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industry news
Silica Quartz mine now offers AFS specification foundry sand; KPL Die Casting comes of age; Carol Boyes: Artist and designer; Environmentally friendly Ecosafe Plus biologically degradable hydraulic fluid gaining momentum; Akhani 3D commercial additive manufacturing service bureau launched by local experts; What comes next for Allied Mineral Products South Africa: Manufacture of precast refractory shapes; Metso confirms closure of foundry – 200 jobs impacted; Can South Africa afford AMSA any longer?; Paul Kruger statue sells for R10.46 million; Hulamin acquires remaining aluminium rolling slab business of Isizinda Aluminium; ZF starts production in East London, South Africa; Important enabling factors for meaningful localisation in the automotive industry; Imerys promotes Durandal and Kersand moulding sand

international news
The four challenges in aluminium high-pressure die-casting; Sub-Saharan Africa Workshop at METEC 2019; Formaldehyde emission limits: HA offers solutions for the cold-box sector; Tesla files patent to die-cast vehicle frame; Loramendi and ASK Chemicals enter alliance with voxeljet; 2019 Winners announced for Altair Enlighten Award; It tolls for thee: £5m needed to save Britain’s last major bell foundry; New furnace plant enables simultaneous melting of aluminium chips and ingots; Aluminium alloy breaks the critical 500 MPa UTS mark

product review
Morgan Molten Metal Systems launches a next generation, ‘game-changing’ crucible for holding molten aluminium; Discover the world of hardness testing – Emcotest; Magma presents a new generation of solutions for virtual casting; Norican Digital’s Refill Monitor; Bühler’s Digital Cell is a step change for the die-casting industry
Is your foundry capable of handling more demand from the automotive industry?

Last year Cabinet approved the South African Automotive Masterplan (SAAM) 2035 alongside amendments to the Automotive Production and Development Programme (APDP), which is expected to take effect in 2021. The changes emphasise localisation, intentionally shifting focus from imported to local content. The SAAM provides a vision for the industry and aims to increase the use of locally manufactured components in domestic vehicle production from 39% to an ambitious 60%.

Of all the initiatives that Government has talked about the SAAM and APDP are two that are contributing to our economy. Government has recognised that the automotive industry has been fundamental to South Africa’s economy. In 2018, the sector directly employed around 110 000 people and contributed a total of 6.8% (4.3% manufacturing and 2.5% retail) to gross domestic product.

While local demand for new vehicles has slowed, numbers of vehicles manufactured in South Africa has increased because of exporting. According to a recent report released by Deloitte Africa, South Africa still remains the number one OEM manufacturer on the African continent (54.3%) with many of the major OEMs operating in South Africa. Morocco, the second largest African producer, has increased production significantly, and produces more passenger cars than South Africa.

The report looks at ways of strengthening the local automotive industry and highlights how tier 2 suppliers in South Africa do not have the same clout as in other countries. Globally, tier 2 suppliers dominate the automotive supply chain and are responsible for 50% of value addition. These suppliers often drive localisation and are important to deepen skills, employment and value chains in the host country. The structure of South Africa’s automotive industry is dominated by OEMs and tier 1 suppliers, with few tier 2 suppliers. In comparison the tier 2 suppliers typically contribute 50% value addition to the automotive industry globally relative to South Africa’s 20%.

Included in the report is Thailand’s successful automotive industry and how it deepened the supply chain with clear objectives on incentives and investments. Notably, it says, Thailand also concentrated on developing local skills, including for lower tier suppliers, often by entering into strategic partnerships and sharing the responsibility of transferring the needed skills to domestic suppliers and employees. The government also introduced industrial policy which linked to the abovementioned objectives. These policies translated into practical benefits for multinationals, including exemptions on corporate income tax and import duties on machinery and raw materials, immigration permits for experts, land ownership options and supercluster automotive zone benefits.

I have recently written how it has been reported that Mercedes C-Class US production could be heading to South Africa. There is apparently no room at the Mercedes US plant to manufacture the C-Class because of SUV demand – the vehicles Americans want most – and the 40 000 vehicle US production might move to Mercedes’ East London plant. I don’t think this is a dream as ZF Lemförder SA has opened a new plant in East London. Only nine months after the proposal, the new plant commenced production of front and rear axles.

Now I have seen reports that the production of Minis could move to South Africa from the current manufacturing plant in the UK because of the Brexit debacle. Mini is one of the most productive manufacturers in the UK, with the Mini the second-most produced car in the country. Last year the Oxford plant produced 175 000 of three and five-door hatch, convertible, roadster and coupé versions.

Just do the numbers between these two rumours. They make up about one-third of South Africa’s current yearly production. In this era where the South African automotive industry is intentionally being shifted from imported to local content, and if the two rumours come to fruition, it could be an industry shifting experience for local suppliers and the people of our country. The questions that need to be asked are: Is the local manufacturing industry ready, and do the investors have the appetite?

South African Institute of Foundrymen

The aim of the SAIF is to promote and develop within Southern Africa the science, technology and application of foundrying for individuals and involved industries.

Council Appointments for 2019

Chairperson – Glen Dikgale
Deputy Chairperson – Janley Kotze
Treasurer – Vacant
Other Directors – Enno Krueger, Nigel Pardoe and Didier Nyembwe
Elected Members – Kevin van Niekerk, Andrew McFarlane, John Taylor, Nigel Brains

Address Details
University of Johannesburg Metal Casting Technology Station — Metallurgy; Room G101, John Orr Building, Corner Siemert and Beit Street, Doornfontein, Johannesburg, Gauteng.

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e-mail: mbliljon@uj.ac.za

Western Cape:
Phewe Nene
Cell: 072 606 0913;
e-mail: phiwe@live.com

Dates for future SAIF activities
14 November 2019 - SAIF Annual Golf Day for SAIF Members
Reading Country Club, Fore Street Alberante, Alberton
09:00 am – 20:00 pm
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FOSECO. Your partner to build on.
The Silica Quartz mine, situated outside Delmas, on the border of Mpumalanga and Gauteng, has been supplying high-grade silica sand and grit to the glass, industrial, mining, filtration and leisure industries. Extensively used in water purification, filtration, separation and the glass industry, the product is dried and sized to meet the specific needs of customers. The mine has been in operation since 1972 and Silica Quartz is among the largest producers of high-quality silica in South Africa, used primarily in the production of glass and graded sand. The operation comprises of an open pit, crushing, and wet and dry screening processing plants for full beneficiation.

The impressive opencast mine has now opened Silica Quartz Wash Plant 3 to service the foundry industry with high-grade alluvial silica sand, one of the most commonly used sands in the foundry industry.

“This consistency of grain size, which includes roundness, allows users to reduce resin consumption and the stability increases productivity, thus saving on costs. Because of the consistency of the material, coating on the sand is regular and this in turn decreases gassing problems while giving superior permeability on the moulds and cores.”
“Moulding sand is at the heart of the sand casting process. It must hold a shape well and capture the fine details of a casting, yet be permeable enough to allow gases to escape. Under the strain of having the moulding pattern removed from it, or while it is filled, it cannot crumble or sink on itself. When it is turned upside down it must not lose its form. The parts of a mould have to stay true while clamped together,” explained Leroux Roets, one of the partner’s instrumental in getting a joint venture (JV) agreement in place with the owners of the Silica Quartz mine.

“Silica sand, or quartz sand as it is sometimes referred to, used in the manufacture of cores and moulds with synthetic binding agents such as furan and cold-box, must be well-defined and to the greatest extent possible, dust-free. Therefore, a process was developed that involves scrubbing and washing the sand, as well as hydro-screening it, before kiln drying with natural gas and the sorting into the final standard grading,” continued Roets.

“The purpose of this process is to achieve high sintering temperatures, low foreign body content and a high degree of chemical purity, which meet our customers’ requirements in all aspects - both for foundry use as well as for a wide range of industrial purposes. Apart from standard grading the process makes it possible to produce a wide range of special grading tailored to our customer’s needs.”

“Silica sand is quartz that over time, through the work of water and wind, has been broken down into tiny granules. In metal casting silica’s high fusion point (1760°C) and low rate of thermal expansion produce stable cores and moulds compatible with all pouring temperatures and alloy systems. Its chemical purity also helps prevent interaction with catalysts or the curing rate of chemical binders. Following the casting process, core sand can be thermally or mechanically recycled to produce new cores or moulds.”

“In metal production, silica sand operates as a flux to lower the melting point and viscosity of the slags to make
them more reactive and efficient. Lump silica is used either alone or in conjunction with lime to achieve the desired base/acid ratio required for purification. These base metals can be further refined and modified with other ingredients to achieve specific properties such as high strength, corrosion resistance, or electrical conductivity. Ferroalloys are essential to specialty steel production, and industrial sand is used by the steel and foundry industries for de-oxidation and grain refinement.”

**Silica Quartz mine**

“The mine has been producing silica sand manufactured to ISO9001 accreditation. The operation comprises an open pit, crushing, and wet and dry screening processing plants for full beneficiation in the industries that it supplies. It produces 220 000 tons of wet sand per year consisting of 160 000 tons per year of glass sand and 60 000 tons per year of float glass sand and 80 000 tons per year of dry sand for the filtration and other industries.”

“The mine’s policy is that everything that it creates should be saleable and conform to all environmental policies. The specifications of the silica sand that are required for the industries that it has been servicing up until now has resulted in a sizeable amount of ‘waste’ sand being available for further processing.”

**Sand manufacturing experience**

“My partner in the JV agreement with the Silica Quartz mine, Johan Stoltz, and I have had many years of experience ‘manufacturing’ silica sand for the foundry industry. We both worked at the processing facility producing foundry sand from the alluvial sand deposit located at Donkerhoek near Cullinan, before the company was sold.”

“During that period we designed and manufactured the equipment that when it had processed the raw material, it was a sought after product in the foundry industry.”

“We have now put this experience into practice in the new venture that materialised because of the need by the Silica Quartz mine to process waste material from the primary manufacturing operation. We analysed the material and found that it would be a perfect silica sand for the metallurgical and foundry industry, once we had done further processing. The reserves of the mine are more than 25 years so we do not expect to be compromised on supply.”

**New processing equipment**

“Even though the material has already been through a washing cycle the initial processing of our product begins on the 250 ton-per-hour primary wet screen before being fed into our fully automated, PLC controlled hydro-sizing plant, where the loadcells and linear actuators are in 24/7 communication. This allows us to cut material to precise AFS specifications with a consistent 98.5% grade.”

“This hydro-sizing plant consists of a jet-sizer that splits the material into five different sizes and, eight hydro-sizing boxes – two sets of four that run parallel. Our IP on this plant
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Supplies welding powders, optical consumables, cobalt sulphate and carbon products to a diverse spectrum of industries.

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Supplying ore, ferro alloys and metals on a global scale.

Rotary Kiln
Our established partnerships with the cement and lime industries enables us to remain the preferred supplier of refractory and technical support to this market.

Fibres
Manufacturer and supplier of both steel and polypropylene fibres into the concrete and monolithic refractory industries.

Powder Coating
This newly introduced division supplies quality coating powders into the metal finishing industries.

Refractory Division
We specialise in the design and supply of refractory products to the metals and furnace building industry.

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is in the dense media separation on the silica quartz sand. Sizing takes place physically on the grain. This is followed by sieve analyses of the feed and we have found that over 85% of our grain sizes meet the AFS grading requirements.”

“This consistency of grain size, which includes roundness, allows users to reduce resin consumption and the stability increases productivity, thus saving on costs. Because of the consistency of the material, coating on the sand is regular and this in turn decreases gassing problems while giving superior permeability on the moulds and cores.”

“This plant is a critical element of the whole process and with all the automation and technology that we have incorporated, it is not a ‘throw together’ plant.”

“We are currently producing 125 tons-per-hour of sand but the plant has the capacity to go up to 250 tons-per-hour or 30 000 tons-per-month. If we increase the input of our wet screening process, we can increase our capacities according to demand.”

New drying equipment

“One processed through the hydro-sizing plant, material is stockpiled according to its grade. From there it is transported to our rotary drum drier. Again, through Johan’s technical and mechanical experience and having been involved in the sand manufacturing industry for many years, we incorporated our own IP into the new rotary drum drier specifically designed to dry silica sand.”

“This consistency of grain size, which includes roundness, allows users to reduce resin consumption and the stability increases productivity, thus saving on costs. Because of the consistency of the material, coating on the sand is regular and this in turn decreases gassing problems while giving superior permeability on the moulds and cores.”

