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Castings SA
A specialised journal covering the technology, processors and materials field for castings

Volume 13 Number 2
August 2012

Cover Story
SPECTROMAXx: More economical and flexible

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Castings SA is the official journal of the South African Institute of Foundrymen (SAIF)
The aim of the SAIF is to promote and develop within Southern Africa the science, technology and application of founding for individuals and involved industries.

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- **Junior Member** – R100.00 – must be enrolled as a full schedule student, in an accredited educational institution in the Metals Industry as a trainee, and who has not reached his 23rd birthday.
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- **Website:** www.foundries.org.za

**Contact details for Western Cape:**

- Tel: 021 573 7311; Fax: 021 573 7296; Cell: 072 313 8375

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**EDITOR’S COMMENT**

**Gaining notoriety**

It was interesting to read that among the many basic manufacturing industries in the US, steel foundries are thriving, largely because their products are essential to infrastructure development and heavy equipment production. One of the steel foundries doing well is Bremen Castings Inc (BCI), a 4th generation family owned manufacturer of machined complete gray and ductile iron castings, based in northern Indiana, US.

But, like nearly every foundry doing well in the US these days, BCI’s success is based on more than the business cycle. It’s among dozens (if not hundreds) of metalcasters building its reputation by emphasizing manufacturing capabilities in addition to metalcasting — specifically precision machining. Other foundries have added prototyping, heat treatment, fabricating, and assembly operations to complement their castings production. There’s more to BCI’s success than installing a few CNC machines though. The foundry’s comprehensive strategy has involved efforts in product and process quality control, safety, environmental management, information management, and production data management. Efforts like this make it likely that Bremen Castings will continue to thrive beyond any current boom in basic manufacturing.

Investing in your business, whether it is during the bad or good business cycles is not a new strategy, but how many companies actually do this? It is therefore encouraging to write about the expansion that has taken place at Knights Foundry, in this issue. Although not the same size as BCI the company has invested in equipment, systems and quality control accreditation, which ultimately will lead to a 60 % increase in capacity.

Knights Foundry is not the only foundry in South Africa in recent times to make a sizeable investment in their business and I hope to report on the others in forthcoming issues. Management is proud of what they have accomplished in recent years and happy to inform the industry. And so they should as it is to the benefit of all in South Africa that our industry is investing.

**Second Hand Goods Act**

One of the more informative and interactive technical evenings hosted by the SAIF this year was on the Second Hand Goods Act, presented by Brigadier Bert Van Der Walt of the SAPS. The meeting was well attended by industry personnel, members and metal recyclers.

The Act came into effect on April 30 this year and requires dealers to report suspicious transactions if the seller attempts to provide false particulars, or if the goods are suspected of being stolen or tampered with, ultimately placing greater responsibility on dealers.

The message for foundries is that if they are purchasing ferrous, non-ferrous scrap and raw materials in future, they should do so only from licensed dealers/recyclers. Should they not do this then foundries may be required to be licensed as a dealer/recycler if purchasing outside of the formal supply channels. The bureaucracy and paperwork involved in attaining such a licence will certainly deter many.

The associated penalties, which provide for imprisonment of up to 10 years, are suitably harsh and will be seen as a clear deterrent to those dealers engaged in the selling of stolen goods.

The SAIF will hold further meetings with the SAPS to obtain clarity for the metal casting industry.

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- **Website:** www.foundries.org.za

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High capacity filtration devices
Easily incorporated

The filtration of ferrous metals is an established technology for improving steel and iron casting quality and performance.

Application of filters to large iron and steel castings has until now been complicated and with a risk of filter failure. The HOLLOTEX CFU system has been developed to allow the simple and effective application of a filtration unit to large ferrous castings.

The HOLLOTEX CFU system is a self contained unit incorporating seven STELEX* ZR filters. The system is incorporated into the castings running system.

As the metal enters the HOLLOTEX CFU unit during mould pouring, the metal is directed to ensure rapid and complete priming of all the filters. This ensures ensuring steady and uninterrupted filling of the mould cavity. Centrifugal forces on the metal within the unit reduce the rate of filter blockage providing a high filter capacity before blockage occurs. Castings up to 40 tonne poured weight have been produced using multiple HOLLOTEX CFU units in one mould.

The largest HOLLOTEX CFU unit currently available incorporates seven 200 x 150 mm STELEX ZR filters and has a capacity of between 6 - 12 tonnes on molten iron or steel.
The CCD-based analytical instrument is the most successful Spectro model over the last few years: Approximately 3 500 instruments have been sold since the beginning of 2005. The current generation of the top seller offers many improvements: The most important innovations are an argon saving module that clearly reduces the argon consumption and a new package of methods and adapters for small sample analysis.

The fifth generation is more economical, more flexible and more user-friendly than its predecessor.

**New argon saving module**
Highlight of the current product generation is the new argon saving module that reduces the argon consumption when the instrument is not in use to zero leading to substantial savings. When the spark generator is turned off at the end of the day, the argon saver shuts the flush down to zero. The operator sets the time when the instrument is to be used the next morning. The system then automatically starts up the instrument so that the spark stand and the optical system are optimally supplied with argon on time for the first measurement of the morning. When idle for a longer period of time, e.g., on the weekend or during holidays, the instrument is also completely shut down enabling a proportionally higher savings. The instrument can also be pre-programmed for this type of interruption over several days so that the optic is already flushed and ready to measure punctually when work begins.

**Improved analysis of small parts**
Small sample analysis has also been improved for the SPECTROMAXx. Pre-defined method packages for small pieces of iron, aluminium and copper matrices in the form of screws, pins, wires and sheets are now available. The method packages cover all standard applications in small part analysis. At the same time, SPECTRO offers a new set of adapters for the new SPECTROMAXx, ensuring simple handling of small samples in the laboratory: With the special adapters, small parts and wires can be precisely and securely fixed over the measuring aperture. The adapters accelerate sample throughput in the laboratory and guarantee reliable and reproducible results for measurement series.

**New diagnosis system**
Important from the maintenance standpoint the SPECTROMAXx possesses an integrated diagnosis system, which continuously informs operators and service technicians as to the state of the system and all of its main components. This makes it possible to more quickly rectify malfunctions and favourably complete service calls. The internal components of the SPECTROMAXx have been rearranged for optimal serviceability. It is no longer necessary to remove any blocking components in order to conduct common maintenance processes such as changing filters or replacing the filter cartridge. The UV lens can be externally cleaned and replaced.

In addition to the new arrangement of the hardware, the SPECTROMAXx now uses the “Spark Analyser Vision Software” already proven in the larger SPECTROLAB systems.

**About Spectro:**
Spectro is one of the worldwide leading suppliers of analytical instruments for optical emission and X-ray fluorescence spectrometry. Spectro manufactures advanced instruments, develops the best solutions for strongly varying applications and provides exemplary customer service. Spectro’s products are exemplified by unique technical capabilities that deliver measureable benefits to the customer. From its foundation in 1979 until today, more than 30 000 analytical instruments have been delivered to customers around the world.

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The Scaw Metals Group is a South African company serving international markets.
KEW Foundries casts a positive light on a solid future

Like many other sectors, the South African foundry industry, which also includes the forging and die-casting industry sub-sectors, was severely affected by the recession, with at least 28 foundries closing their doors in this period.

Kimberley-based KEW Foundries, manufacturer of castings and sheave wheels, managed to survive and thrive despite the economic climate. John Bryson, Foundry Director, is optimistic about the outlook for the company and the R18 billion industry, especially in light of recent training and manufacturing initiatives.

"Compared to two years ago, industry prospects are promising, mainly thanks to the growth and anticipated growth in the valve and pump sector," explains Bryson. The drive by the valve cluster, together with the Department of Trade and Industry (DTI), to enforce a minimum of 80% local content in locally produced valves, holds potential. If this proves successful, other manufacturing sectors will possibly follow suit. KEW Foundries is already active in the valves market. Its long-standing, 11-year relationship with Gunric Valves, built on mutual trust and respect, has just seen it complete a R2.3 million order of seven sets of DN2500-1500KMP valve bodies (weighing 5 tons each) and discs (6.5 tons each) within 15 weeks of order receipt.

The pump manufacturing industry represents another key expansion area. Sulzer Pumps has become KEW Foundries’ biggest foundry customer over the last five years, with the parts supplied by KEW being manufactured to the German specification, GGG40-0.7040, similar to South Africa’s SANS 936 Grade SG42. This specification meets the design requirements and is cheaper than the equivalent steel specifications, which require heat treatment. “We have reached a level of product competency where no casting within our 7 ton maximum casting weight capacity is too challenging. New patterns continuously flow to us, and, with the partnerships forged between ourselves, Sulzer and its patternshops, we are now involved at the pattern design stage.”

However, spiralling labour and energy costs remain challenging. “Over the past five years, our labour costs have increased by 50%, whereas Western European labour costs have increased by only 10% over the same period. In addition, electricity price hikes of, on average, 25% per annum since 2008 have eradicated our historic low price energy advantage. Our industrial energy costs are now above those of our major competitors in other countries,” says Bryson. The National Foundry Technology Network (NFTN) is working with stakeholders to find solutions to these pressing matters.

Another area of concern is new environmental legislation, which compels South African foundries to submit short- to medium-term plans to meet the legislation now in place, often at great cost. “It is imperative that any international company who produces all, or part of any import, is subjected to similar legislation, or else we will once again lose out to imports,” stresses Bryson.

Fast-tracking technology, training and co-operation

Although there have been no recent major technological advances in the ferrous foundry industry, the trend is to move away from steel to SG Iron castings in certain fields, as users become more educated on the material. “Its benefits include lower priced castings, reduced machining costs and compatibility to certain steel specifications, as well as design-friendliness. Global advancement in aluminium and aluminium alloy castings also offers great capacity for growth,” says Bryson.

Current government initiatives and engagements from the DTI, NFTN, the Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA)
and foundries are addressing the lack of training advancement in this industry over the past 25 years. Unfortunately, most foundries are too small to play a significant role, but stand to benefit from learnerships and apprenticeships that the larger roleplayers have put in place. These learners and apprentices will find their way to the smaller foundries to enhance their training, or become permanent employees.

“KEW has been involved in the development of these training programmes, and the standard of the moulder, patternmaker and melter material is such that it matches, if not exceeds, any international qualification. The structure of the material also allows for job fragmentation to encourage semi-skilled qualifications and certification.”

KEW Foundries also participates in the Department of Science and Technology’s Technology Assistance Programme (DST-TAP), a technology localisation initiative aimed to help South African foundries improve their technological capabilities and leverage procurement opportunities from state-owned entities. The DST-TAP has opened up communication channels with major technology services providers, such as Mintek, the Council for Scientific and Industrial Research (CSIR) and other counterparts.

“Although there have been teething problems, we have had success with the DST-TAP in modifying the methodology on our solid sheave wheels, where input from Adrian Paine of SimLogic, via the CSIR, was invaluable. However, further developments within the DST-TAP programme are required in order to assist foundries going forward.”

