Steely gaze

Robert Pell looks at some of the developments from foundries and steel specialists as well examining how mining companies are battling against machine wear, often with innovative solutions

SIMCO's 90 m³ class 'Omega' dragline bucket was commissioned at Curragh mine

Mining is notoriously abrasive and corrosive on equipment, which is why hard-wearing steels with a range of resistant properties are so important. Steel specialists and foundries play an important role in providing the mining industry with the raw materials for the manufacture of mining wear resistant parts and components such as truck bodies and excavator buckets, but also essential machined mechanical components such as gears. Whilst the mining environment remains economically challenging in terms of new supply of equipment, uptime of existing onsite equipment is of paramount importance. High quality metals and alloys need to be used to ensure that mining equipment remains both productive and reliable. This in combination with increased economies of scale leading to bigger machines and therefore bigger components and machine frames puts more pressure on foundry engineers and metallurgists to meet performance specifications.

High strength steel advances

The handling of mined materials can test steels in a range of ways. Equipment from dump loaders to belt conveyors and crushers has to withstand a vast amount of wear and abrasion. One of the world leaders in this area, **SSAB**, has launched Strenx, a new high-strength structural steel product brand, which, the company says, "offers the most extensive portfolio of high-strength steels on the market. This will open up new competitive possibilities for customers to make stronger, lighter and more sustainable products." Strenx is designed for mining, as well as other applications, where structural strength and weight savings are key competitive factors. Strenx is well-suited for the frames of heavy mobile machines, rolling stock, and more. "Now customers will be able to design more competitive and sustainable products – cranes that reach further, trailers that carry more payload, trucks that use less fuel. For customers, this is a totally unique product since Strenx now covers the three product brands Optim, Weldox and Domex that are well-known trademarks of SSAB and the former Ruukki. Strenx embodies our over 50 years of experience in high-strength steels," says Gregoire Parenty, Head of Market Development at SSAB.

Strenx features the world's widest choice of high-strength structural steels both in terms of strength and dimensional range. Yield strengths range from 600 Mpa to 1,300 Mpa, which is the strongest steel available on the market. Strenx is available in plate, strip and tubular products in thicknesses ranging from 0.7 mm to 160 mm. "We give full support to designers and customers to help them upgrade to Strenx. By sharing our in-depth experience and wide knowledge of steel we can guarantee the best results for end-product performance," adds Parenty.

Strenx comes with guaranteed product consistency, services to help customers' businesses and permanent assistance to enhance end-product performance."

SSAB's other steel range, Hardox, has also further expanded its offering with the introduction of the Hardox Tube 500. The new range provides the same hardness and toughness as Hardox wear plate, but in circular form. It has been developed to give outstanding performance in any application where high wear resistance in combination with a lighter product solution is beneficial. "The new Hardox Tube 500 range completes the existing Hardox family product range. We have a long experience of developing wear-resistant steel tubes. The final properties are set after tube rolling and welding, which guarantees consistency as well as high hardness and toughness qualities, just like all Hardox products," says Fredrik Mikaelsson, Manager for Tubes & Sections at SSAB. Its extreme wear resistance allows for a lighter

SSAB's new Hardox Tube 500 steel

product with a long service life when carrying materials such as ore slurry. Hardox Tube 500 is available from stock in 88.9-133 mm diameters and different material thicknesses. Custom tubes in thinner materials and other diameters are also available.

Hardox Wearparts offers customers quick, 24-hour access to thousands of wear products through a unique online interface. This guaranteed fast, easy service for customers is now available at nine of SSAB's centres across the globe including the US, Chile, the UK, China, South Africa, Australia, Singapore and two locations in Canada: in Vancouver and Montreal. The new service - Hardox Wearparts Web shop - provides customers with easy access to product details such as dimensions, materials, tolerances, logistics and on-site service. The Hardox Wearparts Web Shop concept was initially launched in the US. "This will enable customers to start a dialogue contacting SSAB at any time - day or night - which will help expedite the wear part replacement process," says Johan Anderson, Head of Business Strategy and Marketing, Hardox Wearparts. "Downtime in this business is costly, and the new service can help us to get customers up and running quicker." Visitors to Hardox Wearparts Web Shops will find products conveniently categorised by market segment, which includes Mining – Movable and Fixed. Once customers click on a specific segment, they can choose the equipment and appropriate wear part needed which can be either a standard or custom part. Then they can request a quote online and receive a quick response to their request from a representative at the local Hardox Wearparts Centre convenient to the customer's location. Customers can also register their account and keep track of previous enquiries, thus making the reorder process easy and convenient. "SSAB is dedicated to helping customers solve their toughest wear challenges," says Anderson. "Through our knowledge, expertise and products, we're able to help customers to boost their productivity and prolong the service life of their machinery and equipment. The Web Shop is one of many value added services we can offer our customers."