“All dried material is stored in a purpose built 3 000m² under roof building, again according to specification. Silica Quartz manufactures the full spectrum of AFS specification foundry sand. This includes AFS 25/35, AFS 45/55 and AFS 60/70

“Currently we are processing between 50 and 60 tons-per-hour in this plant. All dried material is stored in a purpose built 3 000m² under roof building, again according to specification.”

“Delivery to client is done via our dedicated bulk tanker service.”

Foundry sand product

“More than 70% of our product is being delivered to foundries throughout South Africa. The primary target market is ferrous foundries. However, all other types of foundries use our product including the whole spectrum of non-ferrous foundries. For example, the AFS 60/70 specification that we manufacture is used by bronze foundries that are wanting a very fine or smooth finish to their castings.”

“This same AFS 60/70 specification is also widely sought after in the refractory industry and it is a market that we will be targeting.”

“We manufacture the full spectrum of AFS specification foundry sand. This includes AFS 25/35, AFS 45/55 and AFS 60/70.”

“Industrial sand plays a critical role in the production of a wide variety of ferrous and non-ferrous metals and castings and is an essential part of the ferrous and non-ferrous foundry industry. Metal parts and components ranging from engine blocks to pumps and valves are cast in a sand and/or clay mould to produce the external shape, with a resin-bonded core creating the desired internal shape. These are costly components to produce and any defects or flaws found in them can have a devastating result on the foundry. If we can help with reducing scrap rates and reworking by supplying the foundries with quality sand, then we feel we have achieved our aim.”

For further details contact Le Roux Roets of Silica Quartz on 083 309 9955 or TEL: 013 665 7900 or visit www.silq.co.za
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KPL Die Casting comes of age

The month of August marked a significant milestone in the history of KPL Die Casting, an aluminium and zinc high-pressure die-casting foundry located in Germiston South, Gauteng.

“We have been in business for a full 21 years now so you could say we have come of age. During this period, we believe that we have developed a reputation in the high-pressure die-casting industry for consistently delivering high quality products on time and, to budget. This is endorsed by the loyalty of some of our 30-odd clients that we have which, relatively speaking, is a small number. Two of these clients showed faith in the business in the beginning and they are still our major clients these days. That says something,” says the entrepreneurial owner Sally Marengo, who runs the company with her husband Guiseppe, the engineer and trouble shooter on the manufacturing side.

Sally started her first business in 1992 importing bathroom accessories. However, a flood of similar imported products and logistical problems convinced Sally that local manufacture of niche product was a better alternative and this is how the foundry evolved.

With Guiseppe in tow, Sally made frequent trips to the local appliance stores to see where they could replace white goods components with a better and cheaper alternative. The first order came from a well-known manufacturer of fridges. Sally boldly told them that the fridge door hinges were over engineered and that KPL could save them large amounts of money. Once she had proved this to them, an order for 15 000 components was placed and Sally has not looked back.

Initially three high-pressure die-casting machines were purchased to cast only zinc components and this material was the main focus of the company for some time. However, subsequently a 350-ton high-pressure die-casting machine with an automatic ladle was purchased, when aluminium die-casting was introduced into the foundry. Despite the introduction of aluminium, zinc components still made up the majority of the majority of castings that the company was...
producing monthly. This ratio has gradually changed over the years and today KPL Die Casting casts more aluminium than zinc castings.

The aluminium side of the foundry is primarily casting components for the automotive industry, sanitary ware, lighting and mining industries and the zinc side is casting components for the sanitary ware and automotive industries.

Toolroom and machining

KPL Die Casting has evolved from just being a high-pressure die-casting business into a facility that offers tool and die manufacturing and maintenance as well as offering machining services.

“The talk in the machine tool industry is all about multitasking machines - milling and turning for example. Well
we decided from early on that we had to be a company that could multitask and having its own toolroom that could also offer machining services was a natural progression.”

“Toolrooms play a crucial role in supporting the daily production of many high-pressure die casters or any production manufacturer that uses a tool or die to shape or form the same component repetitively.”

“Because they serve primarily in the background, toolrooms can become almost invisible features in many companies. For this reason, the toolroom’s inherent capabilities are usually taken for granted.”

“But at the same time they can become expensive overheads if the machines are not put to their full use or capabilities. Hence, we have made ours into a machining facility as well. It is generally repetitive machining but it is also another service that we can offer to our customers.”

“Currently we have three CNC lathes, two CNC vertical machining centers, a surface grinder and a spark eroder in this department.”

New equipment

The last 18 months has been a big growth period for KPL Die Casting in more ways than one. First came a new Bruker spectrometer followed by the installation of two new ‘smart’ die-casting machines from Italian manufacturer Idra Presse.

“The first machine is a 700-ton high-pressure aluminium die-casting machine and the second one is a 200-ton zinc high-pressure die-casting machine. Both machines are the biggest and operationally represent the most technically advanced machines that we have invested in, which in itself brings new headaches but pleasant ones.”

“For a while now there has been a trend to convert sand castings into die-castings because of the need by castings buyers, especially in the automotive industry, for well-formed parts formed with metallurgical certainty, mechanical soundness, and excellent surface qualities. Also driving automotive designers toward die-castings has been the ongoing effort to make vehicles lighter and more fuel-efficient. The ability to die-cast complex parts in aluminium and nonferrous alloys, now in larger dimensions, is an ideal match for this automotive prerogative.”

“Coupled with these trends was our capacity inhibitions and quality control. Larger high-pressure die-casting machines also means that we can produce larger die-castings.”

“Simultaneously we also invested in new auxiliary equipment such as a vacuum density tester, a new nitrogen degassing system, a new 800kg melting and tilting gas fired furnace, a new 500kg gas fired holding furnace and a 300kg transport ladle. Additionally, we have purchased a forklift attachment first to transport the ladle from the melting furnace to the degassing machine and then on to fill the holding furnaces of the individual die-casting machines. All of this equipment has been supplied by Silca Southern Africa.”

Safety and environmentally conscious

“To fulfill our safety and environmentally conscious
conscious concerns all of our existing equipment and the new machines have been filled with Ecosafe Plus hydraulic fluid. Ecosafe Plus is a water-based, non-flammable, biologically degradable and environmentally compatible hydraulic fluid with an innovative, glycol-free formulation based on a mixture of polymers, poly-alcohols, esters, corrosion-inhibitors and anti-oxidation agents."

“In use Ecosafe Plus demonstrates very stable physical and chemical properties (%-H2O, viscosity, pH etc.) by reason of its high lubricity and the great stability of the raw materials from which they are manufactured.”

Ntinga Project finalist

“During this period we have also been fortunate enough to be named as one of the finalists of the Ntinga Project, an initiative by Volkswagen South Africa (VWSA) to identify and develop black-owned component suppliers in South Africa. The initiative includes an intensive 18-month mentoring programme run by VWSA, the VWSA Learning Academy, the VWSA B-BBEE Trust and the Automotive Supply Chain Competitiveness Initiative (ASCCI).”

“Gerhard Kotzee from the ASCCI – a dti sponsored initiative – is the mentor assigned to KPL Die Casting and his brief is to develop our company from being a third-tier component supplier to fulfilling the requirements of a first-tier component supplier for the automotive industry. The mentorship covers everything from administration, finance, production to delivery. This includes assisting with the implementation of the industry standards and quality process audits such as VDA 6.3, IATF and OSH on top of our ISO9001:2015 accreditation that we already have.”

“In brief KPL Die Casting is undergoing a complete overhaul of the whole company’s systems and processes. It is a deep and rigorous process but it will take the company from being structured to one that is highly-structured and meets the norms and standards that are required by the automotive industry market that we have been developing and growing in. Even I have to change my ways in how I run the company.”

“Despite this the benefits to the company and our non-automotive clients are enormous and, when our mentorship period is completed, we should be in a position to supply any automotive OEM in the future.”

“The support that we have received from the Trust goes beyond anything we received from any commercial bank. We have been able to increase our production capability as well as achieve leading edge technical capacity which has

Additionally, KPL Die Casting have purchased a forklift attachment first to transport the ladle from the melting furnace to the degassing machine and then on to fill the holding furnaces of the individual die-casting machines

Decorative castings for the sanitary ware industry

KPL Die Casting have installed a new 800kg melting and tilting gas fired furnace, a new 500kg gas fired holding furnace and a 300kg transport ladle. All of this equipment has been supplied by Silca Southern Africa
Some of the dies that KPL Die Casting uses

unlocked new markets."

Undaunted that she is one of a handful of women heading up her own foundry in South Africa, Sally Marengo certainly knows her business and the high-pressure die-casting industry. She has been successful in building a business that currently employs 86 staff and now with her participation in the mentorship programme the business can only become even more successful.

“The saying goes that behind every man there is a good woman but in the case of KPL Die Casting the opposite could be said. Without Guiseppe at my side the company would not be where it is today. He is the engineer and over the years he has implemented many changes that have made our processes more productive and reduced our scrap levels. From the beginning it has been a priority of mine to involve myself on the manufacturing side so that I can feel confident when talking ‘engineering’. It is no good trying to implement solutions when you do not know what you are talking about.”

“I am also very fortunate in that I have a great engineering team and my right-hand lady, Debbie Derman, the financial wizard who has been with the company for 18 years. This somewhat lightens my burden of running KPL Die Casting.”

For further details contact KPL Die Casting on TEL: (011) 873 0264 or visit www.kpl.co.za
Carrol Boyes wanted her brand to live on ‘long after I’m gone’.
Here’s how the former teacher built a global business.

W
e learned recently of the sad passing of Carrol Boyes, a renowned South African artist and designer that skilfully combined the science of engineering with art to produce creative and highly-sought-after tableware. Products are made of aluminium, stainless steel and pewter and are either cast in the foundry or processed via stamping or pressing.

“T
“carol Boyes: Artist and designer

e really became my life. I worked into the night, generally finishing at around two in the morning. I didn’t have a part-time hobby really became my life. I worked into the night, generally finishing at around two in the morning.

man water jug

African artist and designer that learned recently of the sad passing of Carrol Boyes, a renowned South African artist and designer that skilfully combined the science of engineering with art to produce creative and highly-sought-after tableware. Products are made of aluminium, stainless steel and pewter and are either cast in the foundry or processed via stamping or pressing.

“I want this brand to continue long after I’m gone,” said the artist and businesswoman Carrol Boyes three years ago, in an interview published on her company’s website.

“To that end it’s very important to me to know that my family are involved in it and that they are part of the creative process.”

Both Boyes’s step-daughters Kim Jackson-Meltzer and Martine Jackson-Clotz are creative directors in the business, which the 65-year-old Boyes, who died in August 2019 after a brief illness, has built from the ground. She lost her life partner ceramicist Barbara Jackson to breast cancer at the age of 60 in 2010.

Her brother, winemaker John Boyes, is also involved in the Carrol Boyes range of wines and champagne. They grew up in Pretoria and on a farm her father owned in Tzaneen.

At age nine, Boyes became obsessed with drawing portraits, and at the back of a comic book saw an ad for a contraption that would allow her to draw a perfect, life-like portrait. She ordered it immediately, but it didn’t work.

“I then realised that no instrument will do it for me. I will have to do it myself.”

She went on to study sculpture at the University of Pretoria, and worked as an English and art teacher for many years. While teaching in Hout Bay, she finally decided to give up her day job.

“When I turned 35 I decided the time had finally arrived to turn my passion into a business,” she told Prestige magazine.

“I saved for around six months in order to be able to support myself and then I resigned from my job. It was 1989 and I already had the basement studio in my home, and so what was a part-time hobby really became my life. I worked into the night, generally finishing at around two in the morning. I didn’t want to look back and know I hadn’t tried my best to make it work.”

Her first creations were jewellery made from clay and cuttlefish, and she then moved on to copper, which she dipped in her swimming pool to create a patina on it, according to a feature by writer Chris von Ulmenstein.

Once, she couldn’t find any metal for jewellery, and out of desperation melted her own pieces (some gifts from ex-partners) as well as jewellery from her mother and grandmother to create new products to sell. Boyes says she took a very conservative approach to building the business, and bought only materials and equipment when she could afford it.

She eventually started creating cutlery, which long fascinated her. Growing up “with only the serious Victorian stuff in the house, I couldn’t understand why we didn’t have anything that was fun to use,” she said.

She sold her creations on weekends at Green Market Square in Cape Town. When her products were featured in the media, demand grew to the extent that in 1992, she opened a factory on her father’s farm in Limpopo. The company also eventually opened a facility in Paarden Eiland in Cape Town.

According to Prestige magazine, a demand for cutlery that could go into a dishwasher encouraged Boyes to explore cutlery made from stainless steel, and she eventually bought a stainless steel cutlery company, which manufactured items for the airline industry.