Despite the promising forecasts, industry needs to be mindful of the negative impact that the reduced number of foundries in business could have on service levels and volumes, which could lead to an increase in imports.

KEW Foundries was established in 1891 and is Africa’s sole manufacturer of cast headgear sheave wheels. The company also offers an extensive range of hand-moulded castings in Grey and SG Iron up to 7 ton in weight, pressings and Cameron compressed air sludge pumps. Supported by comprehensive design and drafting facilities, including a dedicated pattern shop, machine shop and laboratory, KEW Foundries serves a host of South African and international mining and industrial markets.

For more information contact John Bryson, Foundry Director, KEW Foundries on TEL: 053 841 0474

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When you visited the company just under two years ago we were already in the advance stages of planning for this new expansion. At that stage we were going to rent a 1 400m² factory next door, which we thought met all our requirements including the electricity supply which was in place on site. However we soon realised that we needed more space and fortunately another factory within the same complex and adjoining our existing facility became available," explained elder brother Vincent van der Walt.

“The only downside was that we had to invest in a new 1 200 amp substation but the new foundry is housed under 1 600m² of roof and alongside we have 600m² under roof which has now become our dedicated fettling bay,” continued Vincent.

“At the heart of the new foundry is a one and half ton furnace which was supplied by local furnace manufacturer Solid State Induction Furnaces. The furnace is equipped with a new generation cooling tower that allows us to run on a closed circuit cooling system, and it has a gauge incorporated to monitor the water temperature and give early warning for pipes overheating."

“This is complimented with a new no-bake moulding system that is fed with a 10 ton an hour continuous mixer. We have also installed 2 x 2 metre, 10 ton an hour shakeout as well as a 10 ton an hour reclamation plant and cooler classifier. All this equipment has been manufactured and installed by Endeco. They have supplied the two 60 ton silos as well. One is used for new sand the other for the reclaimed sand.”

“Knights Foundry has recently commissioned a second foundry. Equipment installed includes a 2 x 2 metre, 10 ton an hour shakeout as well as a 10 ton an hour reclamation plant and cooler classifier, manufactured and supplied by Endeco.

A new no-bake moulding system is fed with a 10 ton an hour continuous mixer, manufactured by Endeco.

The 1 x 1 metre gassing station that has been supplied was manufactured by RC Systems. The unit has been fitted with a pre-heater to maximize the productivity. In fact throughout the new foundry and the existing one we have made sweeping changes to automate and maximize our productivity.”

“The relatively large fettling bay is not quite finished yet and the main attraction, the hanger type shot blasting machine, which is being installed by Shotblast Equipment, will only be commissioned in July. The machine is one of the biggest the company has ever manufactured and weighs in at a hefty 18 tons, has a height of 6.5 metres and can accommodate castings up to two metres in diameter.”

“With these large dimensions we have had to engineer specially designed foundations and construct them lower than ground level to accommodate the height. This brought other challenges such as the water table and existing piping that are not on the plans, but we have found solutions.”

One kilometre of roller track
“We have not had the roller tracks in the foundry manufactured new. These were purchased from an auction held for a foundry that closed recently. Each roller has half-a-ton loading capacity and each unit, of which there are plenty, has a five ton load capacity. In total there is over one kilometre of these roller tracks and even after all our requirements in the new facility have been taken care of,
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- Insulating Bricks
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Contact the company closest to you.
we still have enough remaining to possibly start another two foundries. The track did not come with corner units but we are busy manufacturing those ourselves.”

Other changes
“Since your last visit we have made some significant changes to the whole company. In consultation with our clients we have been able to implement a lean, just-in-time system as well as install a software programme to suit our needs. Using batch numbers the programme gives us complete traceability on all castings manufactured. Linked to it is a costing and invoicing module which naturally gives you all sorts of benefits.”

“Plus we have re-arranged the existing foundry to isolate the stainless steel melting and casting. So in essence we have two foundries operating in one, in this section. The common element between them is the fettling bay.”

“This section has been equipped with a 10 ton an hour continuous mixer manufactured by Endeco and a gassing unit manufactured by Lauds Foundry Equipment that can accommodate boxes up to 1.8 metres.”

“Another significant change was that we converted completely to a no bake/alkaline phenolic moulding system and have eliminated any CO2 moulding.”

“We have also installed a 2.4 x 2.4 metre, two pallet top-hat heat treatment unit.”

The company is in the process of implementing ISO 9001, OHSAS 18001 and ISO 14001 with the audit due to take place in August 2012.

Capacity
The new foundry, which was only commissioned in July, is currently casting mainly high chrome but will cast other metals in future. It has increased the capacity by 60 %, which will put the company in the 300 ton a month category. Of this they are casting between 25 to 30 ton a month in stainless steel.

Family business
The family involvement in Knights Foundry includes the younger generation of Vincent, brother Cobus, sister Belinda and brother-in-law Louis. Father Johann, who was one of three brothers who started the company, is still very much involved with the company and wife and mother Letitia has been mainstay of the admin side of the business since the beginning.

The company currently has 85 staff.

For further details contact Knights Foundry on
TEL: 011 827 2517

Knights Foundry has recently installed a 2.4 x 2.4 metre, two pallet top-hat heat treatment unit.

The relatively large fettling bay is not quite finished yet and the main attraction, the hanger type shot blasting machine is being installed by Shotblast Equipment.
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A revolutionary heat transfer technology that can be used to replace your
traditional burner, achieves energy consumption savings of up to 80% and, a reduction in
processing times by an average of 60% (and more) while solving emissions, according to
Sovereign-Tec the marketing company distributing the technology globally.

Sovereign Steel Heat Treatment, a division of the
Sovereign Steel Group, has been proactive in saving
costs on better energy usage and thus increasing the
bottom line substantially.

A year ago the company installed the TKE system on its
existing top hat furnace that was fixed with 11 traditional
burners, weighing 11 tons, and utilised a 55KV blower motor.
Post-installation the top hat furnace requires only one TKE
system unit, now weighs eight tons, and requires only an
11 KV blower motor.

“The TKE kinetic energy technology has been developed
over the last 12 years and is now recognised internationally
and has ABB Sweden TUS (Temperature Uniformity Survey)
certification and is approved in GEC Alstom ISO manuals with
TUV Zero Delta T certification, as well as complying with
ISO and EU standards (EN161, EN1854, EN331, EU125),”
said Anthony Nathan, Chairman of Sovereign Universe.

“We are now also in the process of having Eskom’s
Technology development unit verify TKE for boilers and the
power generation sector specifically. This certificate will verify
our claims relating to the heat transfer properties and energy
efficiency of TKE kinetic energy technology versus its
traditionally less effective radiant heater options. Plus we’ll
be having our carbon emissions reduction effect certified.
Eskom is globally renowned for its technical credibility and
this we expect will open up the power generation market
substantially around the world,” continued Anthony.

Sovereign-Tec – international distributors

“So impressed were we with the technology and the
results that we achieved that we entered into an agreement
with the developers to distribute the TKE System and
technology worldwide,” continued Anthony.

A global network of partners has now been created, each
serving specific territories and industry sectors.

“The product is now manufactured in Dubai, UAE and then
shipped to all countries from there.”

Development of the TKE system

Developed in Europe while working on incineration projects
by Carl Morsner of Gastrim International, the holding company
for its patents and IP, the TKE system replaces the conventional
gas burner which in turn changes the heat transfer of the
thermal process from radiant to kinetic. Implementation of this
technology enables companies to achieve energy consumption
savings of up to 80% and, a reduction in processing times by
an average of 60% while largely solving emissions.

The TKE system has been installed at Major Steel producers
in Europe such as Alfa Acciai, but the applications are not
limited to the steel processing, reheating, heat treatment,
forging, extrusion of non ferrous metals and metal recycling
industries. They are numerous and include every application
and industry where boilers, furnaces, kilns, incinerators and
pre-heating and refractory heating is required.

New rules to support realising the full potential of the
new technology

It is not a burner, it is not radiation, it is not convection and
it is not conduction. It is kinetic energy and follows more closely
the kinetic theory and laws. Due to proprietary knowledge the
formula describing the process as a whole is not available.

The underlying concept is that the combustion process
generates energy in the form of molecular velocity and the
latent energy can be harvested through kinetic energy as the
transfer medium to create more energy.

Areas like production planning, batch processing, material
scheduling, material processing, setup time, ramp up time,
operating algorithms, standby, safety, emission control, shift
change etc are all positively influenced by the installation of
TKE. These parameters will require a critical review of the old
rules and policies to ensure the necessary changes are made
to accommodate the new technology.

The use of directly fired combustors for heating purposes
at temperatures up to 1 350°C is common in the industry.
The heat loss experienced by conventional directly fired
combustors is directly proportional to their operating
temperatures. The result found in a high temperature
application is a substantial loss of heat, which in turn results
in a dramatic increase in fuel consumption. The assumption
has been that there was no alternative to this process in the
production of quality products.

The ideal solution would be to lower the process
temperature and increase the effective heat transfer to the
intended work piece to ensure a quality product. The running
of combustors at lower temperatures with an increase in
efficiencies logically will have the added benefit of reducing
the release of greenhouse gases and urban nitro-oxides.

The Thermal Kinetic Energizer system is the innovation that
allows the use of lower operating temperatures while at the same
time increasing the efficiency of heat transfer, reducing emissions,
producing a better product quality, reducing gas usage and
dramatically lowering overall operating costs of production.
The main power of the new technology
Not to discount the enormous contribution that direct-fired forced-draft burners have had on the world however, the main power of the new technology is a quantum leap in heat transfer, penetration and a reduction in the amount of time that is typically accepted as a proper heat cycle.

Relative to the best conventional combustors, the new technology reduces the heat cycle by more than 60%. In addition to this it also reduces heat losses and emission levels that are inherent with conventional combustors. The reduction in fuel consumption for an equivalent load or charge is up to 80% and carbon emission levels are reduced by up to 80%.

Capital savings
In addition to these savings the TKE System also realises substantial capital savings. After a retrofit the capacity of heat transfer equipment (kiln, furnace, boiler, incinerator etc ) increases by as much as 300%. The TKE system will not only reduce the capital requirement but also reduce the required space. Uniform heating of the work piece is accomplished with a single TKE which could have required 20 conventional burners in the past.

Quality
The list of benefits is substantial and can be categorised into many different categories. However foremost in the minds of most manufacturers is quality. Here the TKE system reduces scale formation by up to 90%, has no flame impingement, improves temperature gradient (near zero delta T) and eliminates thermal stresses.

Limitation(s) that the new technology overcomes
The new technology is a Thermal Kinetic Energizer system creating molecular speeds of 220m/s without creating any heat transfer through radiation. The new technology overcomes and reduces thermal resistance inherent in conventional radiant based heat transfer. From a systems perspective the new technology operates along the path of least resistance. From the combustion of the fuel (gas) until the load, work piece or charge is heated to the required temperature the path of least thermal resistance is travelled. This exchange in energy and the immediate transfer of that energy to the work piece or charge results in core temperature increases exhibited upon the very start of a cycle.

