumed that he or she now had the knowledge and skills to perform better.

Endress+Hauser stands for a shift in paradigm. The focus is not on delivering a training course, but on the learner, ie, that he really acquires new knowledge and skills he can apply in his job. To ensure the success of such a programme an instructional system design model is used, one which has been developed by the American Society for Training and Development, now called ATD which stands for Association for Talent Development. The model is called "The Training Cycle" and consists of five steps.

1. Analyse the training needs: here one performs a Gap-Analysis, and clarifies questions about target groups, necessary and existing preconditions, and other frame conditions;
2. Develop learning objectives. A learning objective is a specific performance statement about knowledge or skills which should be gained during the program. They are essential because, based on the learning objectives, the content will be developed and the success of the program will be assessed
3. Design the program. Again, in the past, most training courses were content-centred, with an 'expert' standing in-front of the audience revealing everything he knows. Using 90 slides in 60 minutes, is possibly not something to be labelled 'training', but it is not unusual. But the question the audience wants to ask is never addressed.

Based on a needs-analysis Endress+Hauser develops only the necessary content which will be transmitted in an interactive style, which takes into consideration the latest findings about adult-learning. Finally steps four and five are implemented to address the implementation and complete the final evaluation.

Endress+Hauser South Africa launched the Universal Training Rig (UTR) at the Africa Automation Fair in May 2015. Purpose-built for Endress+Hauser South Africa, at the company's Application Training Centre (ATC)

in Reinach Switzerland, the UTR utilises 20 devices from the company's extensive range of flow, level, pressure and pH measuring instruments in a variety of flow and control loop configurations.

The integrated oil, water, acid and alkaline reservoir tanks combined with mixing and separation chambers allow a huge range of flow, level and pH conditions to be created through the utilisation of different control loop strategies based on pressure, temperature, level, density and pump speed primary values.

Whilst not emulating a production process of any specific industry, the UTR presents the application frame conditions in such a way as to offer a variety of training possibilities. An agitator (level disturbance), heater element (temperature changes) and injected compressed air (entrained gas), allow the process conditions to be interrupted in a controlled manner thus giving the trainee a practical perspective of the sensitivities of each instrumentation type operating under varying field conditions

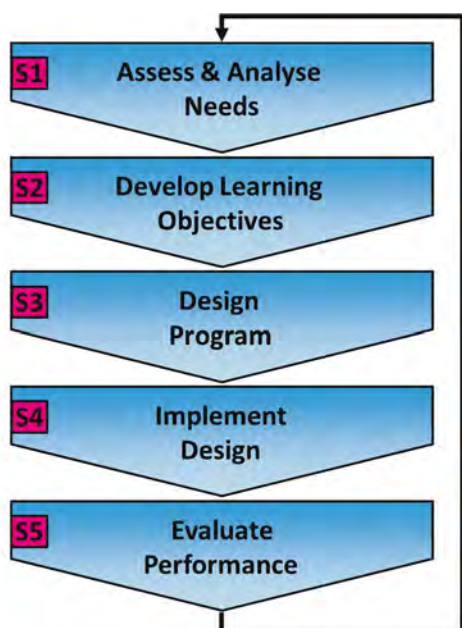
All operational parameters including instrument selection are controlled via the integrated Programmable Logic Controller and touch screen display.

From June this year, Endress+Hauser is offering two new intensive five-day training courses targeted at technical plant personnel from Technician and Engineer grades, right through to Maintenance, Engineering and Project Management. The two courses cover all of the major process measurements classes including level, flow, pressure, temperature and analytics, starting from the principles of operation through to application topics such as meter selection, installation and application issues, and basic trouble shooting.

As well as 'real life' instrument and control operation, the UTR also allows different field communication strategies to be presented via its use of Wireless HART, Profibus as well as standard 4-20 mA connections. Supplementary topics, such as reading and understanding P&ID diagrams and Plant Asset Management, are also included.

On request, a training brochure is available outlining the UTR and training course modules in more detail including pricing and schedules. An open day is being planned for later in the year where invitees will be able to have an in-depth look at the UTR and the training program and discuss specific benefits in detail.

For more information contact Chris Gimson, Training Manager, on tel: +27 11 262 8000, or email info@za.endress.com.



Practical energy management training for City of Cape Town facility managers



City of Cape Town facility managers receiving their Fundamentals to Energy Management Training (FEMT) certificates carrying 3 CPD credits for successfully completing the training and practical demonstration of what they learnt.