“Growing up with the brand, I remember we started selling products on Green Market Square and a few years later we were opening up our own retail stores (and) selling to 51 countries around the world,” said her step-daughter Kim Jackson-Meltzer.

“Exporting (was) one of the biggest challenges,” Boyes told Lionesses of Africa. “It requires endless perseverance and persistence, the resilience to compete in a world in which you are completely unknown, and more financial resources than you ever anticipate.”

There are currently 45 Carrol Boyes shops across the country, and staff own a 20% stake in these outlets. Recently she admitted that “the business side burns her out” and a chief operating officer was appointed to run the business.

However, she still designed the company’s products before her death. She sculpted designs in Plasticine, where after the company’s art department would “fine-tune” her designs, using silicone and fiberglass before casting the final design in resin.

All the pewter, stainless steel and some of the aluminium products are manufactured in-house.

“Nobody in the world forges stainless steel like we do,” Boyes said.

In a video on the company’s website, she added that it was never her intention that the business would grow to this extent.

“It surpassed my wildest dreams and I would like to know that from a South African point of view that it remains a South African icon and that the South African public can be proud that we have created this brand that can go across the world.”

Her own favourite pieces are the Man water jug and the Soul mates salad service, she added.
Two years ago, Silca South Africa introduced Ecosafe Plus to the South African market with a mission to educate the local manufacturing industry about the benefits of the product and its environmentally friendly properties that had been accepted worldwide.

“Ecosafe Plus was developed by Italian company Foundry Alfe Chem and the University of Torino and Silca Refractory Solutions, an internationally operating service and sales company of the Calsitherm group that specialises in high temperature materials as well as lightweight thermal insulation in different fields of application. Silca Refractory Solutions have signed an agreement to market the product in Europe and Africa. The German manufacturer of calcium silicates has been developing innovative products to improve both safety and productivity. In refractory technologies, they cover areas in a wide variety of industries, ranging from aluminium casting to domestic fireplaces and chimneys to heat treatment plants,” explained Alex Saam of Silca South Africa.

“Ecosafe Plus was a new product that represented a breakthrough in the class of non-flammable hydraulic fluids. Ecosafe Plus is a biodegradable hydraulic fluid particularly suitable to be used in hydraulic circuits located near sources of heat, due to its complete non-flammability. Ecosafe Plus’ formulation is glycol-free and, compared to traditional water/glycol based hydraulic fluids, it allows for easy disposal of the exhausted fluid and it is recognised to be environmentally safe - a big factor in the European countries and the rest of the first-world industrial nations,” continued Saam.

“The product was rapidly accepted by many manufacturing industries including die-casting and metalworking companies servicing the automotive industry, rolling mills, equipment manufacturers, material drawing companies, extrusion and forging companies, as well as aerospace companies such as Airbus and Aerospatiale. Great reference points for us to start off with.”

**Application**

“Thanks to its absolute non-flammability Ecosafe Plus is suitable in particular for hydraulic circuits in the direct vicinity of heat sources. The product has an extraordinarily long life and the optimised performance characteristics of the individual components in the formulation give the product its outstanding lubrication properties.”

“Additionally, it has a high compatibility with most of the seals and the elastomers normally used in hydraulic plants.”

“Areas of application for Ecosafe Plus include pressure casting machines, foundry machines, centrifugal casting machines, continuous casting facilities, forging and extrusion presses, reels for bar and strip steel as well as upenders, billets, furnace charging and tipping devices, coke oven door mechanisms, clamping devices for welding, cranes, lifting devices and elevators, forklifts and glass forming machines.”

**Local acceptance**

“We are very pleased with the local acceptance of the product. We have now successfully implemented the system in Borbet SA, Supreme Spring, Pressure Die Casting, Hulamin and KPL Die Casting and are currently implementing it at a large manufacturer of aluminium wheels in South Africa. With these clients for their existing machines we have replaced the hydraulic fluids with Ecosafe Plus and for any new equipment that they have purchased recently they have used Ecosafe Plus from inception or once the machine has been commissioned.”

“We are starting to gain momentum in the local manufacturing industry. Like any new product you have to build up the trust, and once the client experiences the benefits he is convinced. Besides being fire-resistant and environmentally friendly, Ecosafe Plus has very stable physical and chemical properties and is environmentally friendly. Additionally, the client can claim credits against CO2 emissions for the carbon footprint regulations when using Ecosafe Plus.

**For further details contact Silca South Africa on TEL: 011 825 0522 or visit www.silca-online.de**
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Akhani 3D commercial additive manufacturing service bureau launched by local experts

Company offers a turnkey AM production service including design, optimisation and finishing.

“Akhani 3D, a newly established venture between Rapid 3D and Kemtek, has been created to meet the rising demand from within the manufacturing sector for a turnkey AM (Additive manufacturing/3D printing) production service that translates ideas into objects as efficiently as possible,” said Akhani 3D Managing Director David Bullock.

“We are leveraging 15 years of experience in an industry that has seen notable shifts recently. AM is no longer a trend on its way into the mainstream, it’s a serious global business. With new innovations reaching the market constantly, it’s a challenging world to navigate. AM machines are getting faster, design tools smarter and the portfolios of materials and finishes ever more suited to industrial applications. Some of the world’s largest companies are making increased investments in AM, with GE, HP, BASF and Siemens all vying for position,” continued Bullock.

“Additive manufacturing has sidestepped age-old design, tooling and production problems more effortlessly than anyone a decade ago thought imaginable. The ability to consider a component holistically and design specifically to purpose is changing the nature of the $12 trillion manufacturing sector, shortening supply chains, spearheading innovation and significantly reducing time to market,” stated Bullock.

“The promise of full serial production is drawing ever closer, with the industry driven towards the holy grail of delivering high volumes of reliable product at lower costs than traditional processes.”

“Rapid 3D launched when 3D printing was in its infancy, not just in South Africa, but globally. It’s an industry that has progressed at a staggering rate, and through the years we’ve filtered out the noise to pinpoint the processes that deliver real value,” explained Bullock.

“Kemtek Imaging Systems is a specialist supplier of leading internationally renowned brands to the commercial print, industrial print, 3D print/additive manufacturing, auto identification, barcoding and labelling industries in sub-Saharan Africa.”

“Akhani is taken from the Zulu word meaning ‘to make’. Under the vision of ‘Make Possible’, the goal at Akhani 3D is to unlock value through product innovation.”

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“Akhani 3D has been established for two reasons. The first is the growing demand among our clients for cutting-edge manufacturing technologies that speed up their research and development workflows. The second is recognising that the AM industry has reached a level of maturity where the costs, quality and time factors have converged to make scaling production feasible,” said Pauline Bullock, Akhani 3D’s Director of Operations.

“Akhani 3D’s expert team will provide traditional manufacturers with access to industry-leading additive manufacturing production processes that deliver a clear competitive advantage,” continued Pauline Bullock.

“We have recently added the EOS M290, what we believe is the industry benchmark in the industrial 3D printing of metal parts, to our arsenal of 3D machines. With a building volume of 250 x 250 x 325mm, the EOS M 290 is ideal for manufacturing highly complex DMLS components from aluminium and steel in a range of quality grades, the investment has unlocked new possibilities for Akhani 3D’s clients, as the EOS M 290 allows for a fast, flexible and cost-efficient manufacturing process.”
effective production of metal parts directly from CAD data,” said Pauline Bullock.

“Hailing from far ranging industries and disciplines from mining to mountain bikes, Akhani 3D’s clients include Pyga, who build a world renowned range of bespoke trail bikes. Akhani 3D have also played an instrumental role in honing the design of their premier Slakline enduro bike, reducing its weight while building frame strength and durability.”

“For Raptor Rescue, Akhani 3D built solar powered GPS units to track and monitor birds of prey, providing their team with the ability to quickly respond to poisoning sites to save critically endangered vulture species.”

“As technologies have advanced, components have moved beyond the arena of R&D and on to the production line. Consider the aerospace industry. Subject to some of the world’s most stringent performance standards, the ability to develop high performance, lightweight components individually has had far ranging implications in both commercial and military applications. With the rise of additive manufacturing, Boeing has completely overhauled its engineering model, developing a new design approach that considers every mechanical element individually, managed by a single design engineer.”

“A similar revolution is currently underway in the medical field, where high tensile, flexible and biocompatible substrates are transforming surgical implants, dentistry, prosthetics and countless other applications.”

**Turnkey AM production service**

Akhani 3D will be offering a turnkey AM production service that includes design, optimisation and finishing. The company also offers Stereolithography (SLA/DLP); Selective Laser Sintering (SLS); Fused Filament Fabrication (FFF); Composite (FFF); ColorJet Printing (CJP); MultiJet Printing (MJP) and Direct Metal Printing (DMP/DMLS), as well as a full finishing and colouring workflow.

For further details contact Akhani 3D on TEL: 033 330 2936 or visit www.akhani3d.com
U

S-headquartered Allied Mineral Products, Inc., a
producer of monolithic refractories for the foundry, steel
and aluminium industries, has had an association with
and Metallurg South Africa (Pty) Ltd., which subsequently
changed its name to Insimbi Alloy Supplies after a MBO in
2005, formed their joint venture company - AMETSA (Allied
Metallurg South Africa) - in August 1997 and initially operated
primarily as a sales organisation until June 1998, supplying
monolithic refractory products to the South African market,
manufactured by Allied Mineral Products, Inc.

During this period a manufacturing facility was being setup
in Germiston, Johannesburg, and the company began
supplying locally manufactured product in March 1998. At the
time the South African manufacturing plant was Allied Mineral
Products, Inc.’s second manufacturing operation outside of
the USA.

AMETSA manufactured a complete range of monolithic refractory products, including dry vibratables, low-moisture
castables, castables for aluminium, coreless and channel induction furnaces, ladles and pouring units, blast furnace trough systems, arc furnaces, aluminium reverb and holding furnaces, in addition to plastics and ramming mixes for the South African market.

In December 2004 AMETSA expanded its manufacturing and warehousing facilities. The expansion doubled the existing facility to 4 000m² under roof.

Allied Mineral Products South Africa

Then in January 2008 Allied Mineral Products, Inc.
acquired the remaining 49% shareholding of AMETSA from
their joint venture partner Insimbi Alloy Supplies. The name
AMETSA was dropped completely and the company was
renamed Allied Mineral Products South Africa.

The primary function of the South African operation is to
design and manufacture monolithic refractories for the
foundry, aluminium, steel, cement, power, minerals
processing, boiler, heat treating, forging and industrial

What comes next for Allied Mineral Products South Africa: Manufacture of precast refractory shapes
markets. Allied Mineral Products, Inc. has designed, manufactured and sold monolithic refractories for the foundry industry since 1961. The company was founded on supplying product to the foundry industry before expanding to manufacture refractories for the integrated steel and other industries.

The next big development for the local company came in 2016 when it moved from its Waddeville facility to its current position in Gosforth Business Park in Germiston. Again the company doubled the size of its manufacturing and warehousing facilities to 8 000m² under roof.

“The extra space has allowed us to optimise our manufacturing process from delivery of raw material to dispatch of final product. In between we have the mixing department and the batching plant,” explained Clinton Pretorius, Managing Director of Allied Mineral Products South Africa.

“Raw materials and final product are easy to transport as

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ECOSAFE PLUS 46 is a non-flammable water-based, biologically degradable and environmentally compatible hydraulic fluid with an innovative, glycol-free formulation based on a mixture of polymers, poly-alcohols, esters, corrosion-inhibitors and anti-oxidation agents, which are all in total solution with water. In use ECOSAFE PLUS 46 demonstrates very stable physical and chemical properties as well as creating credits against CO₂ emissions in the carbon footprint regulations.

**Application**

Thanks to its absolute non-flammability ECOSAFE PLUS 46 is suitable in particular for hydraulic circuits in the direct vicinity of heat sources. The product has an extraordinarily long life and the optimised performance characteristics of the individual components in the formulation give the product its outstanding lubrication properties.

**Some areas of application**

- Pressure casting machines
- Foundry machines
- Centrifugal casting machines
- Continuous casting facilities
- Forging and extrusion presses
- Reels for bar and strip steel as well as upenders
- Manipulators for bars and slibets
- Furnace charging and tipping devices
- Coke oven door mechanisms
- Clamping device for welding
- Cranes
- Lifting devices and elevators
- Forklift trucks
- Regulation and control technology
- Offshore industry
- Glass forming machines

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or visit www.silca-online.de
they are bagged but plant and equipment is a different story. Despite this our manufacturing was up and running in a relatively short period.”