The Thermal Kinetic Energizer system has limitations of its own. Although the limitations are not restrictive in terms of its useful application it is still worth mentioning.

The limitations include:
- Not suitable for systems operating on negative atmospheric pressure (however in many cases this can be modified for TKE system)
- Not suitable for radiant tube applications

AISTech Conference
Fedmet, the TKE marketing partners in North America presented a paper on the TKE technology in May at The US Association for Iron & Steel Technology conference, which was held in Atlanta, USA and is now being presenting around the world at different industry conferences.

For further details in South Africa contact Warren Diamond of Sovereign-Tec on 082 579 5085
Metal industry wage increases finalised

The Steel and Engineering Industries’ Federation of South Africa (SEIFSA), acting in accordance with the three-year wage deal negotiated with the industry trade unions last year, announced that the industry’s annual wage increases effective from 1 July had been finalised in accordance with the wage model agreed with the trade unions in 2011. The increases range from 7% to 8% for industry workers.

Importantly, there are no further changes to any other employment conditions for the 2012/13 year.

SEIFSA’s executive director, David Carson, in acknowledging the financial plight of certain companies in the industry, stated: “Of course, in an industry as diverse as ours, there will always be those companies which are facing financial pressure and will not be able to implement these increases. Their plight has not been ignored by SEIFSA and an important component of last year’s wage deal was the acceptance by the trade unions of the continuation of the industry’s long-standing and effective wage exemption procedure. These companies are able to apply to the bargaining council to pay lesser wage increases than that agreed, according to their particular financial circumstances”.

He added: “The wage exemption process has proved to be most successful in providing effective and appropriate relief to qualifying companies over a number of years now, and we believe it will continue to do so again this year.”

The agreed increases for all grades and sectors have been calculated by reference to the following wage model:

• Rate A: 7% and Rate H: 8%
• However, if the CPI (April figure published in May) is 8% or above then the actual wage adjustment will be based on CPI (April figure published in May) plus 2% respectively.
• Because the CPI figure for April 2012 was 6.1%, the agreed minimum increases of 7% to 8% for Rates A to H have been applied.

South African Metal Casting Conference 2013

The Metal Casting Technology Station at the University of Johannesburg with the South African Institute of Foundrymen and the National Foundry Technology Network proudly announce the South African Metal Casting Conference in South Africa. This prestigious event is the first of its kind and aims to attract expertise in the field of foundry and metal casting from across the world.

The South African Metal Casting Conference 2013 is scheduled for 13-16 March 2013 with the third Industry Think Tank being hosted on the 13th of March 2013. The theme of the two-day conference is Technology and Practice for Increased Competitiveness and will be hosted at the Kwa Maritane Bush Lodge in Pilanesberg.

The conference serves as a platform for industry delegates, researchers and academics to share, engage and network on the state of technology and competitiveness of the metal casting industry. The participation of undergraduate and postgraduate students is most welcome and encouraged.

Conference programme committee

The programme committee is chaired by Dr Shepherd Bhero from the Department of Metallurgy, University of Johannesburg. Members of the committee include Hannelie Nel, Faculty of Engineering and the Built Environment, UJ, Didier Nyembwe, Head of Department of Metallurgy, UJ, Professor Antoine Mulaba, Head of School: Chemical Engineering, Mining and Metallurgy, John Davies, CEO of the South African Institute of Foundrymen, Dr Xiaowei Pan, Senior Lecturer Department of Metallurgy, UJ, Lucky Juganan, Senior Lecturer Department of Metallurgy.

Both the Industry Think Tank and the conference will carry CPD points for the Engineering Council of South Africa (ECSA).

For more information on the conference visit the website at www.metalcastingconference.co.za

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EXPERIENCED, RELIABLE, PROFESSIONAL
Competition Tribunal approves Petmin’s SamQuarz sale

The Competition Tribunal announced recently that it had approved Petmin’s R259 million sale of the SamQuarz silica mine, near Delmas, in Mpumalanga, to Thaba Chueu Mining.

In January, the Commission said it would not authorise the sale of SamQuarz owing to its strategic importance as a supplier to the producers of ferrosilicon and silicon metal in South Africa, sparking an appeal to the Competition Tribunal by Petmin and Thaba Chueu Mining against the decision.

“With the Competition Tribunal’s approval received today, all conditions for the sale of SamQuarz have been met,” said Petmin director Bradley Doig.

Petmin received the Department of Mineral Resources’ approval last month. Petmin would receive an average net return of 45% after tax year-on-year for the mine, after initially acquiring it for R85 million six years ago.

The proceeds from the sale would fund Petmin’s organic growth and current projects aligned to its focus on commodities in the steel value chain required for urbanisation and infrastructure development.

SamQuarz is South Africa’s largest producer of high-quality silica and has a yearly output of 1.1-million tons of the annual 2,5 million tons of silica produced in South Africa and a life-of-mine in excess of 40 years.

Thaba Chueu is controlled by Silicon Smelters.
Three Port Elizabeth-based businessmen have “broken new ground” by becoming the first wholly black-owned company to operate a steel melting facility in the Eastern Cape, according to Ayanda Vilakazi, marketing and communications manager at Coega.

In “the first partnership of its kind in South Africa”, the businessmen have partnered with one of India’s biggest steel manufacturers to set up AGNI Steel SA, Vilakazi said.

The company is in the process of building a R400 million steel plant in Zone six of the Coega Industrial Development Zone. “The plant is set to have a positive impact on the Nelson Mandela Bay and the Eastern Cape as a whole, as 800 jobs will be created once the plant is fully operational and all phases have been completed.”

It would also have downstream benefits for the local industry, Vilakazi said.

The South African arm of AGNI Steel was started by brothers Hassan and Sharaz Khan and partner Dhiroshan Moodley, who decided to explore untapped opportunities in the metal industries in South Africa and India.

AGNI Steel also identified the need for a local steel producer in light of the amount of scrap which was being shipped out of SA for processing before being brought back into the country.

The project is a joint venture between AGNI Steel and a local Nelson Mandela Bay BEE consortium, with the Industrial Development Corporation having a 10% stake and a further 10% being reserved for a workers’ trust.

The project will be implemented in three phases over a five-year period and the plant will be operational within nine months to a year, with the steel billets produced being exported to India and other African countries during the first phase of the project.

Once all three phases are completed, AGNI Steels SA will use modern drilling mill technology to convert the steel billets produced into reinforced steel for local consumption and exports into Africa.

AGNI Steel is one of the leading secondary steel manufacturers in the South of India and has built a reputation for the quality of their steel products under the brand “AGNI TMT” in that region.

The company has been operating for the past 20 years in the steel industry and was the first secondary steel manufacturer of mild steel billets in India to receive ISO certification.

The plant at Coega will use 10 000 tons of scrap metal every month during the first phase and this would double to 20 000 tons in the second phase.

“Instead of the scrap metal being exported it will be locally beneficiated thereby adding value to locally available resources that are simply exported currently.”

“In addition, new technology will be brought to South Africa which will further job creation and skills transfer to local South Africans,” Vilakazi said.

Programmes that involve local employees being taken to India for training prior to commissioning are being investigated.

AGNI Steel SA will be the first mini steel-melting unit to be commissioned in the industrial history of the Eastern Cape and will be the first project in the metals cluster planned for Zone six.

Next year’s Automechanika Johannesburg exhibition is set to be the biggest yet

The launch of Automechanika Johannesburg — previously known as Automechanika SA — which took place at an auspicious occasion in Gauteng, had a good showing as scores of people from exhibitors, and the media at large, were in attendance.

The actual show, which is scheduled for May 8 to 11 next year, at the Nasrec Expo Centre, showed a great deal of interest with the CEO of the Retail Motor Industry (RMI), Jeff Osborne, having committed at the launch to be part of the forthcoming show. It will be the third instalment since the initial one was staged in 2009 and is earmarked to draw similar if not a bigger turn out of both exhibitors and show patrons alike. In 2010 alone, the number of exhibitors was up 32% to 547 companies, while there was a 10% increase in show visitors, rising to 9036 in 2011.

“This is the third year that Dogan Trading SA will be organisers this major automotive event in partnership with Messe Frankfurt, Germany, which is one of the largest exhibition staging companies in the world,” says show director Philip Otto.

“I believe our show has matured since the first one was held in 2009 and can proudly take its place alongside the established shows that make up this famous global brand.”

Otto also mentioned that the volatile economic conditions in many parts of the world, particularly Europe, has proved favourable for the automotive after market industry as most individuals now “hang-on” to their vehicles a little while longer than previously was the case, which more often than not meant maintenance and repairs were required.

Also speaking at the press conference, was JP Landman, a well renowned political economist who among other things, highlighted that there are many factors suppressing the local economy’s growth rate ranging from the global economic environment, political confusion, strikes, inequality, crime, health and education concerns, some ineffective public sector institutions — especially local government — and tensions in the agricultural and mining sectors concerning transition.

He went on to say that other forces at work included increasing investments in infrastructure development, which has moved from 4% of GDP in 2000 to a projected 7.9% in the current cycle to 2014.

Next year’s event is said to replicate its international counterparts by dividing the show into six categories: parts and systems, accessories and tuning, repairs and maintenance, IT and management, service stations and carwash and safari and off-road.

With technicians and service specialists being few and far between, next year’s show, much like last year’s event that saw Bosch take on a handful of apprentices through a scholarship type training programme with the light of permanent employment at the end, will see a similar programme being undertaken on a much bigger scale.

“Already we are in discussions with the MerSETA as well as other organisations to ensure this aspect of Automechanika Johannesburg 2013 plays an even more important role in the vital areas of employment creation and skills upliftment,” said Otto.
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These include master alloys and alloys, fluxes, coatings, insulation materials (boards, blankets, wool, cloth, bricks and other textiles), filters, inoculants and nodulisers, hollowware, tin, mercury, linings, ceramic pre-cast shapes, crucibles, slide gate systems, filtration and degasser systems, furnaces, core shooting machines, moulding plants and systems, metal treatment and automation systems.

Our international affiliation includes:

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- Selec Corporation: filters for metal filtration
- HOESCH: grain refiners, master alloy’s
- Schaefer: non-ferrous die coats, fluxes
- Strike: aluminium furnaces
- Foundry Automation: core shooting machines
- IVF: turnkey moulding plants and systems
- Mammut: crucibles
- Progelta: molten metal treatment and automation systems for grey and ductile iron foundries
- Kennecott: FeMo
- Elkem: inoculants and nodulisers
- Ceralcast: local ceramic production facility
- CEDIE: cored wire
- RATH: refractory materials

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SAIF’s 49th Annual Awards Dinner

The South African Institute of Foundrymens’ 49th Annual Awards Dinner was held at the Emperors Palace, Convention Centre, Kempton Park, Gauteng on Friday 25 May 2012.

Nearly 300 foundrymen, guests, wives and award winners attended this year’s event. The guest speaker and master of ceremonies for the evening was comedian Dave Levinshon.

The dinner was well supported by sponsors in the form of prizes for the award winners, spot prizes for attendees, wine on the tables and ticket sponsors for VIP guests invited by the institute.