The City of Cape Town has a holistic approach to implementing energy efficiency in its buildings. They have embarked on a journey where they have ensured the implementation of smart meters and developed a data monitoring system coupled with energy efficiency interventions. Training of key employees was critical in ensuring the sustainability of the programme. The City put out a request for proposal to train its facility managers (FMs) on the fundamentals of energy management but required that the service provider include a practical component in the training to ensure that the theory and concepts taught are understood and grasped by its employees. The City developed a training guide on how to access the smart meter data and asked that the service provider incorporate this training material into their programme. The Energy Training Foundation was the successful bidder and was awarded the contract. Together the Energy Training Foundation and the City developed a unique programme, custom designed to meet the City's needs.

Sumaya Mahomed, the Professional Officer at City of Cape Town's Renewable and Energy Efficiency Environmental Resource Management Department initiated the project and said, "I didn't want to just provide a training course for the facilities managers, I wanted more. I wanted to know I would receive a direct return on investment through active project implementation." Mahomed continues, "What better way to do it than use the trainer who understands the topics, to not only present the training, but assist with the practical aspects within each trainee group's working environment too."

The training was focused on training mainly non-technical staff like facility managers, building operators and maintenance staff. Izelle Bosman, Training Manager of the Energy Training Foundation, who

facilitated the City of Cape Town FEMT project says, "The level of staff member is not important, whether it is a cleaner, a receptionist, maintenance personnel, or the managing director and CEO of the organization – every person in a facility's actions influence the energy use."

Bosman refers to studies done on the largest impact on reducing carbon emissions which has proved that about 35% (AEE®) can be attributed to energy efficiency and within energy efficiency 30% of its success lies with human intervention or, as we call it, energy efficiency, awareness. Bosman continues, "Pitching training to the right level of relevance to each person in the organization creates a realization of how and why their actions influence the energy use leaving a lasting impression on the employee, with the ultimate result of a long-term change in the human intervention aspect of energy use – this in-turn ensures sustainable energy savings." This has proven an optimal approach to sustaining an energy management system and energy efficiency interventions.

With the FMs not only being trained in the savings opportunities and where and how to find them, but the practical aspects that followed the theoretical training ensured that they understood the concepts and could physically see the difference it made to their division's energy use.

The FEMT training included topics such as energy costs over time, energy quantities, energy has quality (usefulness), energy for sensible heat, energy for latent heat, using the psychometric chart to determine set points of equipment, energy accounts and tariff structures, insulation, fenestration, heat flow and losses, HVAC, load factors, maximum demand, power factor, types of lights, lumens, lux, efficacy, light quality, capacitors, etc, to name but a few. Using

the training guide of their own meter reading equipment, the trainer explained how to obtain information and how to identify possible energy management opportunities from the load profiles.

With the City of Cape Town employees not only being trained in the savings opportunities and where and how to find them, but also in the practical aspects that followed, the theoretical training ensured that they understood the concepts and could physically see the difference it made to their division's energy use.

The participants were required to present their proposed energy efficiency interventions with the best presentation being supported to implement their proposal. Another key success to the programme was allowing the participants to work in groups. Nine groups were formed, the task given comprised of a general set of theory questions based on the smart meter reading with the final question focusing on proposed energy efficient solutions.

At the FEMT certificate handover to all the trainees, Martin Stander, Manager of Facilities Management at City of Cape Town said: "By up-skilling our staff to be able to become energy efficient in their work approach, we are growing our own trees, by growing our staff in this way." Stander is very supportive of the training and the outcomes it delivered and congratulated his team on their efforts. The City has to date trained 45 of its building facility managers with the clear vision of ensuring sustainable management of their facilities.

For more information contact:

the media office of The Energy Training Foundation on tel: +27 41 582 2043, or email yolanda@entf.co.za.



Atlas Copco turns theory into practice for Grade 12 business study learners

Atlas Copco Mining & Rock Excavation Technique invited 130 Grade 12 learners from Hoërskool Garsfontein to attend a presentation to illustrate how key legislation which correlates with their matric Business Studies, is strategically and practically applied in large businesses.

Hoërskool Garsfontein, located East of Pretoria and affectionately known as 'Garsies,' opened its educational doors in January 1988 with 310 learners. Now with close to 2 000 learners, the high school has developed into one of Pretoria's top schools, bearing testimony to the school motto "Bou en Bewaar" (Build and Conserve) which symbolises the endeavour to build and develop a school for the community and to conserve it for future generations.

"When we were approached by Hoërskool Garsfontein with a request to assist learners with their business studies, we saw it as a great opportunity to make a positive contribution to our future leaders," says Johan Goosen, Business Line Manager - Atlas Copco Drilling Solutions.