“The plant consists of two batching lines that run parallel to each other so we can either run the same mix or different ones depending on sales requirements. We have over 2 500 recipes unique to Allied Mineral Products, Inc. The flexibility of our plant allows us to respond quickly to any urgent product request. However, before any changeover to a new batch the plant is flushed and cleaned to prevent any contamination.”

“Our quality control is carried out according to Allied’s global standard, a company that has been ISO certified since 1985. This includes strict raw materials qualifications and pre and post verification of every single batch is tested.”

“We are also focused on developing new products, improving existing ones and perfecting installation techniques. Product testing and development is conducted in Allied’s state-of-the-art research and technology centres and are vigorously tested in our modern labs that are tailored to unique installation and application condition requirements.”

“Stock holding of both raw materials and final product depends on our sales pipeline predictions but is not totally reliant on these forecasts. As most of our raw materials are imported from China, the US and other countries we do have a stock holding of between nine and 12 months. We will also buy locally but the supplier or mine will have to meet Allied’s specifications.”

“We have a bigger stock holding of raw material because the shelf life is a lot longer as compared to the final product once it has been through the mixing and batching plant.”

Graftech products

In 2018 Allied purchased the intellectual property rights to a collection of refractory cements and pastes previously owned by Graftech Advanced Graphite Materials. The purchase is in response to restructuring at Graftech Advanced Graphite Materials, which ended production of several staple products for the steel, ferroalloy and iron industries. Allied seized the opportunity to meet market needs. Allied now own and supply nine key products previously from the Graftech line, including carbon and graphite-based cements, ramming materials and grout, complementing Allied’s existing refractory solutions.

Allied markets its new products under existing trade names, such as C34 Cement and C46 Cement. These products joined Allied’s existing product line of clean-carbon mortars, grouts and ramming materials, marketed under the GC name.

Local manufacture of precast refractory shapes

“Allied’s first precast shapes facility was founded in 1995 in Columbus, Ohio when it acquired
Moulding sand is at the heart of the sand casting process. It must hold a shape well and capture the fine details of a casting, yet be permeable enough to allow gases to escape. Under the strain of having the moulding pattern removed from it, or while it is filled, it cannot crumble or sink on itself. When it is turned upside down it must not lose its form. Equally, the parts of a mould have to stay true while clamped together.

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American Precast Refractories. Since then, our precast capabilities have grown significantly with the expansion of our first facility and the addition of four others around the globe. Allied has become a leading manufacturer of custom engineered precast, pre-fired refractory shapes for a variety of industries,” explained Pretorius. “Some of our most popular shape capabilities include foundry crucibles, furnace structural parts, EAF deltas and spouts, tilters and skimmer blocks, incinerator shapes, and rotary furnace shapes.

We have application engineering capabilities that allow us to design and manufacture complex pieces of virtually any shape and size. Precast shapes can be designed and created based on existing drawings or an existing shape.” “Allied can manufacture precast refractory shapes from 1kg to 15 metric tons in our plants in Ohio and Alabama in the USA, Tianjin in China and Tholen in the Netherlands.” “Allied has now given us the go-ahead to manufacture precast refractory shapes locally. We have rented a facility across the road from our existing facility. It comprises two factories - one 2 800m² and the other 2 400m². Our manufacturing plant has been setup in the bigger factory and the other one will be occupied once we have created the demand for our product.” “The plant consists of a furnace manufactured by Technifurn and a mixing platform that consists of two Mud Hog 1-ton paddle mixers. Moulds are also made locally, either in wood or steel.” “You could describe it as diversification but we look at it as an extension of our local product offering and to meet the growing demands of our customers and their markets since we are taking know-how and IP from Allied who have been manufacturing the products since 1995.” “Precast refractory shapes are not mass produced, but purpose-made products for a specific application. Precast components are easy to install and examples are given where one precast block replaces about 30 bricks or an iron ladle can require as many as 3 000 bricks to build. However, only eight precast blocks are required to build the ladle.” “Our foundry shapes offerings encompass coreless furnaces, channel induction furnaces, cupolas, gas-fired furnaces, resistance rod furnaces, heat treating and forging furnaces, reverberatory furnaces, vacuum tundishes, transfer ladles, ductile treatment ladles, pouring tundishes/boxes, launders, centrifugal casting feed equipment and impact shapes.” “We also supply precast shapes for high temperature applications such as heat treating and forging and also an array of products for the other industrial applications such as fireplaces, woodstoves, pellet stoves, bio-mass stoves, indoor/outdoor wood boilers, gasifiers, other boilers, incineration processes, lime kilns, asphalt processing, cement manufacture, iron ore processing, power generation and waste to energy gasification processes.”

Steel industry

“We also offer a complete line of specialised precast, pre-fired refractory shapes for the steel industry including iron troughs, runners, slag runners, tilting runners, transfer equipment, blast furnace subearth/hearth, EAF roof deltas, EAF spouts and EAF electrode rings.” “Our long history is reflected in that our skilled engineering team employs a variety of programmes and calculations to create a custom refractory system for each customer. Our engineered solutions are based on equipment design, thermal considerations and material characteristics,” concluded Pretorius.

For further details contact Allied Mineral Products South Africa on TEL: 011 776 2400 or visit www.alliedmineral.com
Mining OEM specialist Metso, which recently announced a merger with Outotec, will discontinue its Isithebe foundry by the end of September 2019 resulting in the loss of approximately 200 employees. The foundry is located in KwaZulu-Natal half-way between Durban and Richards Bay.

In developing its global supply footprint in its minerals consumables business area, Metso says the decision to close Isithebe follows consultations in which it evaluated the closure or other alternatives. This undertaking will have a small negative impact on Metso’s third quarter result, the company said in an announcement on their website.

“Our strategy is to utilise synergies of the most efficient manufacturing and sourcing opportunities globally to ensure the best value, availability and quality for our customers. After careful evaluation of all opportunities for Isithebe, discontinuing the operation was identified as the only feasible solution,” said Sami Takaluoma, President, Metso’s Minerals Consumables business area.

“This is a very unpleasant but necessary action for us. We will focus on ensuring a sustainable transition for Isithebe as well as uninterrupted service to our customers.”

Metso’s foundries produce metallic wear part castings for the mining and aggregates industries. In addition to Isithebe, Metso has five of its own foundries globally and an extensive network of external suppliers.

**Metso Minerals and Outotec join forces**

In July 2019 Metso Corporation and Outotec Oyj announced that their respective boards have unanimously approved a demerger plan and a combination agreement to combine Metso’s Minerals business with Outotec.

The combined company, Metso Outotec Corporation had an illustrative 2018 combined sales and Adjusted EBITA of €3.9 billion and €369 million (excluding the impact of the €110 million provision recorded in relation to the ilmenite smelter project as described in Outotec’s 2018 financial statements). This represents an illustrative combined adjusted EBITA margin of 9.6% in 2018, excluding the benefit of the synergies described elsewhere in this stock exchange release, and also Metso’s recently announced acquisition of McCloskey International. Including McCloskey, illustrative 2018 combined sales would have been approximately €4.2 billion.

Upon completion, Metso will be renamed Neles Corporation and will be a separately listed entity focused on flow control, independent from Metso Outotec and 100% owned by Metso shareholders.

Both Metso Outotec and Neles will continue to be listed on Nasdaq Helsinki.

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**Metcast Technology Station**

The Metal Casting Technology Station (MCTS) is an initiative of the Department of Science and Technology (DST) managed by the Technology Innovation Agency (TIA) and hosted by the University of Johannesburg, at the Faculty of Engineering and the built environment.

The MCTS’ primary function is to act as a partner for metal casting industry in South Africa to provide technical support to improve the competitiveness of industry through:

- Applied research and development activities
- Technology demonstration and transfer
- Human Capital development
- Process and product development

The MCTS is ISO 9001:2015 certified with the following capabilities:

- Full green sand and chemical bonded sand casting facilities
- Mechanical and Metallurgical Testing (such as hardness, tensile and impact test) which is 17025 SAMAS accredited
- Material characterisation facilities using high level techniques such as Scanning Electron Microscope (SEM), X-Ray Diffraction (XRD), X-ray fluorescence (XRF)
- Small scale casting with 5kg and 50 kg melting furnace

The MCTS has a close working relationship with local partners such as the SAIF, WPTN, TLIU, Recaptivate Cluster Programme and international partnerships with IK4 Akerlan (Spain), Central Metallurgical Research and Development Institute (Egypt), Freiberg University (Germany), MPM Infosol (India) and the University Of Wisconsin Platteville (USA).

**Contact us for more information:**
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*Paul Kruger statue sells for R10.46 million*

The price for the bronze by renowned South African sculptor Anton van Wouw smashed world records for works by the artist and the price for any South African sculpture. The work is the maquette of the famous statue of Paul Kruger that stands at the centre of Church Square in Pretoria today. The sculpture features the Boer president in top hat, presidential sash and hallmark beard, writes Ufrieda Ho in the Daily Maverick.

And while the bronze in Church Square, sculpted in 1896, has remained steadfast on public display for decades, it’s the maquette that has had a quirkier back story.

To begin with, art specialist Dr Alistair Meredith of auction house Strauss & Co, which facilitated the sale, says the piece is unique and has glowing provenance. He also says it was highly prized by Van Wouw collectors, all of which added to the buzz around the sculpture before it went under the hammer at the Wanderers Club.

“The piece will remain in South Africa. It was denied a permit to be exported because it’s considered to be such an important historical and heritage art piece,” says Meredith.

Meredith says the plaster of pariscast was acquired by Sir Ernest Oppenheimer in the years after the Second Anglo-Boer War. Oppenheimer had a bronze cast in the Nisini foundry in Rome, to meet Van Wouw’s exacting standards. It became part of Oppenheimer’s private collection and was only brought out again for public display at Kruger’s funeral in 1904. Kruger’s body was repatriated from Switzerland where he had been in self-imposed exile.

In 1953, the one-metre-tall sculpture was sold by Oppenheimer to the Rand Club in Johannesburg for 125 Guineas, according to club records. It was probably a purchase that matched the changed political whims of the Nationalists in the Union Buildings.

The club chose to place its acquired Kruger at the entrance of its bar, facing off with Cecil John Rhodes at the opposite end. Rhodes was one of the founders of the Rand Club in 1887. He was also linked to the botched Jameson Raid led by Leander Starr Jameson over the New Year weekend of 1895-1896, which was meant to stir rebellion against Kruger.

“I have been a member of the Rand Club since 1975 and often thought about these two quite contrary figures and how they were placed at the entrance to the bar together. I think it was fitting, though, because they were figures who both represent a time in our history,” says Rand Club chairman Rick Currie.

Currie says it is a little sad to let the Kruger statue go, but he says it was a move that made financial and managerial sense for the club.

“The Kruger statue did have a long association with the club, but we knew that it was a piece that was worth quite a bit, so it was a good decision to auction off this one piece instead of lots of smaller pieces. The profit from the sale means we now have more financial muscle to make further advances on club projects and to ensure the club can run profitably,” he says.

The Rand Club is still playing financial catch-up after a 2005 fire that caused extensive damage to the Loveday Street landmark. By the late 1990s, it was also losing members, due to the exodus of big business in downtown Joburg, and suffering from the image problem of being dated and exclusionary rather than exclusive.

Brian Kent McKechnie, a younger member of the club, says the Kruger statue had for some time lost its appeal. Over the past two years, it had been moved from its prominent spot at the entrance to the bar to just outside the women’s toilets.

“No one even noticed that he had been moved. But the sale of the Kruger statue at the incredible price it went for means that it will be better loved and better appreciated by its new owners,” says Kent McKechnie.

In Kruger’s place (back guarding the bar) there’s a bust of Chief Albert Luthuli. This was a piece that was part of later acquisitions that now also include the giant John Meyer portrait of Nelson Mandela that has a prominent location above the grand central staircase in the club. Madiba was a member of the Rand Club.

Kent McKechnie says the club has over the years needed to change with the times, find contemporary relevance and innovate to meet the demands for modern convenience.

“You can’t erase history, but you can add layers to it to tell our collective heritage story,” he says.

The boon in profits from the auction (about R9.2m after deductions) means the club will be able to speed up on some of its capital projects.

Kent McKechnie says the club will revamp its billiards room as well as the bedrooms on the upper floors of the club, which has become an increasingly popular venue for functions and events.

“The presence of the Kruger statue in the Rand Club has always been rather odd and Kruger would never have set foot in a club of the ‘Uitlanders’, but from this auction, he’s ensured the preservation and sustainability of the club.”

“So now Kruger is — in endless irony — truly intertwined in the history of the Rand Club.”