The SAIF would like to thank the following sponsors for their valuable contributions:

- Insimbi Refractory and Alloy Supplies
- Sasol Synfuels Procurement and Marketing
- Mineral-Loy, Foseco South Africa
- Lil Sales
- J & D Castings
- SI Group
- Lauds Foundry Equipment
- Morgan Thermal Ceramics

Awards handed out on the evening were as follows:

- **Past President:** Luis Dias
- **Non Member Diploma:** Geordie Osler for the best technical presentation presented during 2011 by a non-member to the institute. He presented a paper on “Silicon Carbide in the Metal Industry”

- **Honorary Member:** Peter Forbes
- **Sasol Synfuels Procurement and Marketing/Insimbi Alloy Supplies Award:** For the highest marks achieved by a 1st year metallurgy student: This year there were two students that tied for this award. They were Martin Moeng from VUT and Sibonelo Makama from TUT

- **Foseco Award:** For the best final year metallurgy students: Tebogo Nkwe from UJ

- **Colin Butler Award:** For the best technical presentation presented in 2011 by a SAIF member went to John Bryson for his “Overview of GIFA 2011 visit”

- **SAIF Life Member:** George Laurens

- **A H Guy Award:** For outstanding service to the industry: David Mertens

The following Career Path Framework learners received their MerSETA certificates in recognition of the completion for NQF Level 2:

- Michelle Pillay, Tersias Foster, Jason Stevens, Brandon Capiama, Vincent Pieterse, Francois Swartz, Olebogeng Marekwa, Simphiwe Sodela, Thokozani Mbele, Feafe Prince Totetsi and Tumelo Pheto.
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The field transmitter can be mounted directly onto the probe thus:
- Saving panel costs

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John Davies with Coenie de Jager of Autocast, who accepted the A H Guy Award on behalf of David Mertens

Mukesh Chauhan of Technology & Alliance Modtech India, Rajesh Patel of Krishna Techrevol Pvt. Ltd, Ian Gibson of RELYIntracast and Apurva Oza of Technology & Alliance Modtech India

Life membership was awarded to George Laurens

Freddie Hersleman from the DTI and Mark Krieg from AFSA

Jaimie Goncalves and John Bryson, both from Kimberley Engineering Works with Linda and Rocky Bernardes of B & K Foundry

Daniel and Joshua van Flymen from Lil Sales

Sulze and Johnny Britz from J & D Castings
Since 1940, the Industrial Development Corporation, South Africa’s largest development finance institution, has helped to build the industrial capacity that fuels the country’s economic growth, by funding viable businesses.

As the government’s key partner in revitalising the economy, the IDC focuses on priority economic sectors that offer the greatest potential to unlock job opportunities.

**Our vision**
To be the primary driving force of commercially sustainable industrial development and innovation to the benefit of South Africa and the rest of the African continent.

**Our mission**
The Industrial Development Corporation is a national development institution whose primary objectives are to contribute to the generation of balanced, sustainable economic growth in Africa and to the economic empowerment of the South African population, thereby promoting the economic prosperity of all citizens. The IDC achieves this by promoting entrepreneurship through the building of competitive industries and enterprises based on sound business principles.

**What we offer you**
The IDC assists start-up and existing businesses with a minimum funding requirement of R1 million and a maximum of R1 billion. Funding is offered across its mandated sectors under the following Strategic Business Units:
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- Information and Communication Technology
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- Metal, Transport and Machinery Products
- Mining and Minerals Beneficiation
- Strategic High Impact Projects and Logistics
- Textiles and Clothing
- Tourism
- Venture Capital

Special *funding schemes* are available that address transformation and entrepreneurial development (TED); topping up equity contributions from entrepreneurs (TES & RCF); and sector-specific schemes (horticulture, forestry, clothing and textiles, hospitality). The IDC Gro-e-Scheme provides funding for projects from R1 million to R1 billion at prime less 3% for up to five years.

The IDC’s business support programme addresses non-financial support to entrepreneurs. Assistance is provided with capacity building to improve project viability.

If you have a project that can contribute to building South Africa’s industrial capacity and creating jobs, visit [www.idc.co.za](http://www.idc.co.za) to find out how the IDC can help build your opportunity.
Robert Hallaby of Aluminium Copper Processors, Graham Hardisty and Gary Coull, both of Zealous Pressure Castings, Percy Jacobs of Henkel, Paul Cook of Zealous Pressure Castings and Jacque Smith of Henkel. In the background are Antoinette and Craig Irvine.

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The Applied Solutions team from left to right: Ronell and Dennis Baker, Johan and Maggie de Beer, Clare Hennion and Jaco Visser. In the background are Antoinette and Craig Irvine.

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Geordie Osler of Sublime Industries was awarded the Non-members diploma.

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Back row left to right: Trudy and Nigel Pardoe of Thomas Foundry, Hennie and Helen Coetzee, Ryno van Rooyen and Sue Ann van der List. Front row: Peter and Susan Bird of Durrans RMS and Pauline and Dave Downing of ZF Autocast.

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Michael Hill and Fubio Ciani, both from Procor, Cobus van der Walt of Knights Foundry, Derick Elliot of Procor and Stefan Strydom of Wanderers Engineering

Seated left to right: Pieter Schutte and Jacques Swanepeel, both from Insimbi Refractory and Alloy Supplies with Charles Lloyd and Richard Lewis, both from Thermitrex.

Standing left to right: Dudley de Beer of Insimbi, Peter Rees of Sasol Synfuels, Colin Botha of Insimbi, Johan Jonker and Riaan Klopper, both from Sasol Synfuels and Stefan Roberts of Insimbi

Mike Kleinhans of Almacast Foundry, Rob van Niekerk of R.C. Systems, Willie Very and Peter Grimes both of Almacast Foundry, Brian Clough of Ceramic and Alloy Specialists, Darren Brown of Lenreco and Byron van Niekerk of R.C. Systems

The Sasol Synfuels Procurement and Marketing/Insimbi Alloy Supplies Award for the highest marks achieved by a 1st year metallurgy student went to joint winners this year. Peter Mendonides from VUT on the left who accepted the award on behalf of Martin Moeng and the other winner was Sibonelo Makama from TUT. In the middle is Johan Jonker of Sasol Synfuels Procurement and Marketing

Career Path Framework learners received their MerSETA certificates in recognition of completion of NQF Level 2
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Thomas Foundry builds for the future

Two moulding apprentices added to the company’s training program.

The versatility of metal casting is demonstrated by the number of casting and moulding processes currently available. This range of choices offers design engineers and component users flexibility in their metalforming needs. Each process offers advantages when matched with the proper alloy and application.

However, in order to compete, a company must have the necessary skilled employees to take advantage of the many technological tools that are available, as well as the basic foundry practices such as moulding, melting and patternmaking.

With the shortage of trained foundry personnel in our industry, a skills-gap has developed resulting in qualified personnel becoming targets for poaching.

“One of Thomas Foundry’s core values is the growth and development of our employees. It is an old cliché but the best investment you can make is the training and up-skilling of your employees. Just over 10 years ago, Thomas Foundry started a training programme for metallurgical engineering students in our laboratory. Each year we take on two students from UJ to complete their practical experience. This year we have increased the intake to seven students, four of whom are part of the MINTEK programme, to help alleviate the shortage of trained personnel in the industry,” explained Nigel Pardoe, Moulding Manager at Thomas Foundry.

“Whereas the training programme in our laboratory is well established and has seen nearly 20 students passing through the ranks, our staff turnover throughout the rest of the company has historically been very low. Over the past few months we have noted a definite increase in the number of our skilled moulders that are been headhunted to join other foundries. Most of our peers within the industry don’t need to poach our staff as they have their own in-house training programmes, but it is becoming increasingly clear that there are a handful of foundries who seem to believe that they are entitled to a free ride and can simply recruit from outside. This is frustrating but it’s a phenomenon that is not unique to our industry, or our company,” continued Pardoe.

“With this in mind we have decided to look for new recruits and embark on a moulder apprenticeship programme, with the hope that these newcomers, once qualified, will stay loyal to the company long enough until the next set of apprentices qualify.”

“Initially we are concentrating on my department, which is moulding, but there are plans to extend the initiative to the other departments.”

“The first two apprentices joined us in May and they were selected from an overwhelming response to our advertisement. What shocked me was the number of applicants, especially those in their early 20’s, that had never been for an interview before.”

“The minimum criteria was a matric qualification with mathematics and science as subjects. This response has now given us a pool of names that we are drawing on to fill other positions within the company, and those that show initiative will certainly be considered for the apprenticeship programme.”

“Future foundry operations and metalcasting technology will require a workforce that is more skilled. Today’s foundry industry realises that there is a skills-gap currently, and that this gap is growing. Education and training are required to fill this. In addition, the workforce is changing and so are company requirements. This includes the concepts of having employees that are capable of completing multiple assignments within a metalcasting operation, while at the same time having selected employees that also are specialised in a specific area of expertise.”

“Adapting to the changes in the workforce will allow the education and training programmes to succeed.”

Capabilities
Thomas Foundry produces a large variety of high integrity ferrous castings in various grades of carbon, alloy, manganese and stainless steels and on the iron side: grey, ductile and chrome irons. The company produces castings ranging from 20 Kg up to 18 tons net weight in steel and up to 20 tons net weight in iron. Products are supplied as cast, proof machined or finished machined configurations.

Manufacturing facilities include an air set resin sand foundry for jobbing and short runs and a green sand foundry for production runs. The foundry is well equipped to perform the ancillary functions of patternmaking, melting, fettling, welding, heat treatment, chemical analysis, mechanical and non destructive testing.

Thomas Foundry’s customer base comprises both original equipment suppliers and end users in the following industries: mining and general engineering sector, power generation, automotive/railway components, smelting, chemical and petro-chemical, brick manufacturing, cement production, paper and pulp processing and sugar refining.

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R100 million allocated to three-year titanium development programme

Government has allocated R100 million over a three year period to the development of a titanium industry in South Africa.

This money, flowing from the Department of Science and Technology (DST), will be made available to the CSIR’s Titanium Centre of Competence (TiCoC), says CSIR materials science and manufacturing light metals manager Dr Willie du Preez.

South Africa has the world’s second-largest titanium-bearing resources in the world, after Australia, but it does not produce any metal. TiCoC was founded by the DST to remedy this situation.

Of the R100 million in allocated funding, R29 million will be spent on the construction of a pilot plant to produce titanium powder at a rate of 2 kg/h by the second quarter of next year.

“We recently received the go-ahead and the funding for the plant,” notes CSIR materials science and manufacturing light metals research group leader Dr David van Vuuren. “We are in the detailed design phase of the plant now.

“Our primary activities all centre around efforts to make powder from the titanium-bearing mineral.” Producing titanium powder is a vital building block in establishing a titanium industry.

The current process used worldwide to create titanium metal uses a number of expensive steps to produce the metal. For example, midway through the process it makes a titanium sponge that is porous, and still in need of vacuum arc refining before it can become a useable material.