The initiative, held at Atlas Copco head office in Jet Park, Johannesburg, on 19th March 2015, included three interactive presentations covering Human Resources, SHEQ and training legislation and learners were encouraged to ask questions. Human Resources Manager for Atlas Copco Mining and Rock Excavation Technique, Lerato Mokgethi, shared insight into BBBEE, the Labour Relations Act as well as the Employment Equity Act and explained the objective of each legislation. Lerato pointed out the importance of correct implementation which can result in positive outcomes and present



Grade 12 learners from Hoërskool Garsfontein attended presentations by Atlas Copco South Africa to illustrate how legislation is applied in business

many opportunities for all South Africans. "Job creation will eliminate poverty, contribute to economic growth and help to make South Africa globally competitive."

In his presentation, Cedric Marillier, SHEQ Coordinator - Branches/Mine Sites, touched on the importance and history of Safety Legislation in South Africa for both general industry as well as for the mining and related industries. "We showed how Atlas Copco and other organisations ensure compliance and utilise aspects of the various legislation including Occupational Health and Safety Act, Mine Health and Safety Act, Compensation for Occupational Injuries and Diseases Act and the Consumer Protection Act, in their operational activities."

Atlas Copco's 1 100m² state-of-the-art, fully equipped in-house training facility, ACademy, addresses a wide range of operator, technical and dedicated computer based training. ACademy Manager, Kathryn Coetzer, wrapped up proceedings with an overview of Atlas Copco South Africa's train-

ing and development activities which are in line with local skills development legislation. "We believe that competent and committed people are crucial for achieving our strategy. Developing our employees enables us to improve our business and the solutions that we offer to our customers."

'Garsies' learners all agreed that the day was extremely valuable and that the presentations were most informative. "It was great to see actual application of the legislation in a business instead of just learning theory without any practical examples," said Brandon Nel. In conclusion, 'Garsies' School Vice-Principal, Willie Vorster, commented: "Following the informative sessions at Atlas Copco, the learners now understand numerous aspects much better. It was indeed a 'wow-experience' for the learners!"

For more information contact: Ditumiso Mahlaba on tel: +27 (0)11 821 9572, or email ditumiso.mahlaba@za.atlascopco.com

Chemical Technology is the only publication in Africa for chemical engineers focusing on all unit operations in a comprehensive way



SUDOKU NO. 106

Complete the grid so that every row across, every column down and every 3x3 box is filled with the numbers 1 to 9. That's all there is to it! No mathematics are involved. The grid has numbers, but nothing has to add up to anything else. You solve the puzzle with reasoning and logic. For an introduction to Sudoku see <http://en.wikipedia.org/wiki/Sudoku>

	6	7		2	3			
	4							2
					4			7
		4	5					
				7		8		1
9		3		6				
6	9							8
	5			4	1			9
								2

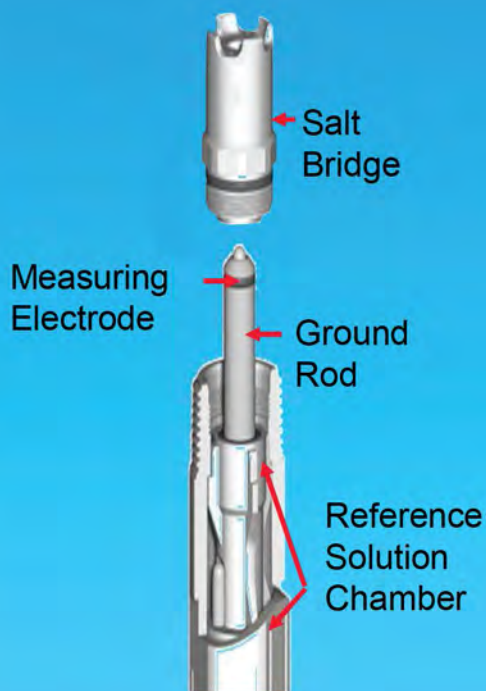
**Solution
for SUDOKU
105**

1	2	8	7	3	9	5	6	4
6	9	4	5	1	8	2	3	7
5	3	7	2	4	6	1	9	8
3	8	1	6	7	2	4	5	9
2	5	9	1	8	4	3	7	6
4	7	6	3	9	5	8	1	2
8	1	3	9	2	7	6	4	5
9	6	2	4	5	3	7	8	1
7	4	5	8	6	1	9	2	3