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*Image: Picture Daily Maverick*
Gerhard Papenfus has also called for the scrapping of steel import duties, which he says are negatively impacting on South Africa’s downstream steel sector. “According to ArcelorMittalSA (AMSA), consumption of its steel has slumped to a ten-year low – falling to 70% of the consumption level achieved in 2008,” says Gerhard Papenfus, the CE of The National Employers’ Association of South Africa (Neasa).

“The foreign owned AMSA operates a 70-year-old antiquated steel mill which, both in terms of price and quality, cannot compete with international production facilities. However, instead of upgrading its mill, AMSA enjoys government protection, by means of import duties (currently 20%), in order to deter the steel downstream from importing cheaper, better quality steel.”

“This arrangement severely disadvantages the steel downstream, causing it to be uncompetitive and serving as a slow poison, gradually leading to the decline of the steel downstream, AMSA’s client base. It is quite amazing that AMSA, benumbed by its own short-term interests and survival, refuses to admit that the protectionist duties it convinced government to grant them, is contributing to the slump in South African steel consumption. The uncompetitive price of steel negatively impacts on the buying power of its customers - a vicious circle, a steel industry death spiral. It has also resulted in finished products now being imported, which, in turn, has caused job losses.”

Can South Africa afford AMSA any longer?

South Africa Incorporated has inherited the albatrosses of the likes of Eskom, SAA, the SABC and all the dysfunctional state-owned enterprises. Over and above these burdens, AMSA is forced down the throat of the steel downstream.”

“It is imperative that Government urgently decides which priority demands preference, either: AMSA – a self-serving monopoly primary steel producer or the steel downstream. A thorough assessment in this regard will have to be made urgently! Privileged and challenged to be South African. We are all in this together.”

AMSA and ESKOM

“AMSA’s antiquated steel mill is 60% less economic in terms of electricity usage. As a result, AMSA is currently pursuing tariff relief from Eskom. Should Eskom agree to that, the burden of paying for AMSA’s electricity usage will shift from AMSA to the South African public, including the steel downstream.”

“For AMSA to even contemplate such a scenario, within the context of the current steel/Eskom scenario is, to say the least, audacious. It clearly illustrates AMSA’s attitude – it is completely self-centred.”

“AMSA, South Africa’s steel monopoly, instead of investing to improve AMSA’s competitiveness, thereby offering to South Africa a quality product at a market related price, has become a liability to South Africa in general and the steel industry in particular.”

“South Africa Incorporated has inherited the albatrosses of the likes of Eskom, SAA, the SABC and all the dysfunctional state-owned enterprises. Over and above these burdens, AMSA is forced down the throat of the steel downstream.”

The Competition Commission has recommended that the Competition Tribunal approve the proposed transaction whereby Hulamin Systems intends to acquire the slab business of Isizinda Aluminium without conditions.

The Competition Commission has recommended that the proposed transaction does not raise any public interest concerns.

Hulamin (40%) and Bingelela Capital (60%) jointly own the slab cast house adjacent to the Hillside aluminium smelter in Richards Bay. This cast house also holds assets for rim alloy, extrusion billet and aluminium rod production. Hulamin and Bingelela have reached an agreement for Hulamin to procure the rolling slab assets from Isizinda.

The two shareholders of Isizinda Aluminium, Bingelela Capital and Hulamin Operations, have agreed on a restructure of Isizinda whereby, inter alia, Hulamin has purchased the rolling slab casting business and assets from Isizinda, subject to regulatory approval, and entered into a lease agreement with Isizinda to continue operating this casting facility. The shareholders of Isizinda have also agreed to pursue the sale of the property, subject to Isizinda’s continued right of occupation in respect of the property, once the subdivision of this property from a larger site owned by South32 has been concluded.

The decision to restructure the business served as an indicator for impairment. An impairment test was conducted and it was determined that the carrying amount of land and buildings exceeds the recoverable value of the property. The property was thus impaired to reflect its recoverable amount, which in this case represents the fair value less costs to sell. The recoverable amount was determined to be R68.7 million. The fair value of the property is level 2 in the valuation hierarchy. The fair value of the property was determined with reference to market-related rental prices per square metre, accepted vacancy rates and maintenance costs per square metre. An independent valuator was used to determine the fair value less costs to sell.

In April 2015 Isizinda Aluminium announced the acquisition of the Bayside casthouse in Richards Bay, KwaZulu-Natal from BHP Billiton. At the time Isizinda concluded a five-year metal supply agreement with BHP Billiton that liquid metal would be supplied by the nearby Hillside smelter directly to the Bayside casthouse. Hulamin in turn concluded a matching slab offtake agreement with Isizinda, with an estimated value of more than R10 billion over the five-year period.
ZF Lemförder SA (PTY) Ltd opened a new plant in East London in May 2019. Only nine months after the nomination, the new Plant commenced production of front and rear axles for its customer, Mercedes-Benz South Africa.

“We are expanding our global footprint by opening our new plant in East London. Additionally we are strengthening the relationship with one of our strategic customers and with the region,” states Dr. Peter Holdmann, Head of ZF’s Car Chassis Technology Division.

Proximity to international customers is of great significance to the ZF Group to ensure a just-in-sequence supply chain. Following the ‘local for local’ principle, ZF will continue to consistently expand its global market presence. As a new supplier in the East London Industrial Development Zone (ELIDZ), ZF Friedrichshafen AG will contribute to the growth of the automotive industry in the region as well as its own market presence.

At the newly established East London facility, ZF currently employs 200 people. The new plant has a production capacity of up to 150 000 axle sets per year. The chassis, including all actuators and axle systems, will continue to play a central role in the safety, comfort and efficiency of vehicles in the future. In South Africa, ZF is present in five locations: Cape Town, Pretoria, Johannesburg, Durban and East London. With 460 employees, the company achieved sales of €175 million in 2018.

*ZF has recently celebrated the manufacture of its 500 000th AKC (Active Kinematics Control), an active rear-axle control system. ZF has reached the half-million mark in just under six years from start of production. The AKC rear-axle control system provides meaningful advantages, especially in critical driving situations and during braking.*

**ZF Group is a global supplier**

**Strengthening partnership with Mercedes-Benz South Africa**

Mercedes-Benz South Africa (MBSA) is proud to announce its partnership with global technology company, ZF Friedrichshafen AG in the region. Based on a project called Vertical Integration, ZF supplies MBSA with front and rear axle modules. As a leader in the automotive industry, Mercedes-Benz constantly works towards the contracting of suppliers that will contribute significantly to the implementation of the company’s strategy of value creation, quality and innovation.

“Through the reduction of our own vertical integration, the company seeks to further contribute to the creation of jobs in the supply chain industry, increase transformation efforts and ensure long term sustainability of the next generation of vehicles at MBSA,” said CEO of Mercedes-Benz South Africa and Executive Director for Manufacturing, Andreas Engling.

It is a Daimler plant standard to increase production capacity and flexibility in order to achieve higher volumes in a shortened space of time. The new project will allow the Mercedes-Benz East London Plant to increase volume outputs, optimise the assembly line and achieve commercial synergies. As with all other Daimler plants, axle assemblies are to be externally supplied by 2020. Through a rigorous commercial process, ZF was nominated as the axle assembly supplier in March 2018.
Manufacturing, and the automotive industry, is often seen as a gateway to inclusive economic growth. A well-developed manufacturing sector creates embedded jobs, deepens and broadens local value chains, advances technology, and supports local skills development. Because the automotive industry is such an important part of the manufacturing sector, many developing countries have incentivised domestic automotive production,” says Dr. Martyn Davies, Africa Automotive Leader, Deloitte Africa.

“In a newly released report called Rooting SA: Strengthening the local automotive industry, Deloitte Africa unpacks important enabling factors for meaningful localisation, which would also assist in deepening automotive investment into even wider socio-economic gains.”

The automotive industry in South Africa

“For decades, the automotive industry has been fundamental to South Africa’s economy. In 2018, the sector directly employed around 110 000 people and contributed a total of 6.8% (4.3% manufacturing and 2.5% retail) to gross domestic product (GDP). Through policy intervention, the South African Government seeks to further entrench the auto industry through a greater set of local content targets.”

“Last year Cabinet approved the South African Automotive Masterplan (SAAM) 2035 alongside amendments to the Automotive Production and Development Programme (APDP), which is expected to take effect in 2021. The changes emphasise localisation, intentionally shifting focus from imported to local content. The SAAM provides a vision for the industry and aims to increase the use of locally manufactured components in domestic vehicle production from 39 to a lofty 60 per cent.”

Enabling meaningful localisation

“However, legislation alone is not enough to unlock the full potential of the local automotive industry. Below are insights on developing meaningful localisation drawn from interviews conducted with various automotive stakeholders. Three key themes emerged.”

“One: The will to improve current inefficient structures in both the public and private sectors. Such improvements include much-needed structural reforms, more efficient use of special economic zones, lower administrative burdens, prioritisation and alignment of key policies and increased transparency from OEMs.”

“Two: With current production volumes around 600 000 vehicles, scale is one of the most pressing challenges facing the South African automotive industry. The industry will need to find alternative methods to stimulate demand, while the domestic economy is weak and unlikely to yield significantly more demand in the short term. This could include stimulating demand through more comprehensive regional integration, incentivising South African consumers to buy locally produced vehicles and deepening cross-industry value chains.”

“To grow and support local manufacturers as envisioned by the SAAM, it is crucial for the industry to understand the type of upskilling needed. In South Africa, as the skills spread is wide, blanket-approach incubation programmes are often less effective. Instead, skills training needs to be tailored for individual business’ needs. This requires developing successful localisation strategies to grow and support local suppliers sustainably based on their individual needs and aspirations.”

“Three: The SAAM and the APDP amendments have highlighted the importance of meaningful localisation within the automotive industry. The reasons are clear: it can generate high-value economic activities, improve living standards and create higher-paying jobs. Of course, continuous increases in productivity are essential throughout this process.”

“Nonetheless legislation alone is not enough to unlock the full potential of the automotive industry. Meaningful localisation requires a shift away from a compliance-driven mindset, towards value beyond compliance thinking to address key areas and unlock the industry’s full potential.”
In an interview with Willie Nicklin, Commercial Manager for Imerys in South Africa, Nicklin said: “The final quality of the metal casting is the result of a tremendous amount of controlled parameters inside the foundry. On a daily basis, parameters such as pouring temperature, sand quality, moulding conditions, etcetera are leveraged by metal casters to balance quality versus the yield of production, which usually have an opposite trend.”

“The moulding sand and the sand used for core making have a direct impact on the casting quality, and thus on the efficiency of production. The use of special sands has been widely spread to reduce sand fusion, metal penetration, and veining. Despite the high price, such product choices can generate significant savings in the foundry process, particularly referring to the lower scrap percentage as well as the shorter finishing time. On top of that, nowadays, health and environmental conditions are critical and have to be taken into consideration when the sand type is chosen,” continued Nicklin.

“Two of Imerys’ sands, Kersand (AFS 60), which is mined and produced in France and Durandal 60 (AFS 50), which is mined and produced in South Africa, are now used regularly by sand casting foundries and tests show that they fulfill the requirements in terms of refractoriness and thermal expansion. The two products are similar, made with natural minerals. In addition, they are respirable crystalline silica free, and this over the several sand processes. The two sands are performing well in all steel alloys, cast iron and copper alloy foundries and are compatible with all types of binding systems (organic and inorganic), and furthermore, generate no low melting temperature point when mixed with silica sand.”

**Market conditions**

“Chromite is commonly used for its refractoriness properties as well as for its anti-veining characteristic. Nevertheless, in a two-year time period, chromite prices FOB in South Africa have more than doubled from the initial prices. This clearly shows the high volatility of the chromite sand market price and how it can have a considerable effect on pricing, especially in Europe. This is not surprising, considering that all South African producers are primarily in the ferrochrome business producing metallurgical grade, with non-metallurgical grades being produced as a by-product. The production cost of foundry grade chromite is considerably greater than the production cost of sintered metallurgical grade chromite. The majority of the chrome ore deposits are usually providing undesirable foundry properties due to their formation type, crystal size and impurities, therefore, extra processing is needed to reach the necessary final properties.”

“Special sand, even if used in a lower volume compared to silica sand (for instance 10%), can represent roughly half of the expenses when compared to silica sand, resin and coating cost.”

“New types of special sands were developed over the past 10 years, in order to improve the performance and compensate the high price volatility associated with the traditional chromite sand. Durandal D60 and Kersand are two natural mineral products that have been designed specifically to reduce casting defects and are respectively produced in South Africa and France. European sourcing is an important advantage considering logistic delivery delays as well as the geopolitics stability situation.”