However, the CSIR’s method delivers a titanium metal powder that can be sintered together to directly produce mill products, such as tubes, sheets or bars. From here, strong, lightweight parts are made, such as for the automotive, medical or aerospace industries.

“We follow a new, shorter route to a solid, usable metal,” says Du Preez. “We also want to make it cheaper for the end-user,”” adds Van Vuuren. “We can save an estimated 25% in costs by using powder to go directly to mill products.”

The CSIR is in a race with a number of countries, including the US and Australia, to create a simpler, smarter, cheaper way to produce titanium metal than the currently more-than-50-year-old process.

Construction of the CSIR’s pilot plant is to be followed by a semi-commercial test facility producing 500 ton of titanium powder a year. Such a facility would represent the first step in the industrialisation of the new process and will include the involvement of commercial partners. This is to be followed by a full-scale commercial plant with a production capacity of 20 000 t/y. Starting the feasibility studies on this project is planned for 2018.

A vital part of the centre’s work is to create local capacity and demand within the local manufacturing industry for the CSIR’s technology by 2020, notes Du Preez.

“We need companies to be ready to use the powder produced by these plants as the process unfolds.”

Foundry help required for investment casting

Other building blocks required in the DST’s research and development-led titanium industrialisation programme include the ability to create investment castings, as well as to machine titanium castings, and to form and forge titanium.

The centre has already made headway in terms of investment casting, and is currently exploring routes for commercialisation.

Also known as lost-wax casting, investment casting is an industrial process used to create metal parts with great detail that are difficult to achieve with other casting methods. Investment casting uses a pattern that is destroyed as part of the process, thus making an investment in the finished product.

The mould cost for investment casting is considered to be minimal, compared with other forms of permanent mould casting or die-casting.

However, casting titanium is not as easy as it sounds, as titanium reacts with oxygen and most ceramic oxides, warns Du Preez.

“Only a few players can cast titanium on a commercial scale, and nobody shares their technology to do so.”

To cast titanium, one needs to create a mould that does not react with the metal, and the metal must be melted and cast in a vacuum. Also, despite doing all of this, there remains an oxygen-rich layer of oxygen that needs to be removed from the casting – all of which the CSIR have now achieved.

“We are working towards building a demonstration plant for this casting process,” notes Du Preez. “We are hoping a local foundry can work with us on executing this project.”

For further details contact Willie du Preez of the CSIR on TEL: 012 841 4955.
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South Africa gets unique laser system able to build 3D objects out of metal powder

A state-of-the-art laser machine capable of building complex three dimensional objects out of fine metal powder – microscopic layer by layer – was unveiled at Stellenbosch University (SU) on 25 May 2012.

Known as the M2 LaserCusing System, the machine has been imported from Germany at a cost of R5 million, funded by the Technology Innovation Agency (TIA). The only one of its kind in the country, the system has been installed at the Institute of Advanced Tooling (IAT), hosted within the Rapid Product Development Laboratory in SU’s Department of Industrial Engineering.

The IAT is an initiative of the Department of Science and Technology, implemented through the TIA. It has branches at Stellenbosch University, Tshwane University of Technology and the Walter Sisulu University. The TIA stimulates technological innovation in South Africa.

The M2 LaserCusing System’s primary application is the production of complex tooling inserts for metal moulds used in various industries. Moulds are routinely employed to manufacture products made from a variety of substances, such as plastic, glass and metal.

In addition, the machine can also be used to manufacture advanced metal components for utilisation in the aerospace, automotive, medical and dental industries. This wide range of applications facilitates synergies between numerous research, development and industrial projects.

“This machine can produce components that cannot be made in any other way. It allows for complete design freedom. Whatever can be imagined, can be built with this system,” Prof Dimitri Dimitrov, Head of the Rapid Product Development Laboratory at SU, said. He also acts as mentor at the IAT.

One of the machine’s major advantages is that it can process a wide variety of metals, such as aluminium, stainless steel, various hot-work tooling steels, titanium, cobalt-chrome and nickel-based alloys.
Dimitrov pointed out that although the machine can build 3D metal objects, it should not be confused with 3D printing. “This system also uses an additive process, but it is not the same as 3D printing. In printing, a substance is laid down layer by layer, and an object is built up by using binder liquid jetted by a printing head. With this machine, metal powder is fused by laser. It is basically selective melting and micro-welding by laser.”

The system was developed and made by Hoffman Innovation Group AG, a leading German tooling producer. The term LaserCusing is made up of the letter “C” from “Concept Laser” and the word “Fusing” for “complete melting”. The manufacturers describe the system as “the technology of the future”.

The metal powder used in the system consists of extremely fine granules of 20-40 microns each. The laser fuses them at temperatures of above 1 000° C. And it does so in very thin layers of 20-30 microns each.

The system will be used for advanced research purposes by post-graduate students at SU and IAT tooling engineers. In addition, the system will service the tooling industry, which will help create employment opportunities and stimulate economic growth. The system can provide a productivity improvement for various moulding and casting processes of about 30% through cycle time reduction.

“The SSME sector now has access to an advanced manufacturing capability for the production of complex tooling inserts and other objects. Before, they would have had to go overseas; now they can do it right here. Local industry has already shown significant interest in this advanced technology,” Prof Dimitrov said.

The funding application to the TIA was supported by the Tooling Association of South Africa (TASA), which recommend the equipment to support the industry through cutting edge technologies.

The advantages that the system brings to the industry and research community alike are in line with the objectives of Stellenbosch University’s HOPE Project, which uses the institution’s academic and research excellence to tackle developmental challenges in society.

For further details contact Prof Dimitrov on TEL: 021 808 3205

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<th>Typical specifications</th>
<th>HcFeMn</th>
<th>McFeMn</th>
<th>SiMn</th>
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<td>C</td>
<td>76.0% Min.</td>
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<td>Si</td>
<td>7.5% Max.</td>
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- Spondmetal
- Ferro Manganese
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SepFluor poised to shake up sector

Fluorspar miners in South Africa have battled in recent years with some closing down. New entry SepFluor will beneficiate high grades from Nokeng mine locally.

A new fluorspar group, SepFluor, plans to list in the first quarter of next year, bringing to the market a fully funded R2.1 billion mine and plant, CEO Alan Smith said recently.

SepFluor will spend R900 million building the Nokeng mine 80km north of Pretoria and a further R1.2 billion on a fluorochemical plant at an industrial site in Bronkhorstspruit, he said.

SepFluor has 800 shareholders, including government ministers who owned shares in JSE-listed Sephaku Holdings, which unbundled the fluorspar business. Mr Smith declined to name them.

“Some government ministers are also invested in us, obviously not big positions but they like what we’re doing and they’ve taken some equity with us,” he said.

The key differentiators between SepFluor and other fluorspar mines in SA that have battled in recent years, some closing down, was that the Nokeng mine had a high grade and the company would process its fluorspar in South Africa instead of relying on off take from overseas customers, Mr Smith said.

SepFluor was in advanced talks with the Industrial Development Corporation (IDC) about funding some of the capital it needed and it was likely the state-owned funder would be involved in debt and equity components of the company’s capital raising drive, he said.

The IDC is conducting a due diligence study into the project. The equity will be raised in the mine and separately in the chemical plant. The debt side, managed by Nedbank, should be concluded by the end of September.

“We anticipate, when we go to the market, both of those projects will be fully funded,” Mr Smith said. There are three other exploration projects in Limpopo and Gauteng, which are in the exploration stage, which will provide future growth.

The Nokeng mine is scheduled to begin production in the second quarter of 2014.

Fluorspar is used in iron smelting to decrease the viscosity of slags at a given temperature. This increase in fluidity is the result of the ionic nature of the mineral, noted for its usefulness as a flux. The compounds used as flux are used in metallurgy for a number of different purposes, but in smelting they are used to lower the melting point and promote the fusion of metals and minerals in slag.

The world reserves of fluorite are estimated at 230 million tons (Mt) with the largest deposits being in South Africa (about 41 Mt), Mexico (32 Mt) and China (24 Mt). China is leading the world production with about 3 Mt annually (in 2010), followed by Mexico (1.0 Mt), Mongolia (0.45 Mt), Russia (0.22 Mt), South Africa (0.13 Mt), Spain (0.12 Mt) and Namibia (0.11 Mt).
Despite barriers to entry, the Industrial Development Corporation (IDC) believed that there was still room for additional steel production capacity in South Africa and that the focus should be on developing low-cost steel production methods and technologies.

Speaking at the Africa Iron Ore conference in Cape Town, IDC industry champion for mining and beneficiation Dave Cousins said that South Africa currently had a theoretical steel production capacity of over 11 million tons a year, but that actual capacity was closer to 9 million tons a year.

In terms of consumption, South Africa was using in the order of 5.4 million tons a year, which meant that there was at present a surplus in production capacity. But forecast growth indicated that the country’s steel demand would increase dramatically by 2020.

Sector growth and gross domestic product forecasts indicated a doubling in consumption, while predictions based on emerging market experience forecast a three-fold increase, meaning a shortfall between the consumption rate and current production capacity would emerge in future.

But Cousins said South African steel producers were experiencing pressure on profit margins as a result of aging steel plants that were developed when cheap iron-ore, coking coal and electricity were available. As this was no longer the case, producers were facing significantly higher operational costs, which were also being driven by the increasing costs of logistics and scrap metal.

To enter the market at a competitive level, new production methods would need to focus on using low-cost iron-ore sources, using technologies that did not require imported coking coal and were optimally located to reduce logistics costs, Cousins explained.

Currently, South Africa had two dominant iron-ore sources for steel production: The Sishen-type iron-ore and the Bushveld Complex-type iron-ore. The Sishen iron-ore had a higher iron content (over 65%) and was generally a better quality resource than the Bushveld Complex resource (iron content approximately 54%). In addition, the Sishen resource was estimated at nine billion tons, significantly less than the Bushveld Complex estimated at 26 billion tons. Thus, using technologies that were able to use the lower-quality, cheaper and abundant Bushveld Complex iron-ore would have advantages for more cost-effective steel production.

Cousins said that the IDC’s focus on low-cost steel had led it to recently complete a prefeasibility study on a 2.5 million-ton-a-year low-cost iron and steel project with processes that made use of “stranded” magnetite and South Africa’s abundantly available low-grade coal.

The intention was to align steel production technologies with the available resources allowing the use of lower-grade iron-ores, be more energy efficient and require non-coking coals. Cousins said that more details would emerge when the IDC engaged further with its partners, which would be carrying out the operation side.
GM China casts magnesium chassis parts

Shanghai R&D centre claims lightweight automotive breakthrough.

The General Motors China Advanced Technical Centre in Shanghai has produced a magnesium low-pressure diecasting, calling it a "milestone in lightweight automotive research." The part is described as a chassis system component that is 30% lighter than a comparable aluminium diecasting, contributing to overall fuel savings by reducing vehicle mass without diminishing structural strength and integrity.

"Today's consumers want their vehicles to be more stylish, safer, more durable, more affordable, and more fuel-efficient," stated GM China Science Lab director John Du. "This is resulting in demand for lightweight, yet strong, materials that make a vehicle more economical to operate."