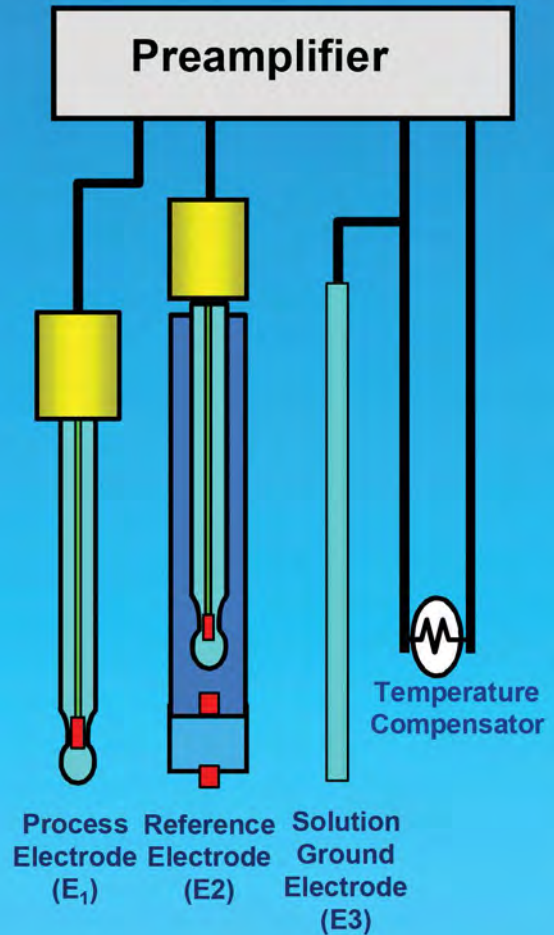
pH MEASUREMENT

DIFFERENTIAL pH SENSOR

- MINIMUM MAINTENANCE IN HARSH ENVIRONMENT
- MAXIMUM ACCURACY
- COMPLETELY SERVICEABLE



DIFFERENTIAL ELECTRODE TECHNIQUE



PREI *instrumentation (Pty Ltd)*

52 B Le Maitre Street Brackenhurst, Alberton 1448 P.O. Box 1552 Bramley 2018, RSA
Tel: (011) 867 5001/7 • Fax: (011) 867 5047 • E-Mail Address: sales@prei.co.za
Website: www.prei.co.za

READY-MADE SOLUTIONS

To Your Specific Bulk Bag Handling Problem



FILL

Fill one bulk bag per week or 20 per hour with REAR-POST, TWIN-CENTREPOST™, and SWING-DOWN™ Bulk Bag Fillers

Flexicon's extra-broad model range, patented innovations and performance enhancements let you exact-match a filler to your specific cost and capacity requirements. Patented TWIN-CENTREPOST™ models maximise strength, accessibility to bag loops and economy. Cantilevered REAR-POST models allow pass-through roller conveyors. SWING-DOWN™ models pivot the fill-head to the operator at floor level for quick, easy and safe spout connections. Optional mechanical and pneumatic conveyors.

CONDITION

Loosen material solidified in bulk bags during storage and shipment with BLOCK-BUSTER™ Bulk Bag Conditioners

Opposing hydraulic rams drive contoured conditioning plates to crush and loosen solidified bulk material safely and easily. Bulk bags can be raised, lowered and rotated to allow complete conditioning of the entire bag through the use of automated turntables and scissor lifts, or electric hoist and trolley assemblies. Offered as stand-alone units for loading with forklift or electric hoist and trolley, or integrated with bulk bag dischargers for reduced cost, footprint and loading time.

UNLOAD

Save time, money and space with BULK-OUT™ Multi-Function Bulk Bag Dischargers and Weigh Batching Stations

Condition, de-lump, screen, feed, weigh batch, combine with liquids, and convey as you discharge, with a custom-integrated, performance-guaranteed, dust-free discharger system. Offered as stand-alone units for loading with forklift or electric hoist and trolley, split frames for low headroom areas, economical half frames and mobile frames. All available with mechanical and pneumatic conveyors, flow promotion devices, bag dump access, automated weigh batching packages, and much more.

Stand-alone units to complete, automated systems integrated with mechanical and pneumatic conveyors

flexicon™
.co.za



See the full range of fast-payback equipment at flexicon.co.za: Flexible Screw Conveyors, Tubular Cable Conveyors, Pneumatic Conveying Systems, Bulk Bag Unloaders, Bulk Bag Conditioners, Bulk Bag Fillers, Bag Dump Stations, Drum/Box/Container Tipplers, Weigh Batching and Blending Systems, and Automated Plant-Wide Bulk Handling Systems



SOUTH AFRICA
sales@flexicon.co.za
+27 (0)41 453 1871

USA +1 610 814 2400
UK +44 (0)1227 374710
SPAIN +34 647 670 302
AUSTRALIA +61 (0)7 3879 4180
SINGAPORE +65 6778 9225
CHILE +56 2 2415 1286