**Technical considerations**

“Chromite sand is heavy and will need 40% more in weight to fill the same volume of cores compared to Kersand and Durandal 60. This is a key point regarding sand consumption. Indeed, loose bulk density is around 1.6 for Kersand and Durandal 60 whereas chromite sand lies at 2.7. This difference leads to immediate savings of 40% of sand consumption for a constant volume of core produced.”

“In a direct comparison of Kersand and Durandal 60 versus chromite sand, in terms of thermal expansion, both Kersand and Durandal 60 show linear expansion with temperature compared to silica, which exhibits the well-known transition quartz α to β at about 573°C. Furthermore, this expansion is low compared to silica and chromite. Thermal
expansion, on top of refractoriness, has a direct impact on veining defects. Anti-veining properties have been proven in numbers of foundries, in tough casting conditions for Kersand and Durandal 60 products.

“Iron casting has been performed with chromite, silica sand, Durandal 60, and a mix of Durandal 60 and silica sand cores. These cores were made with alkaline phenolic resin. Results show sand fusion defects when silica is used, and clean casting for chromite and Durandal 60. Furthermore, under those casting conditions it is demonstrated that a mix of 50/50 Durandal 60 and silica still leads to clean casting. Also, the cooling time of casting was simulated by using three parameters depending on the temperature (thermal conductivity, heat capacity, and density). These were calculated and measured per the hot wire method until 1 400°C on the bulk sand sample. Those simulations have shown a very similar solidification time for Kersand and chromite sand for a given condition (respectively 32min and 29min).”

Conclusion

“Some foundries switched from chromite to 100% Kersand or Durandal 60 for technical reasons (quality variation of chromite sand) as well as for health and environmental requirements (further regulation on Cr VI hazardness), but mainly for economic constraints. Use of low loose bulk density sand is a strong lever to reduce consumption of sand. Shifting from 100% chromite to 100% Kersand or Durandal 60 will intrinsically lead to an immediate saving of 40% of sand consumption for a constant core volume amount. It should also be pointed out that cores will be 40% lighter by using Kersand or Durandal 60 compared to chromite, which in terms of operator working conditions is a significant improvement.”

“Finally, raw material sourcing is critical in every industry. Its stability in terms of quality, cost and supply conditions, directly impact the quality and efficiency of the final application. We believe Imerys’ Kersand (AFS 60) and Durandal 60 (AFS 50) are definitely a realistic, relevant and sustainable alternative to replace chromite in sand casting applications,” concluded Nicklin.

Imerys supplies the foundry industry with high-performance minerals and innovative solutions for moulds and cores in sand casting and investment casting as well as refractory solutions for both ferrous and non-ferrous foundries. Besides Kersand or Durandal 60 Imerys supplies bentonite to various types of refractory sands and flours, coatings, green moulding sand additives for sand casting, as well as sintered and fused minerals for ceramic moulding, honeycomb casting filters, slag binders, insulation materials, including insulating feeders, mineral mats and insulating furnace and ladle covers, refractory compounds, resin coated sands, filtering systems, graphites and blackings to serve virtually any foundry application. Imerys is also one of the world’s leading producers of calcined products for the refractory industry.

For further details contact Imerys Refractory Minerals SA on TEL: 011 643 5880 or visit www.imerys.com
The worldwide aluminium foundry industry has been undergoing massive change for several years. Strong growth across the industry and significant changes in ownership have changed the industry dramatically.

Currently, far-reaching changes are to be expected again. The automotive industry, as the largest customer of the aluminium foundry industry, is facing a serious change. The demands for a drastic reduction of CO2 emissions are getting stronger. Weight reduction and e-mobility are identified as major levers. As a result, today’s article portfolio of the aluminium foundry industry will change ‘revolutionary’. Further challenges are the internationalisation, the introduction of new technologies and the important issue of employees.

In order to manufacture lightweight components, the focus is on aluminium as a material, which has to prove itself against other light metals. In addition to high costs, high energy consumption also plays a major role. Another challenge will be the ongoing parallel production of new electric motors and conventional combustion engines, which will initially even lead to an increase in the number of components. The ultimate impact on the foundry industry is not yet fully apparent. First indications of the extent and significance of the expected changes are given by the automotive industry itself.

Only a few years ago, the automotive industry significantly reduced investment and thus capacity in the in-house aluminium foundries. However, due to the high demand for new products such as structural components, delivery bottlenecks may now arise at smaller foundries. In order to prevent this, OEMs are currently investing in their own foundries again. As an example Audi built a new die-casting foundry for aluminium structural parts.

Only foundries that have short-term strategic answers to these major challenges will be successful in the long run.

This whitepaper contains:
Challenge 1: Internationalisation
Challenge 2: Product portfolio
Challenge 3: New technologies
Challenge 4: Employee recruitment

The 4-part series of articles presents estimates, expectations and recommendations for the challenges described above in the individual contributions. As only foundries with short-term strategic answers to these major challenges will be successful in the long term, the series of articles also provides practical recommendations for action.

For further details visit Spotlightmetal:
https://www.spotlightmetal.com/the-4-challenges-in-aluminium-high-pressure-die-casting-d-41056/
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The METEC Sub-Saharan Africa Workshop took place for the first time on June 26th, 2019 during the METEC/GMTN trade fair in Düsseldorf, Germany. Key players from Africa and Germany exchanged ideas on how to do business in Africa. The workshop focused on the challenges and opportunities of the African metallurgy market. Speakers from a variety of African and European countries and companies were invited to hold presentations and participate in panel discussions thus giving the international audience an excellent insight into the African markets. The workshop took place for the first time on June 26th, 2019 during the METEC trade fair in Düsseldorf, Germany. It was initiated and organised by africon GmbH in close cooperation with Messe Düsseldorf and The Mechanical Engineering Industry Association in Germany (VDMA) represented by Dr. Timo Würz, Managing Director of VDMA Metallurgy. More than 50 attendees participated in the high-level workshop.

The event was characterised by an open and lively exchange between all participants and panellists. Opinions were exchanged, similar and differing ones debated, and many conclusions drawn. Several key challenges not only to European firms, but to African nations and industries were identified.

The following recommendations arose:
1. European firms should consider Africa as a market. Although often small and sometimes challenging, some African markets can be very profitable and provide huge long-term growth opportunities. Many Africans already appreciate European quality
2. International firms have to understand that Africa is a huge and diverse continent. Especially smaller firms will not be able to deal with all countries at once. Clear priority countries have to be defined early on
3. Skills are a critical bottleneck. Training and education for staff is a key to success. Organisations like the German VDMA are in a position to support here as well
4. Providing adequate aftersales service is key for EU machine suppliers to African customers. To achieve this at reasonable costs, teaming up with other suppliers or utilising locally present external service providers can be beneficial. Creating service hubs in certain countries can be equally helpful. For example, Kenya can be used as a hub for East Africa
5. German firms often have to show flexibility in their commercial terms and conditions, as well as showcase cultural understanding for the other involved parties
6. German firms wherever possible have to check on their pricing models as this is still a huge issue. In that context, modular/scalable solutions are often highly appreciated. Offering German solutions made in lower cost countries like India can be interesting entry level options as well

African delegates that attended the workshop were from Kenya, Ethiopia, Nigeria, Tanzania and South Africa.

Eds Comment: As I said in the August 2019 issue of Castings SA the belief that South Africa is the only country on the African continent that the rest of the world focuses on must be dismissed. The honeymoon period for South Africa is over. The Government, from the State President down, needs to take note. What is happening in our country at the moment with regard to our fellow Africans is very disappointing (an understatement). The rest of the world has lost patience and has begun exploring other countries in Africa to invest in. This workshop is just one of many examples.
Stricter emission limits for formaldehyde, which will also apply to older plants as from 2020 onwards, present many foundries with an additional challenge. Hüttenes-Albertus (HA) is ready to provide its customers with appropriate solutions, namely specifically developed innovations for cold-box binder systems, additives and coatings.

In December 2015, the Federal/State Working Group (LAI) issued its recommendations on limiting formaldehyde emissions. The tightened limit values laid down therein affect general operating permits for plants. With the expiry of a transitional period, these limit values will also apply to older plants from February 2020 onwards. For the foundry industry, the lowest limit values apply according to these recommendations.

Today’s HA Cold-Box system no longer contain any free formaldehyde. This means that the stricter limit, which will see the volume of permitted formaldehyde emissions cut from 20mg/m³ to 5mg/m³, does not represent a problem in most process steps. Under certain conditions, however, formaldehyde can split off from the finished core. This happens mainly as coated cores are cured in gas ovens. Depending on various influencing factors, such as temperature, core geometry, air humidity and flow velocity, the new exhaust air limit of 5mg/m³ could pose a problem for a number of existing plants. There are a range of technical solutions for reducing emissions from plant equipment. However, these measures frequently involve higher building and technical licensing efforts as well as capital expenditure.

In order to meet the challenge of complying with the substantially reduced limits for formaldehyde emissions, HA, as a specialist for foundry chemistry, already offers its customers Cold-Box binders, coatings and additives that are specially tailored to their foundry-specific needs and actively bind formaldehyde and thus neutralise emissions.

With the opening of the HA Centre of Competence (CoC) in Baddeckenstedt in 2017, HA is in an even better position to test special applications on a practical scale outside the laboratory in order to develop new products and customise existing products for customers’ specific processes. In addition to classic core and mould manufacturing processes, the CoC’s facilities also include systems for a wide variety of other foundry processes, including robot-assisted sizing, core drying, melting units and casting lines, as well as modern manufacturing techniques such as 3D printing. HA uses these technical possibilities to develop solutions for tomorrow’s challenges together with its customers, and to offer a wide range of products for individual requirements.
German 3D printer manufacturer voxeljet has entered into an alliance with Loramendi, a Spanish tooling maker, and ASK Chemicals, a global foundry material-science company, to develop the Industrialisation of Core Printing (ICP) technology. Reportedly the world’s first fully automated 3D printed core production solution, ICP has been designed to produce complex sand core tooling for casting processes.

Using voxeljet’s additive manufacturing technology, ICP overcomes the design limitations associated with traditional core tooling, while also matching the conventional core making process in serial-production.

“We started nearly 20 years ago as a spin-off from Technical University Munich with a clear vision in mind: To match conventional manufacturing by constantly pushing technological boundaries,” said Dr. Ingo Ederer, Chief Executive Officer of voxeljet.

The ICP technology and partnership was officially launched at GIFA 2019.

ICP uses inorganic binder system on voxeljet 3D printer

Founded in 1973, Loramendi maintains a substantial background in designing and supplying solutions and turnkey projects for core making, moulding and casting services. Using this expertise, the company designed ICP as a core production line that is both 3D printed and fully automated, enabling high production flexibility. Loramendi aims to increase the opportunities of industry 4.0 for core making factories and foundries with the ICP technology.

“Loramendi has built equipment for the foundry industry for more than 45 years and nowadays enjoys world-wide prestige. We are really excited about starting this new journey that will completely transform the landscape of the foundry industry and set new standards for core making,” stated Joseba Goitia, General Manager of Loramendi.

In order to ensure the success of the ICP solution, Loramendi collaborated with voxeljet to leverage the company’s expertise in 3D printing, as well as precision mechanics, microfluidics and materials sciences. voxeljet provided the project with its new VJET X 3D printer, said to be over 10 times faster than its previous models.

Furthermore, ASK Chemicals, a supplier of casting materials, is part of the alliance to develop inorganic binding materials tailored to the requirements of the ICP technology. Its material expertise will potentially help ICP produce core tooling that meets the expected quality and productivity goals. The company provided its inorganic binder called INOTEC 3D, which was equipped on the voxeljet 3D printer. A two-component system, the INOTEC 3D consists of a printing fluid and promoter, applicable for hot-curing additive manufacturing processes. The INOTEC 3D binder will help the voxeljet 3D printer to produce sand cores with low finishing effort required, leading to castings with potentially high dimensional accuracy and surface quality.

“Printing has been used in the foundry industry for many years to produce prototypes and small series. However, with the development of ever faster printers, the technology now offers new opportunities for foundries. We are therefore very pleased to take the important step towards industrialised core printing with our alliance partners Loramendi and voxeljet,” said Frank Coenen, CEO of ASK Chemicals.
Tesla has wisely made arrangements to quieten all the critics crowing about its production capabilities - the company just obtained the patent for a giant machine that will create the entire body frame of a car in a single press. It’s called the Multi-Directional Unibody Casting Machine.

Tesla filed a patent for a casting machine that could help streamline production for future vehicle projects. The die-casting machine is likely to be part of several manufacturing improvements for its Model Y programme.