GM estimates that using magnesium may result in a 7% improvement in fuel economy for every 150-kg reduction in vehicle weight.

The 65 000 m² ATC is the research centre for several GM technical and design organizations — the China Science Lab, Vehicle Engineering Lab, Advanced Materials Lab, Advanced Powertrain Engineering Lab and Advanced Design Centre. When completed later this year, the ATC will include 62 test labs and nine research labs, and employ over 300 engineers, designers, researchers, and technicians.

The magnesium casting research was undertaken at the ATC's "micro foundry" and formability lab. Both were started up in the first phase of the ATC project, which includes a battery cell testing lab, battery material lab, metallography and electrochemical lab, and cell fabrication lab. The focus of research there is on lightweight materials (e.g., magnesium) and electric-vehicle batteries, among other advanced technology vehicles.

"The successful production of a part made from magnesium alloy is an important breakthrough for the ATC in lightweight automotive materials research. Satisfying the demands of our customers through new technological achievements is significant for GM's ongoing growth in China and the Chinese automotive industry," according to Du.

Super-vacuum magnesium diecasting among projects earning DOE funds

GM research foresees lighter, more cost-efficient vehicle doors.

The U.S. Dept. of Energy identified 13 manufacturing research projects to receive over $54 million in funding support. Describing the various projects as efforts toward "innovative technologies and materials" DOE said the investments would help to supply domestic manufacturers with the "cutting-edge tools, techniques and processes they need to compete successfully in the global marketplace."

DOE's Office of Energy Efficiency and Renewable Energy's Advanced Manufacturing Office (AMO) will distribute the funds. AMO forms partnerships with industry, small business, universities, and others to pursue emerging technologies that can expand or create new markets, according to Dr. Leo Christodoulou, AMO program manager.

U.S. Energy Secretary Steven Chu said the 13 projects were competitively selected to demonstrate the Energy Department's commitment to clean energy technology. "When it comes to clean energy," Chu said, "[it] should be invented in America, made in America, and sold around the world."

Notable among the projects earning DOE support is a General Motors concept for "super-vacuum diecasting" of a new Magnesium alloy, reportedly offering potential for a 50% energy savings compared to the current production sequence for stamping, assembling, and joining automotive doors. "By substituting Magnesium for steel inner panels, car doors could weigh 60% less, resulting in serious fuel economy improvements and carbon emission savings," DOE stated. It will give $2,672,124 to GM and its research partners, Meridian Lightweight Technologies and The Ohio State University.

Also earning DOE support is a project led by the American Iron & Steel Institute to commercialize a “flash ironmaking” process that sprays iron ore directly into a furnace chamber and uses natural gas, hydrogen, or syngas as a reducing agent to replace the blast furnace process (and thereby, the cokemaking process), which is energy- and capital intensive. Another concept to be supported is a program at The University of Utah to develop a new metallurgical process for producing titanium components for aircraft and automotive parts. Ford Motor Co. and Reading Alloys/Ametek are supporting the development, too. It involves a lower melting temperature and a reduced number of post-processing steps. That project will receive $1,460,285 from DOE.

GM research foresees lighter, more cost-efficient vehicle doors.
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Rolls-Royce has begun building a state-of-the-art Advanced Blade Casting Facility in Rotherham, England, where it will produce up to 100,000 single-crystal turbine blades annually. The cost of the new plant was not announced. Start-up is expected in 2014.

Mike Mosley, executive vice president for turbines, stated: “Rolls-Royce invests in world-class technology and infrastructure to expand the scale and efficiency of our operations, and to deliver our promises to our customers.”

“In the last five years,” Mosley continued, “we have invested over £950 million (est. $1.48 billion) on infrastructure in the U.K. alone. The Advanced Blade Casting Facility will use cutting-edge manufacturing techniques to produce single-crystal turbine blades, which play a critical role in jet engines and must withstand incredibly harsh conditions.”

Rolls is one of the world’s largest producers of aerospace, marine, and gas turbines engines, which require large volumes of the critical components. For example, the Trent 900 engine installed in the Airbus A380 wide-body aircraft features as many as 65 turbine blades that withstand the high-heat, high-pressure, and high-speed operating conditions of a jet aircraft.

“One single-crystal turbine blade extracts around 1,000 horsepower from the gas flow towards the rear of the engine ... to drive the engine’s compressors,” Rolls explained in its announcement.

“Single-crystal turbine blades operate in temperatures up to 200° C above the melting point of their alloy, and sit in a disc that rotates at more than 12,000 rpm,” it explained.

“Single crystal” refers to the metallurgical grain structure of the superalloys in an investment-cast part: A very high degree of process control is maintained so that the thousands of alloy grains form a single elongated structure through the length of the blade.

Other “ground breaking” manufacturing capabilities to be adopted for the new plant will include “3D structured light” for inspecting the geometric quality of finished turbine blades. The 14 000 m² investment casting operation is located in South Yorkshire’s Advanced Manufacturing Park that is also the site of Casting Technology International, the metalcasting R&D centre.

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Building upon the success of the recently completed 116th Metalcasting Congress in Columbus, CastExpo ’13 will be better than ever as it brings together the Metalcasting Supply Chain for 4 days you can’t afford to miss. Sponsored solely by the American Foundry Society (AFS), CastExpo is the single largest trade show and exposition for metalcasting in the Americas. CastExpo’13 in St. Louis will offer metalcasters, suppliers, and casting buyers and designers the opportunity to connect and educate themselves on the latest and greatest metalcasting has to offer.

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**Education:** Every minute of every day is filled with presentations in the Metalcasting Congress technical sessions, in workshops and in the Metalcasting Theatre on the exhibit floor, delivering to attendees cutting edge and practical shop-floor information on how to improve their operations. In addition, keynotes from world-renowned experts will be highlighted throughout the four day event.

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For more information visit www.castexpo.com
General Motors, in collaboration with Meridian Lightweight Technologies Inc., Strathroy, Ontario, Canada, and the Ohio State Univ., Columbus, Ohio, has won a $2,672,124 Energy Department grant to explore magnesium diecasting technology.

The project, which will also be funded by $668,031 in cost sharing, is intended to develop an integrated super-vacuum diecasting process using a new magnesium alloy to achieve 50% energy savings compared to the stamping and joining process currently used to manufacture car doors. By substituting thin-walled magnesium castings for steel inner panels, car doors could weigh 60% less, resulting in significant fuel economy improvements and carbon emission savings.

In 2010, Meridian won several awards for a 17.6 lb. magnesium liftgate casting used on the Lincoln MKT. The part was at the time the largest diecast magnesium closure panel used in the world. It replaced a six-piece steel weldment and offered the customer more than 20% weight savings while functioning as the primary structural load bearing component in the liftgate assembly.

GM’s Energy Department award was part of more than $54 million allocated to 13 projects across the country to advance technologies and materials that can help American manufacturers increase energy efficiency.

“By investing in breakthrough technologies that can drastically reduce the amount of energy consumed during manufacturing, the Energy Department is supporting President Obama’s blueprint for an economy built on American manufacturing, American energy and skills for American workers,” said U.S. Energy Secretary Steven Chu.


The carmaker won the award in collaboration with Meridian Lightweight Technologies Inc. and the Ohio State Univ.
Aluminium demand in auto industry set to double – Alcoa

Demand for aluminium in the auto industry is expected to more than double by 2025 as manufacturers seek lightweight alternatives to steel in an effort to meet ever tightening fuel efficiency regulations.

Reuters reports that more and more automakers are beginning the transition away from heavy steel components and moving toward an increased use of aluminium according to the world’s leading producer of primary and fabricated aluminium, Alcoa.

Mr Randall Scheps, director of automotive marketing at Alcoa, said that as markets around the world tighten fuel standards, carmakers are forced to react. He said that “We have every car maker calling us, wanting to increase their aluminium content, wanting to start new R&D projects about how they can convert bodies from steel to aluminium, wanting to convert hoods and doors from steel to aluminium.”

Mr Scheps expects this transition to more than double the auto industry’s overall rate of aluminium consumption from 11.5 million tons in 2011 to a predicted 24.8 million tons by 2025 when the average car will incorporate 250kg of aluminium compared to the 155kg in today’s vehicles.

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rancesco Savelli, commercial director of the Savelli SpA of Brescia, is the new president of Amafond, the national association which brings together suppliers of machines, products and services for the foundry industry. He was elected unanimously after being nominated by the outgoing Board. The meeting took place at the village of San Vitale Borgonato Corte Franca, which also entailed the re-election of other officers.

Savelli (the youngest president in the history of the organization at 40 years), will serve for the next four years with a goal of moving the mark of continuity and renewal in a phase not easy for “Italian industry”. He stressed in his speech at his inauguration the story and “pioneering spirit of its predecessors”.

At the same time he outlined the strategies for “several ambitious goals, which he hopes to reach together”. Among the results to be realized in the medium to long term, the leaders stressed the need to define “a new relationship with Assofond as truly equal, and no longer play the part of mere suppliers”.

The Assembly has re-appointed the Governing Council in which they are joined by Brescia and Riccardo Ferrario (Idra Ltd.), Danilo Verzeletti (Evolut), Roger Pederzoli (Mechanical Pierre), Maurizio Sala (Mec-Ecocer Foundry, who is also vice president for Products Division), Gabriele Galante (IMF Luino), was appointed in office for five years as Honorary President of the Association. The Director is Fabrizio Carmagnini.
On March 1st 2012, IMF Group celebrated their 40th year anniversary and there was another fiesta in Luino for about 300 guests from the industry, suppliers, politics and science in June 2012.

The company was founded by President Gabriele Galante in 1972 and is now known all over the world for its high technological advancements and reputation with the most important foundry groups. IMF has greatly expanded its manufacturing program, thanks to the collaboration of two important brands, Foundry Automation in the coremaking field and Carlo Banfi in the shot blasting area.

With nearly 500 employees, four production units in Italy, China, Brazil and Czech Republic, three representative offices in key-markets such as Russia, India and USA, the IMF Group has become a ‘global partner’ for all foundries. In the last 15 years, 90% of IMF production was exported to more than 25 countries worldwide.

The annual turnover of the company has grown from € 47 million in 2007 to € 67 million in 2011 to expected € 110 million in 2012.

Gabriele Galante is currently the Honorary President of Amafond and has been President of Cemafon since 1988. In this position, he created the concept of the International Foundry Forum (IFF), a meeting in which foundries come together with the largest casting buyers and suppliers. Galante’s interactive performance is based on the relationship of mutual respect with his stuff and his attention to the aspirations and needs of workers in order to create a steady development.

The IMF Group has organized significant events at its Headquarters in Luino, Italy to celebrate this important milestone for the company’s history.

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IMF Group celebrates 40 years

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As a leading supplier of measurement, automation equipment and solutions for the process industries, Endress+Hauser will become a principal member of the Open DeviceNet Vendors Association (ODVA) in Ann Arbor, Michigan, USA, joining leading suppliers Bosch Rexroth, Cisco Systems, Rockwell Automation, Omron and Schneider Electric.