CEO Elon Musk has said Tesla is shifting to an aluminium casting design instead of stamped steel for the Model Y. Tesla’s patent is for a “Multi-Directional Unibody Casting Machine for a Vehicle Frame and Associated Methods.”

“When we get the big casting machine, it’ll go from 70 parts to 1 with a significant reduction in capital expenditure on all the robots to put those parts together,” Musk said in an interview last summer.

In the patent filing, Tesla said its new machine “may reduce costs associated with manufacturing including, but not limited to, factory operating costs, tooling costs, time, and other equipment and labor costs.” It also said the machine “may reduce a number of castings or actual castings required to cast a complete or substantially complete vehicle frame.”

“In some embodiments, multiple portions of the vehicle frame may be integrally formed or casted (sic) without the need for further assembly and attachment (e.g., welding, rivets, etc.),” Tesla said in the filing. “This may reduce a number of castings and/or steps for manufacturing or casting a substantially complete vehicle frame.”

As evidenced in the patent schematics, it looks to be a large-scale press that will produce the car’s body in one go or at least in the minimum amount of time that should enable Tesla to increase its production numbers manifold, imagination is the limit.

Tesla applied for this patent last year and received official approval just recently. This is great news for Tesla’s future vehicle production efforts as 2020 should mark the beginning of production for the next-gen Roadster, Tesla Semi, and Model Y. Although looking at the patent files, it’s unclear which car from the existing and/or upcoming Tesla line-up will be first built using this giant casting machine.

The inventor of this machine mentioned in the patent document is Matthew Kenneth Kallas who appears to be a Tesla engineer.
2019 Winners announced for Altair Enlighten Award

Ferrari, FCA, Material Science Corporation, ZF, Alba Tooling & Engineering Automotive Management Consulting GmbH, csi entwicklungstechnik GmbH take top honours.

Altair, a global technology company providing solutions in product development, high-performance computing and data intelligence, has announced the winners of the 7th annual Altair Enlighten Award. The awards were presented this evening at the 2019 CAR Management Briefing Seminars (MBS).

“The winning products demonstrate the power of innovation and engineering disciplines to reduce vehicle weight and emissions,” said Richard Yen, senior vice-president, strategic solutions team and global automotive business of Altair.

Ferrari’s Portofino was the winner in the Full Vehicle, low-volume production category. Innovative design approaches and manufacturing processes were applied to achieve a much lighter and stiffer body-in-white structure. All the body-in-white and chassis components were redesigned and integrated to an even greater extent. The A-pillar, for example, now consists of just two pieces compared to 21 different components in previous models. Modern production technologies, most notably sand-casting which allows the creation of hollow components, allowed designers to create innovative forms that are lighter.

Full vehicle, high-production category winner
FCA’s 4th generation Jeep Wrangler, eliminated 92kg from the previous generation vehicle. It employs an advanced strategy of lightweight aluminium, sheet moulding compound (SMC) and high-strength steel. Technology highlights of its new design include a lightweight body system that shed 51kg (>12%), by strategically applied advanced lightweight materials to maximise customer value, comfort, safety, and convenience, as well as minimise manufacturing impact to bolster the benefit of lightweight material applications.

Module category winner
ZF with its latest knee airbag (KnAB) design replaces the typical metal housing found in existing low mounted knee airbags by a fabric housing. This lightweight “Global Baseline Module” technology is based on a fabric housing and provides high-restraint performance capability while allowing significant weight reduction. With a weight reduction of 30 per cent, it is 20 per cent more compact, and a design that can be tailored for all specific customer needs and markets to help meet global safety test requirements and standards.

Enabling category winner
Material Sciences won top honours in the Enabling category for MSC Smart Steel, the first ever spot weldable
low-density composite laminate to be used in a body application. MSC Smart Steel is a new multilayer steel laminate engineered as a direct substitute for vehicle body parts stamped from low carbon steel. The concept involves creating a three-layer laminate whereby the outer skins are steel, and the middle layer consists of a low-density conductive polymer core, which allows MSC Smart Steel to be stamped and spot welded – an industry first!

**The Future of Lightweighting winner**

The award for the Future of Lightweighting went to a feasibility study for #ULTRALEICHTBAUSITZ, a collaborative effort by Alba tooling and engineering, Automotive Management Consulting GmbH, and csi entwicklungstechnik GmbH. #ULTRALEICHTBAUSITZ aims to completely rethink car seat design from scratch through consequent use of cutting-edge generative technologies with the philosophy of ‘form follows force’. Their goal is to manufacture a comfortable and highly adaptable, yet ultra-lightweight vehicle seat prototype with a mass of about 10kg.

For a list of finalists and their innovations, please visit http://altairenlighten.com/award/.

FCA’s 4th generation Jeep Wrangler, was the winner in the Full Vehicle, high-volume production category. An advanced multi-material strategy was implemented for lightweighting to save 92kg from the previous generation vehicle.

“LIL was founded in 2008. Our mission is to supply consumers with primary non-ferrous products, ferro alloys and other raw materials consumed by the foundry industry.

LIL supplies over 40 products to a multitude of industries, primarily in South Africa but also in the neighbouring countries. We pride ourselves with keeping stock at all times, as well as efficient and reliable deliveries. LIL is also ISO-9001 certified.”

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It tolls for thee: £5m needed to save Britain’s last major bell foundry

It is said that, every day, 20 million people in Britain hear the chimes of a bell cast at Taylor’s of Loughborough. The foundry is Britain’s last still casting full sets of church bells and has produced them for St Paul’s Cathedral and Yale University among others. You can even hear one tolling on the AC/DC track Hells Bells.

Now, however, the foundry is desperately seeking £4.7m for restorations to its Grade II listed premises just to keep going, the latest challenge to an ancient industry that is struggling to survive.

The Leicestershire site’s supporters are looking anxiously at Whitechapel bell foundry in London, which is facing permanent closure. It ceased operations in 2017 but campaigners hope it will yet be reopened.

Whitechapel, which had operated in the East End since 1570, was Britain’s oldest manufacturing business; it cast Big Ben and America’s Liberty Bell. To the consternation of locals, artists and historians, its new American owners have applied to turn it into a boutique hotel.

“Bells feature in people’s daily lives even when they don’t notice it – just walking along the road and a clock chimes,” said Hannah Wilby, chair of Loughborough Bellfoundry Trust. “If both these foundries disappear it would be a very sad loss for our national heritage.”

Wilby is hopeful that a solution can be found to keep open the foundry, which is operated by Taylor Bells. It has been awarded £300 000 from the Heritage Lottery Fund to work up a detailed proposal for a grant of £3.7m, which would be matched by £1m the trust raises itself. “We’re super-optimistic we will raise the money in the end. It’s something we all care so much about. Most of the trustees are bell ringers – I ring at Southwark Cathedral – so we have skin in the game to keep the foundry going,” she said.

Those fighting to see off the developers and reopen the Whitechapel foundry also believe they will succeed, pinning their hopes on a recent groundswell of support from local people that they hope will swing the council’s decision their way. Support has also come from the East London Mosque, which stands very close to the foundry and has significant local influence. The showdown will come when Tower Hamlets council meets on 19 September to consider the planning application.

Among those backing the campaign to reopen the foundry is Dan Cruickshank, the art historian known to millions for his BBC programmes on architectural history. He told the Observer: “There is no better use for an old bell foundry than to be a bell foundry. There is a demand for bells and there is a viable continuation of industrial use on that site. It’s that or another boutique hotel, and the poor East End has lost so much of its authenticity and employment.”

Cruickshank visited the foundry for a programme he was presenting about the Palace of Westminster, and he went to see where Big Ben was cast. “I live nearby, in Spitalfields, and I was used to the story of loss and abandonment and death of spirit in the area,” he said. “But this was an amazing experience – like a dream coming true. I remember thinking, ‘Thank God, there is somewhere still working and doing what it was meant to do.’ So I was heartbroken [when it ceased production], because I had thought it was safe.” He said he was hopeful that the planning process would frustrate the developer’s plans, and the foundry could be saved.

Also behind the campaign are the director of the Victoria and Albert Museum, Tristram Hunt, and the metal sculptor Antony Gormley, who used to look into the foundry yard and watch the casting process as he walked through the East End.

The UK Historic Building Preservation Trust also hopes planning permission for the developer’s scheme will be refused, and its offer to buy the foundry and start casting bells there again will now succeed.

Stephen Clarke, a trustee, said: “This is Britain’s oldest continuous business – it’s part of the locality’s DNA – and we want to put in new technology so we can continue and regenerate that business. We have a lot of potential commissions we can put through that foundry, many of them coming from overseas and China in particular. “Whitechapel bells are a global brand and they should be kept as a global brand. You walk in and you smell the dust and you are surrounded by the most fantastic atmosphere. Yes, it’s been shut for two years now, but my goodness me! That building is crying out to be opened up and the furnaces turned back on.”

Back in Loughborough, Wilby agrees there is great potential from the export business. She returned last week from Singapore, where the cathedral had just hung Loughborough bells. And, even if the lottery grant doesn’t come through, she pledged they would fight on: “We’ll keep going. As long as that building is repairable, we’ll absolutely keep going.”

This article first appeared in The Guardian.
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ZPF, a manufacturer of aluminium melting furnaces, has just developed a melting furnace that melts down aluminium chips as well as recycle material and ingots, ensuring a sustainable utilisation system.

In the past, different shapes of ingots, return material and aluminium chips were melted in different furnace types according to their material. This method does not pay off for die-casting foundries with very low volumes of aluminium chips or return material, so only ingots were molten down.

The new plant from ZPF is equipped with an automatic charging system and can melt up to 500kg of raw material per hour, 250kg of aluminium chips and 250kg of ingots. The new melting furnace technology premiered at GIFA 2019.

The production of by-products such as scrap material, runner systems and even aluminium chips are usually collected and recycled externally in most foundries, which are not melted right away for economic reasons. This results in high storage and transport costs, not forgetting the logistics involved.

“A material mix of ingots and recirculation aluminium parts was previously only possible to a limited extent because of the desired boundary parameters such as melting loss and melting rate,” Sven-Olaf Sauke, R&D at ZPF notes.

“For some foundries, a pure chip furnace is uneconomic, since the metal-cutting share in the cast product is often too low. With ZPF’s new technology that enables melting furnaces to simultaneously melt chips, ingots and return material while still keeping the melting loss values at an extremely low level, companies now can enjoy greater flexibility in the recycling process and new opportunities to optimise the melting process.”

Sump melting furnace with chips as the main material

“For an optimal constructive design of the new furnace, simulations were used during the development to assess the basic system behaviour. Moreover, power and exhaust gas measurements were carried out under foundry conditions to determine functional parameters. The decisive factor for us was the optimum melting of the metal and the required temperature control in the furnace,” explains Sauke.

He adds that apart from the energy consumption, other factors that strongly influence the melting result play a role in a modern furnace system, like the quality of the raw material or the melt loss. The company then analysed the data collected and determined the parameters required for the simultaneous melting of chips and other aluminium materials. A prototype with the new technology was then introduced based on the results collected.

The dimensions of the melting furnace are (L x W x H) 575cm x 380cm x 445cm with an empty weight of about 28 ton, allowing for a maximum throughput of 500kg/h. The furnace system has an automatic charging unit. The modular unit is designed for different types of material as per customer requirements.

“For the simultaneous melting of different material forms in one furnace, the first step is to determine the leading material variant. For the prototype, aluminium chips were the main material, meaning that the furnace was designed as a heel melter. As a result, the chips can be melted down in combination with return material, return wheels and ingots. Whichever variant that is added to the chips can be selected by the operator. The one important factor is the optimum quantity ratio of chips to the secondary material to ensure optimum melting performance is achieved.”

Aluminium alloy breaks the critical 500 MPa UTS mark

A 20X™, the aluminium alloy developed and patented by UK foundry specialist Aeromet International, has cemented its status as one of the strongest aluminium additive manufacturing powders commercially available after surpassing the key 500 MPa UTS mark.

As part of a recent research project involving aero-engine giant Rolls-Royce and additive manufacturing equipment specialist Renishaw, heat-treated parts produced using A20X™ Powder have achieved an ultimate tensile strength (UTS) of 511 MPa, a yield strength of 440 MPa and elongation of 13 per cent, putting the powder at the forefront of high-strength aluminium additive manufacturing.

Crucially, parts additively manufactured with the powder maintain high-strength and fatigue properties even at elevated temperatures, outperforming other leading aluminium powders.

“Since bringing the A20X™ alloy to market for additive manufacturing five years ago we have seen significant adoption for high-strength, design-critical applications. By working with Rolls-Royce, Renishaw and PSI we have optimised processing parameters that led to record-breaking results, opening up new design possibilities for aerospace and advanced engineering applications,” said Mike Bond, director of advanced material technology at Aeromet.

The HighSAP project is backed by the UK’s National Aerospace Technology Exploitation Programme (NATEP). The powder for additive manufacturing is derived from the MMPDS-approved A20X™ casting alloy, the world’s strongest aluminium casting alloy, which is in use by a global network of leading aerospace casting suppliers.

Aeromet International is a leading supplier of cast metal parts to the global aerospace and defence industries. It provides major OEMs including Airbus, Boeing, BAE Systems and Rolls-Royce with parts ranging from engine and fuel system components to winglets and doors.

For further details visit www.a20x.com/powder or www.aeromet.co.uk
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Morgan Molten Metal Systems launches a next generation, ‘game-changing’ crucible for holding molten aluminium

The newly developed VA.luStar crucibles by Morgan Molten Metal Systems have a significantly longer life than other iso-statically pressed crucibles for lower temperature applications and retains its good thermal conductivity over the entire life.

Morgan Molten Metal Systems (MMS) has been manufacturing crucibles for non-ferrous metals for more than 160 years.

The new VA.luStar crucibles are highly resistant to oxidation at low temperatures due to its internal and external glazes. These crucibles are particularly suitable for holding aluminium and aluminium alloys in electric resistance furnaces.

VA.luStar are high density, clay-bonded, iso-statically pressed crucibles containing graphite and silicon carbide. The company has recorded highly encouraging trial results for VA.luStar in European region foundries.

Morgan Molten Metal Systems says that when compared with available crucibles in the market for aluminium holding application in electric resistance furnaces, VA.luStar has better crucible life by 50% or higher, lowered production downtime due to reduced frequency of crucible changeover and increased production capacity per crucible upwards of 50% that generates a significant cost saving for the customers.

With the new product, Morgan MMS is confident to offer a game changer product that can significantly improve the ‘value’ achieved by crucible users.

For further details contact Keegor Meltech on TEL: 011 421 0711 or Eddie Short on 082 460 1593.

Discover the world of hardness testing – Emcotest

Emcotest manufacture a wide-range of hardness testing instruments suitable for various applications such as Vickers, Knoop, Brinell, Rockwell, plastics and carbon test methods and the possibility for either single point or advanced, multi-point tests such as case hardness depth, nitriding hardness depth, surface hardness depth, Jominy sample testing and Weld HAZ (heat-affected zone) testing.

The complete range includes manual, semi-automatic and fully-automatic that may be configured according to your testing requirements.

These instruments utilise ecos Workflow software for simple management of user rights. The ecos Workflow operating software offers the possibility of selectively and individually controlling user rights by means of user levels. Any number of user levels with different rights can be created and changed at any time. All available rights can be very easily assigned to the desired user level with the help of a rights editor. The users are then assigned to the user level that can, if necessary, be additionally protected by means of a password. This ensures that only authorised users can perform a measurement with the required test method or can change machine settings.

Also, with Emcotest hardness testers, a measurement data group can be created and selected before the test. All test results are collected in separate lists, allowing them to be represented clearly, exported or saved as a report at any time. Use grouped measurement data management to assign test data to individual users or user groups, components, batches or departments. In addition, frequently used test parameters can be assigned to the measurement data group in the form of templates (method, conversion, geometric correction). This significantly reduces the amount of work for the operator and the possibility of incorrect operation.

IMP is SANAS accredited for hardness and they have extensively trained technicians to assist with repair and calibration of hardness testers.

For further details contact IMP on TEL: 011 916 5000 or visit www.imp.co.za
Online research is a key part of the industrial buying cycle, particularly during the consideration and selection stages. Castings SA Online is where buyers search, research and learn about new product technology and new process innovations. Aligning your message with the areas where prospects are likely to look for technical solutions is the essence of contextual advertising and brand development.

**Online Advertising Opportunities**
With an average monthly readership base of over 4 000 unique readers, Castings SA is the premier online space in South Africa for all foundry-related news, information and international industry insight. As industry experts with highly credible journalistic integrity, Castings SA is always at the forefront of the latest foundry and related trends and innovations. Extend your brand and put your message in context and receive the actionable results needed to grow sales while expanding your brand’s digital presence. The Castings SA publication is extended to the web with its own dedicated website (www.castingssa.com) where you will find many more exciting features. These include the latest issue and archives of the publication in both digital and PDF format to download, industry events, international and local exhibitions and links, news, employment opportunities and a showroom giving you details of supplier and metalcasting engineering companies’ activities.

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At GIFA 2019 Magma demonstrated how autonomous engineering is replacing conventional casting process simulation. MagmaSoft autonomous engineering supports casting design, robust process layout and optimised casting evaluation even before the first part is produced. By making use of the fully integrated capabilities of virtual Design of Experiments and genetic optimisation, MagmaSoft easily and reliably finds the best solutions, from the first casting design to improvement of a running production layout.

As a world premiere, visitors experienced autonomous engineering live in 4D in a captivating Holo-Theater performance.

MagmaSoft - The digital foundry process
Magma has been developing powerful solutions for digitising foundry processes for over 30 years. With the Virtual Core Shooting Machine, the company showcased an innovative Industry 4.0 application together with leading industry partners. A direct coupling between process simulation, core box design, moulding material and core shooting machine enables the real-time optimisation of the complete core shooting system for the first time.

With the Virtual Die Casting Die, Magma demonstrated how to simultaneously realise and reliably evaluate a robust tooling design and an optimised production window simultaneously within the shortest possible time for high pressure die-casting processes.

Moreover, Magma introduced numerous new capabilities for virtual optimisation of all casting processes and alloys, heat treatment and the complete core production process. In cooperation with leading partners from the supplying industry, new developments for digitising moulding materials and for quantitative prediction of core distortion, degradation behaviour of binder systems and core gas related defects during the casting process were presented. Through new solutions, accessing databases for feeding system components in MagmaSoft has become even easier.

Ease of communication internally and with customers
MagmaInteract, the new and innovative visualisation programme for MagmaSoft results, supports communication internally within a company as well as a fast exchange of information with both customers and suppliers. Using real castings as examples, Magma interactively showed how easy it is to use information from MagmaSoft with MagmaInteract.

Predicting binder decomposition and core gases with material database
Magma and ASK Chemicals, one of the world’s leading suppliers of foundry chemicals and consumables, are involved in a joint development project on binder decomposition in sand cores and associated gas formation. The aim is to provide the MagmaSoft users with validated data on quantitative prediction of process relevant effects for ASK products. With a new database, joint customers should be even better supported in the interpretation of the vesting behavior of sand cores and the prediction of core gas-related casting defects.

Cooperation between Magma and GTP Schäfer
Magma also announced a cooperation with GTP Schäfer, a leading producer of exothermic and insulating risers. Technical riser data of the GTP Schaefer product range is to be made available in MagmaSoft.

The data of GTP Schäfer’s standard product range enables the foundry to select risers having a modulus between 0.7 to 5.0cm via a database accessed from the MagmaSoft 5.4 programme, plus all who have purchased the update rights. Supplementary to the standard product range an online interface developed between MagmaSoft and the digital online portal GTP Toolbox, allows users to import their customised, portfolio that includes risers that were specifically developed to meet the individual requirement of the customer into Magma. The user friendly toolbox data offers access to riser, sleeve and breaker core geometries in both 2D and 3D format meaning that labour intensive creation of files for individual customer use is no longer necessary. The riser data that can be accessed directly from the GTP Toolbox or via the main GTP website is, therefore, always up-to-date.

For further details contact Ametex on 083 306 1867 or visit www.ametex.co.za
Norican Digital’s Refill Monitor

Norican Digital has launched its digital product Refill Monitor which, uses real-time sensor data to improve the productivity and uptime of casting lines. The system is also simple to install on existing facilities.

Refill Monitor uses sensor generated data to ensure dosing furnaces (e.g. Westomat) or bale-out furnaces never run low on metal, maximising machine productivity and uptime.

Refill Monitor is a tool that employs real-time production data to manage multiple casting lines. It ensures the timely supply of molten metal and avoids over filling. The data driven solution also helps operators to ensure that the correct alloy is supplied to each machine.

The power of sensor data for optimum refilling

One Refill Monitor visualises up to eight casting lines. It can be retrofitted on any dosing or bale-out furnace. It is web connected and requires minimal installation effort, with IoT infrastructure provided by Norican Digital.

When developing Refill Monitor, Norican Digital worked collaboratively with StrikoWestofen engineers who embedded their foundry and engineering expertise to maximise functionality and optimise the technology for Westomat owners.

A key component of Norican Digital’s powerful IoT infrastructure is the NoriGate data gateway which captures and collates sensor intelligence, enabling it to be visualised on a dashboard and empowering operators with the information they need to make decisions critical to maximising uptime.

For further information contact Peter Petersen of Mondeco Solutions on 079 448 1277 or email peter@mondeco.co.za or visit www.mondeco.co.za
Bühler’s Digital Cell is a step change for the die-casting industry

Bühler Die Casting has introduced the Digital Cell, a solution that aims to deliver 0% scrap, 40% less cycle time, and 24/7 uptime to make the die-casting industry more profitable and efficient. Three solutions launched GIFA 2019 form part of the future Digital Cell, the first of which will be every future Bühler die-casting cell’s smart digital brain - the SmartCMS (Smart Cell Management System). With the capability to collect and manage information from every component and peripheral, it will improve process performance and make it possible to significantly increase OEE (Overall Equipment Effectiveness).

SmartCMS is the Digital Cell’s brain

“The Digital Cell brings all of the individual die-casting components together under one smart digital brain called SmartCMS (Smart Cell Management System). If we think of a die-casting cell like a human body, with lots of different tasks carried out by different parts, the SmartCMS is the brain, ready to coordinate all of that activity in the most effective way,” says Abbis.

“It lays the foundation for the smart management of entire die-casting cells, with the capability to collect information from every component and peripheral in a single control system. Initially available at the cell level, SmartCMS delivers improvements through equipment connectivity, cell automation and operation, centralised alarms, data collection, flexible part flow, and recipe management. It will improve process performance and make it possible to significantly increase OEE.”

Digital Services keep downtime to a minimum

The Digital Cell, with its Industry 4.0 and IoT technologies, can create opportunities for a wide range of digital services aimed at improving die-casting performance. The Die Casting Dashboard offers a visual platform for machine monitoring, alarms, remote support, and historic performance data. This is the first important step to giving foundry managers and owners timely information and strategic insights.

Predictive Analytics uses machine learning from sensor data on each cell. Instead of dealing with an unexpected breakdown that can cost a foundry around 30 hours until the system is back in operation, Predictive Analytics can cut those 30 hours down to three hours because it calculates engineering parameters of key machine parts and suggests scheduled interventions. It cuts expensive and time-consuming downtime by 10-times. Validated accuracy of prediction is 95%. This will soon be extended to include even more critical processes to cover the components typically responsible for around 80% of unexpected downtime in the die-casting machine.

Each hour of downtime on a single cell can cost a customer thousands of Euros and puts pressure on delivery schedules. Understanding more about what is causing downtimes and applying proactive fixes can save significant sums. Downtime Analysis is a comprehensive cloud-based failure analysis tool, providing root cause reporting from the die-casting machine. Analysis can help to reduce downtime on a single machine. It can then inform changes on other machines within the foundry, helping to drive best practice. While data is provided on several die-casting machine parameters, an extension to cover the entire cell is planned in the near future. All data is securely stored in the Bühler Insights IoT platform powered by Microsoft Azure.

Fusion three-platen die-casting platform

Fusion is Bühler Die Casting’s next generation, three-platen die-casting platform, designed to deliver exceptional OEE. It can make full use of Smart CMS’s future machine learning and artificial intelligence capabilities. With its closed-loop control, modular energy frame, and Industry 4.0 automation capability, Fusion is a flexible solution for high-quality aluminium and magnesium die-casting parts. Smoother servo-driven hydraulics can cut cycle time and reduce energy consumption by up to 40%.

For further details visit www.buhler.com
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Excessive mould moisture in Alkaline Phenolic binder systems can lead to the generation of hydrogen gas, a major cause of gas defects in castings. Applications with thin-walled castings, high sand to metal ratios and high temperature castings are particularly susceptible to this kind of defect. In many cases defects are only found later, after fettling, machining and/or X-ray testing wasting both time and money.

The range of Novaset resins from ChemSystems has proved time and again to substantially reduce moisture absorption in the mould, and that translates into far lower scrap and rework rates.

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