Endress+Hauser’s increased participation in ODVA builds on its long-term support of open industrial networking technologies, including the company’s portfolio of mass flowmeters designed for the EtherNet/IP network.

“ODVA is one of the world’s largest consortiums advancing open, industrial networking standards through commercially-off-the-shelf (COTS) technology and a media-independent network protocol,” said Katherine Voss, Executive Director at ODVA. “We welcome Endress+Hauser in this consortium as we have a shared vision for leveraging EtherNet/IP to simplify an end user’s network architecture.”

With leading industrial automation suppliers, such as Endress+Hauser, as principal members, ODVA is one of the first associations to strive to support Industrial Ethernet down to the field level in process automation. This will help provide manufacturers a complete, plant-wide network infrastructure for process, motion, safety and discrete applications and from plant-floor to IT systems.

Traditionally, devices measuring and controlling process variables rely on a field network to transfer information, while other devices within the plant use completely different networks for data communication. By improving this complex multi-tier networking strategy with one standard network architecture, namely EtherNet/IP, users have a simplified network structure as well as better access to plant-floor information. This enhances the ability to monitor overall performance, troubleshoot out-of-margin conditions and minimise downtime.

“Our customers demand open, interoperable solutions such as EtherNet/IP, as it enables higher-level software such as ERP systems, process historians, control loop tuning programs, and asset management systems to access data from process instrumentation,” said Raimund Sommer, Managing Director of Endress+Hauser Process Solutions AG. “We look forward to continue working through ODVA to help users achieve seamless integration of our instruments into system architectures.”

Endress+Hauser made its first major commitment to ODVA technologies in 2009 with the launch of the Promass 83 – the world’s first Coriolis mass flowmeter with EtherNet/IP connectivity – capable of measuring mass flow, density and temperature, featuring an integrated Web Server that allows authorised users to remotely conduct diagnostics, configure the instrument or perform process optimisation. In addition, the Promag 53 electromagnetic flowmeter was also relaunched with EtherNet/IP connectivity. By using EtherNet/IP, up to 10 measured variables can be configured and transmitted including volume flow, calculated mass flow and totalised flow.

The ODVA will introduce Endress+Hauser as a principal member at its 2012 Industry Conference and 15th annual meeting, to be held 16-18 October 2012 in Stone Mountain, Georgia, USA.

For further details contact Hennie Blignaut, Marketing Manager Endress+Hauser (Pty) Ltd on TEL: 011 262 8000
Durrans RMS have introduced a new non-zircon coating for the steel and chrome steel casting foundries. It is a well-known fact that the price of zircon has increased enormously in the past 18 months and this has put pressure on the foundry industry which needs to contain input costs. Zircon is still the preferred product for castings exceeding eight tons, however this new coating, which is not a hybrid, has proven itself locally and overseas as a reliable coating in the casting size range below eight tons up to 250mm section thickness and has given excellent casting finishes at a number of local foundries, according to Durrans RMS.

The refractory material is imported from selected sources overseas and is a very high quality virgin material. Despite the variations of the exchange rates, it has been possible to provide substantial savings due to the dual effects of less expensive raw materials and a lighter density of coating. The properties of RSB 6602-02 give it a wide range of application by flooding, spraying, brushing or swabbing. The coating has been used on sodium silicate, alkali and acid phenolic silica sand systems and very recently on green chromite sand systems.

The original local trials of this versatile coating were conducted at a facility producing a large quantity of chrome iron pump bodies and impellers up to 500 kg cast weight. These trials were followed by successful trials on mild steel thin section castings up to 4000 kg cast weight, with cast temperature at about 1600° C.

In conclusion this versatile coating used on various moulding media combined with a consistent wet and dry film thickness and relatively lower density than zircon results in the considerable saving compared to the conventional zircon coating says Durrans RMS.

For further details contact Durrans RMS on TEL: 011 917 0702.
Matching the crucible to your application

A how-to guide in selecting the optimal crucible for your metalcasting facility operation, application and desired crucible characteristics. Didier Finck, and Dieter Heumannskaeper, MorganMMS

If you melt metal or hold a molten bath, chances are your operation is unique. Your particular combination of furnaces, alloys, working practices, metallurgical treatments, pouring arrangements and end products are not likely to be duplicated at any other facility. So choosing a crucible that will provide maximum performance for your particular operation is an individualized and complex task.

This article is designed to serve as a guide for selecting the optimal crucible for your operation. It explains the relationship between metal melting/holding operations and specific crucible characteristics. It provides support for but does not replace the need for metal melters and crucible suppliers to work closely together in the crucible selection process.

Today’s crucibles

The modern crucible is a highly heterogeneous, graphite-based composite material, which relies on its material composition and control of the graphite’s structural alignment to achieve the performance required. Crucibles may be as small as teacups or may hold several tons of metal. They may be fixed in place within a furnace structure or may be designed to be removed from the furnace for pouring at the end of each melt. Crucibles are used in fuel–fired furnaces, in electric resistance furnaces, in induction furnaces or simply to transfer molten metal. They come with or without pouring spouts and in a wide variety of traditional and specialized shapes.

Fig. 1. Crucibles are available in a wide range of sizes and shapes and offer many different performance characteristics

They also offer many different performance characteristics since each application presents a complex set of temperature, chemical and physical parameters which define the technical boundaries within which the crucible has to be designed to operate.

So how do you select the right crucible for your operation from the extensive range of crucible types and materials available to you?

The best approach is to begin with your own detailed assessment of your operations. You need to fully document and, where possible, quantify all aspects of your melting, holding and metal handling processes. These include:

- The capacity, dimensions and type of your furnace
- The specific alloy or range of alloys you melt
- The melting and/or holding temperatures you maintain
- The temperature change rate the crucible will experience
- How the crucible is charged
- The fluxes or additions used

- Degassing or refining processes
- How slag or dross is removed
- How the crucible is emptied.

These nine categories reflect the more common factors you must take into account when selecting a crucible to match your specific requirements. You should also consider any additional processes or requirements that might be specific to your operations. An example might be your ability to tolerate or your need to avoid alloy cross-contamination.

Be aware, however, that on a practical level, there may not be a single crucible type that offers the highest level of every desirable characteristic for your application. Crucible performance characteristics often involve trade-offs. For example, the crucible with the best thermal conductivity may not also offer the best protection against thermal shock. Therefore, you should prioritize the list of crucible properties most important for your application and review those priorities with your crucible supplier.

Fig. 2. Multiple considerations must be taken into account in selecting the right crucible for a specific application

While you bring the detailed information on your own operations to the crucible selection process, your crucible supplier must contribute a high level of expertise on crucible materials, characteristics and performance. For the greatest selection, look for a crucible supplier able to offer overlapping crucible product lines suitable for each specific metal but offering different operational characteristics. Then, working together, you will be able to closely match a specific crucible to your specific requirements. Achieving this match is the key to crucible safety, performance and maximum service life.

- Furnace capacity, dimensions and type

The capacity, dimensions and type of furnace you use will establish most of the observable details about your crucible. For example, when you know the metal capacity your furnace was designed for, you will know what capacity your crucible should provide. Similarly, the dimensions of the space for the crucible in your furnace will dictate the dimensions and shape of your crucible. This will also determine if your crucible must include a pouring spout. But choosing a crucible to match your furnace type will give you many other less obvious factors to consider.
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Fuel-fired furnaces
Fuel-fired furnaces include furnaces powered by gas, oil, propane or coke. Each of these fuels directly exposes the crucible to the heating source and each provides a different level of heat, normally measured in BTUs. Any crucible selected must be able to withstand the maximum BTUs the furnace fuel is able to apply to the crucible. In gas, oil and propane furnaces, the crucible must be able to withstand the effects of the burner flame at the base of the crucible and the crucible must be tapered to allow the flame to circulate around the crucible from bottom to top. This allows even heating of the crucible. The crucible material also must be able to resist oxidation damage from the flame and accommodate the rate of thermal change the crucible will experience.

Good thermal conductivity and even heating are important crucible properties in transferring the heat from the interior of the furnace through the crucible to the metal charge. Crucibles with high graphite content in the carbon binder offer high thermal conductivity for fast melting in gas-fired furnaces.

Electric resistance furnaces
Electric resistance furnaces provide even, all-around heating to a crucible and are ideally suited to precise temperature control in metal holding applications. But they are slower than fuel-fired furnaces in melting applications. Consequently, energy efficient crucibles with high graphite content in the carbon binder are often selected to provide high thermal conductivity for faster melting in these furnaces. Crucibles designed for electric resistance furnaces are normally basin shaped and provide a uniform distance between the crucible and the furnace heating elements.

Induction furnaces
Selecting crucibles for induction furnaces is a more complex task. In some applications, such as refining precious metals, crucibles designed to heat in the furnace’s inductive fields are used to melt the charge. In other applications, crucibles that allow the inductive field to pass through them and heat the metal charge directly are used. Therefore, it is important to match the electrical characteristics of the crucible to the operating frequency of the furnace and to the melting application. For example, in some designs, lower frequency induction furnaces require crucibles with high silicon carbide content and in other applications, higher frequency induction furnaces require crucibles with high clay content. Matching a crucible’s electrical resistivity to the induction furnace is key to preventing crucible overheating.

Removable crucible furnaces
All of the above furnace types can be designed to use removable crucibles. These crucibles can be charged while outside or when installed in the furnace, but they are removed from the furnace for pouring. Like crucibles used only for metal transfer, they are bilge-shaped or A-shaped to allow them to be lifted with tongs designed to properly support the crucible.

Furnace power limitations
A final factor to consider when documenting your crucible requirements based on your furnace’s specifications is power availability. In many locations, power for melting or holding might not be available at all times or might be prohibitively expensive at certain times or at certain levels. If this is the case at your facility, it may be particularly important to select an energy efficient crucible.

Metals you melt and/or hold
Knowing what metals and alloys you melt or hold will tell you a lot about what characteristics you need in a crucible. Your detailed catalogue of the metals you intend to melt will help to establish the maximum temperature the crucible must support for melting and holding, will define how the metal will interact with the crucible material both chemically and physically and it will be a key factor in determining what characteristics your optimal crucible should offer. A case in point, in melting copper-based alloys in fuel-fired furnaces, roller formed silicon carbide crucibles perform better due to higher thermal shock resistance. In other types of furnaces, crucibles are often selected because of their high density. Less dense and more porous crucibles may allow erosion.

Carbon-bonded and ceramic-bonded clay graphite and silicon carbide crucibles are widely used in melting and holding aluminum and aluminum alloys, aluminum-bronze, copper and copper-based alloys, cupro-nickel and nickel-bronze alloys, precious metals, zinc and zinc oxide. Crucibles also are used in melting cast iron. Taken together as a group, these metals represent a temperature range from 400° C / 750° F to 1600° C / 2912 ° F.

Metal Casting Temperature and Crucible Selection Chart

While some crucible types support metal temperatures encompassing a broad spectrum of metals, it is often necessary to select crucibles targeted to specific metals or alloys and with more limited operating temperature ranges. Selecting such crucibles is often more advantageous because they offer performance characteristics important to your operations. For example, using a crucible able to melt metals from iron to
zinc may not be as important to your aluminium alloy melting operation as having a crucible limited to the temperature range you need but able to resist corrosion damage from your metal treatment fluxes.

**Melting and holding temperatures**

Generally speaking, the metals and alloys you melt or hold will determine the temperature range within which your crucible must be able to operate. Crucibles must never be heated above their maximum temperature. This can lead to dangerous crucible failure. However, operating below the crucible’s lower temperature limit can also cause problems. For example, crucibles designed for the high temperature melting of copper-based alloys will oxidize if used at low temperatures for zinc melting.

Melting and holding practices involving metal temperatures also need to be taken into consideration in selecting crucibles. If your operations involve superheating, you will need to take the higher metal temperatures reached into account.

**Rate of temperature change**

The ability of a crucible to handle the rate of temperature change is as important as its minimum and maximum temperature limits. If your operational practices lead to frequent heating and cooling cycles for the crucible or otherwise subject it to rapid temperature changes, you will need to select a crucible that is resistant to thermal shock. Some crucible types are much better at handling rapid temperature change than others. For example, high carbon content of the graphite in a crucible imparts high thermal conductivity and non-wettability. And when that graphite forms a directionally oriented matrix, the crucible also provides high thermal shock resistance. This is critical to foundry applications where temperatures can change by several hundred degrees in seconds. Your crucible supplier can advise which crucibles provide the best resistance to thermal shock for your application.

**How the crucible is charged**

If your furnace is always charged with molten metal, it probably does not need a crucible designed to be highly resistant to physical damage. However, if metal ingots or other heavy materials make up the bulk of your charge and they are not carefully lowered into the furnace via an automatic loading system, you may want to select a crucible that is mechanically strong and able to survive physical shocks. Crucibles featuring high carbon content and a directionally oriented graphite structure provide excellent impact resistance.

**Degassing and refining**

Degassing aluminium and aluminium alloys typically involves bubbling inert gas, usually nitrogen, through the molten bath while agitating the bath with a rotor designed to break apart and disperse the gas bubbles. These small bubbles then pull the undesirable hydrogen and oxides out of the bath and carry it, along with dross and inclusions to the surface where the gas escapes into the air and the solid material can be removed. This process, often used along with fluxing agents, physically erodes the crucible and attacks it chemically as well. Therefore, a dense and mechanically strong crucible that is highly resistant to chemical attack is required. Silicon carbide crucibles provide excellent resistance to elevated temperature erosion and to chemical corrosion. Also, when isostatically pressed, crucibles form a random arrangement of the graphite in their structure. This contributes to creating denser products that can survive erosive and corrosive conditions more effectively.

Many refining and metal treatment processes used with other nonferrous metals also call for a mechanically strong and chemically resistant crucible. In refining and melting precious metals, it is particularly important that the crucible you use provide clean metal by incorporating non-wetting properties. That means that the crucible must be well sealed against metal penetration. This characteristic is imparted by having a dense crucible material structure and a durable protective glaze.
Equotip is one of the most established and trusted brands for portable metal hardness testing. Proceq developed their measuring principle in 1975. Equotip uses the well accepted dynamic Leeb hardness testing principle. An impact body with a hard-metal test tip is propelled by spring force against the surface of the test piece. Surface deformation takes place when the impact body hits the test surface, which results in loss of kinetic energy. This energy loss is detected by comparison of impact and rebound velocities, \( v_i \) and \( v_r \), measured at a specific distance from the surface immediately before and after the impact.

The powerful Equotip 3 indicating device is easy to operate and meets all customer needs in terms of statistics, data analysis and reporting.

**Equotip 3 impact devices**

Equotip 3 impact devices address most users’ requirements regarding size, preparation and hardness of work pieces. The different impact energies, probe sizes, test tip geometries, and indenters suit particular application needs.

**The automation package**

Not only do Equotip testers offer quick tests by hand, but Equotip 3 can also be remote controlled. The Equotip 3 Automation package facilitates the integration of hardness tests into quality management systems. Production engineers set up the

**Equotip Piccolo 2 / Bambino 2**

The Equotip Piccolo 2 / Bambino 2 integrate the display and impact device in one unit. They follow the same Leeb hardness principle. The standard D test tip can be exchanged with an optional DL test tip for testing in restricted areas.

Metal heat treatment allows mechanical properties to be changed to make the metal harder, stronger and more resistant to impact. The Piccolo 2 / Bambino 2 can be used to monitor and document the strengthening of high integrity metal components, for example in the automotive industry.

For more information, contact your nearest IMP branch, Gauteng TEL: 011 916 5000, Kwazulu Natal TEL: 031 764 2821, Western Cape TEL: 021 852 6133, Eastern Cape TEL: 041 371 1925, Free State TEL: 018 293 3333 or email: info@imp.co.za or visit www.imp.co.za

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**Baumer inductive sensors: resistant to aggressive sea air**

The inductive outdoor sensors IFRR (proximity switches) and IWRR (distance -measuring sensors) by Baumer have passed the latest corrosion tests with flying colors. Both sensors meet the requirements of the highest corrosiveness category C5-M. Both sensors are therefore ideally suited to use in demanding ambient conditions at sea or on the coast, e.g. in wind power stations.

Digital inductive sensors are mainly used to detect the nacelle position and the rotor speed. Measuring sensors are applied for monitoring the brakes and the shaft deflection. To meet the requirements of the maximum corrosiveness category C5-M, the sensors were subjected to a 1440-hour or 60-day salt spray test in accordance with ISO 9227, followed by a 720-hour condensation-water resistance test in accordance with ISO 6270. The results show that these inductive sensors meet the highest corrosion resistance demands, and Baumer can guarantee a very long service life for its products.

High-quality materials like V4A stainless steel and special design procedures guarantee the high level of resistance of the inductive sensors. Thanks to the unique proTect+ impermeability concept, they are still completely leakproof in accordance with protection class IP 69K even after countless temperature cycles, and reliable functioning can be guaranteed even after many day-night cycles. This means that the sensors are especially low-maintenance, with an average service life (MTTF) of over 100 years. The wide temperature range of -40 to +70 °C also ensures constantly reliable measured values and detection results, even at extreme temperatures or great temperature fluctuations.

For further information please contact the Sales Department of Temperature Controls (Pty) Ltd on TEL: 011 791 6000 or email: sales@tempcon.co.za or visit www.tempcon.co.za
Known as a supplier for innovative foundry chemicals, ASK Chemicals, Hilden, offers not only a diverse product portfolio but also extensive expertise in the simulation of casting processes. The global player is now providing this expertise as a comprehensive service package for foundries, thereby creating environmental and economic optimization potential for the various stages of the casting process.

The early application of casting process simulation plays a key role in sustainability for foundries. Casting process simulations allow for depiction and adjustment of dynamic processes, and efficient changes to them, in the planning stage as well as in live operations.

This is where the simulation area of ASK Chemicals comes in. Simulation is a separate service designed for all process-oriented foundries. It delivers custom concepts that provide environmental and economic solutions for foundries – precisely tuned to their process parameters.

Using state-of-the-art computer technology, the application engineering for the customer analyzes and simulates processes such as core shooting, core gassing and dehydration, along with mold filling and solidification. “This allows us to develop a secure foundation for risk-free production decisions in the casting process,” explains André Gerhards, Manager, Technical Assistance and Simulation. The extensive knowledge of ASK Chemicals about foundry processes offers a wealth of advantages.

Simulation allows for an exact description of the cast part’s quality even before production commences. Virtual prototypes created in this manner enable foundries to reduce their product development costs, shorten preparation times and enhance product quality.

For more information visit www.ask-chemicals.com
The filtration of ferrous metals is an established technology for improving steel and iron casting quality and performance. Application of filters to large iron and steel castings has until now been complicated and with a risk of filter failure. The Hollotex CFU (Centrifuge filtration unit) system has been developed to allow the simple and effective application of a filtration unit to large ferrous castings.

The Hollotex CFU system is a self-contained unit incorporating seven Stelex ZR filters. The system is incorporated into the castings running system. As the metal enters the Hollotex CFU unit during mould pouring, the metal is directed to ensure rapid and complete priming of all the filters. This ensures steady and uninterrupted filling of the mould cavity. Centrifugal forces on the metal within the unit reduce the rate of filter blockage providing a high filter capacity before blockage occurs. Castings up to 40 ton poured weight have been produced using multiple Hollotex CFU units in one mould.

The largest Hollotex CFU unit currently available incorporates seven 200 x 150 mm Stelex ZR filters and has a capacity of between 6 - 12 tons on molten iron or steel. Hollotex CFU systems are manufactured so that no pre-heating of the holloware running system is required prior to pouring. Every effort should be made to avoid direct contact with water or other organic solvents prior to use.

When using Hollotex CFU systems, the flow rate and filtration capacity achieved during pouring varies according to foundry practices, metal temperature, metal grade, metal head pressure and the relative cleanliness of liquid metal. Foseco estimate that 720 million filters are used in a year worldwide and they have close to a 50 % share of the market.

New appointments at Foseco

Foseco South Africa has recently made two new appointments.

- **Enno Krueger (41)** has joined Foseco as Sales and Marketing Manager. Enno is a qualified metallurgical engineer and has worked in the foundry and related industries throughout his working career, most of this time spent at a local large foundry. Enno has vast experience in most foundry operations including metallurgy, melting, fettling and heat treatment having been in a senior position in these departments.

- **Jurgen Radstake (38)** has been appointed Laboratory Manager. Jurgen is a chemical engineer, having completed his studies in Holland. Most of his career has revolved around chemical situations and specifically in the foundry industry since 2001. He has been with the Foseco Group, based in Hengelo, Holland since 2002 with a specific interest in developing coatings used in the foundry industry.

For further details contact Foseco South Africa on TEL: 011 903 9500
Now there’s less to fume about

The pristine feel of nature, may seem far removed from the foundry environment, but at Applied Solutions we are as concerned about developing chemical solutions that are environmentally friendly as the most ardent conservationists. One of the challenges facing the foundry industry today is being environmentally conscious whilst continuing to be increasingly competitive. Environmentally friendly sand binders offer quality performance and cost benefits that can improve your foundries bottom line.

Together with our technology partners, ASK Chemicals, we are constantly innovating new products for the benefit of our customers. Flexibility, speed, quality and sustainability are crucial to achieving higher quality in your foundry. Our environmentally friendly, non-toxic, inorganic binder system ensures higher productivity and fewer health risks.

Look at the advantages -
- Virtually emission free
- Less condensate, fewer gas-related defects
- Higher productivity
- Higher casting tensile strength
- Improved casting elongation properties

So instead of fuming about the difficulties you face, call Applied Solutions today and get a team on your side who are dedicated to making your life a lot easier.
SI Group HA (S.A.) manufacture a range of specialised furane resin binders and activators, highly suitable for maximising yields on reclamation of silica and chromite sands. These resins are polymerised in order to yield nitrogen contents of less than 1%, as required by steel foundries.