The Web Shops are initially available at nine of SSAB-owned Centres and more web shops are coming soon.

On the quenched and tempered steel plates market, **NLMK Clabecq** specialises in high-performance ultra-thin and wide steel. Russia's NLMK Group, of which Clabecq is a subsidiary, controls the entire supply chain, from the raw materials, thanks to its own mines, to the local distribution of finished products close to the customer. One of the products that are provided by NLMK Clabecq is the abrasion resistant steel Quard®. The durability of Quard makes it ideal for big machines used in mining applications. The Quend product line refers to high yield strength steels developed for low weight applications which require high carrying capacity such as lifting or transportation. Quenched and tempered steel plates from NLMK Clabecq are produced with the most advanced heat treatment technology on lines especially designed for thin and wide plates, to the benefit t of OEMs for equipment manufacturing.

NLMK Group has delivered plate made from abrasion-resistant Quard 450 steel for the production of the BELAZ 75710 450 t truck (see High Profile article in this issue). The first 75710 was commissioned in August 2014 at SDS Chernigovets and the second machine has recently been completed. NLMK steel is used to make the truck body. BELAZ has selected Quard 450 plates "because they are characterised by exceptionally high resistance to wear and load impact, ensuring longer life time compared to alternatives." NLMK says that the use of Quard steel may result in a 40% reduction of the weight of the structural component while increasing its volume by 5%, reducing fuel consumption, and reducing production costs by 45%. Quard plates are produced from slabs supplied by the Company's Lipetsk production site, using a unique technique involving quenching and tempering at NLMK's Belgian Clabecq plant. Ilya Gushchin, NLMK Group Vice President for Sales, said: "BELAZ is one the leading consumers of NLMK Quard plates in the CIS. Our participation in the creation of the world's heaviest-lift dump truck is the result of our successful collaboration with the Belorussian company. We are currently in negotiations with a number of large Russian machine-building companies on the use of Quard and high-strength Quend plates in the production of technical equipment, in order to create the conditions for increased competitiveness of Russian machine-building." For over three years, NLMK Group has successfully sold abrasion-resistant Quard and high-strength Quend plates in Europe, North America, and the Far East, as well as in the CIS. Buyers of Quard and Quend plates include leading machine building companies. NLMK Group is planning to expand its range of premium Quard and Quend steel products in 2015 by adding Quard 550, Quend 1100 and Quend 1300. NLMK Plans to increase the total production volume of abrasion-resistant Quard plates and high-strength Quend plates to 150,000 t/y.

Azovstal Iron and Steel Works has supplied over 1,000 t of R-34 rails to the Ukrainian market and received its first order for export in the CIS. These types of rails are widely used in the construction of narrow gauge railway tracks for construction and mining enterprises. Metinvest's products have the following key advantage – it's boltholes for rail fastening are manufactured directly at the mill. Previously, the customers had to do them at their sites via flame cutting. DTEK's mining enterprises located in Ukraine were the first customers of these products. R-34 rails were used to construct and repair rail track for lifting loaded railcars from the mine to the surface. DTEK has purchased over 1,000 t of these rails since September 2014. The first export order of 60 t received by Metinvest will be manufactured in February. Dmitry Nikolaenko, Sales Director of Metinvest Group said; "Metinvest continues to master

products with high added value that are in demand in Ukraine and abroad. This is important for us that we launched regular supplies of a new type of mine rails to the largest company in Ukraine's mining sector. At the next stage, we are planning to setup partnerships with customers in Kazakhstan, Russia, Poland and Bulgaria."

ArcelorMittal division **Industeel** produces a wide range of abrasive-resistant steel solutions "to keep mining and quarry equipment up and running far longer, thereby eliminating costly downtime, production losses and unnecessary investments in additional equipment. In addition to abrasion resistance, Industeel products offer uniform wear and high workability. Industeel also has solutions providing high yield strength, impact strength, corrosion resistance and temperature withstand, as needed by many applications in this industry. Beyond standard products, Industeel says it has the necessary know-how to find effective solutions to new problems as well as more cost-effective alternatives for existing solutions.

Brands include Creusabro®, a high added-value steel solution for special abrasion applications with particularly severe operating conditions; and SuperElso®, a range of quenched and tempered steel products combining high yield strength (500 to 1,100 Mpa) and excellent toughness.

XAR® from **ThyssenKrupp** is available in various grades from 300 HBW to 600 HBW and plate thicknesses from 3 to 100 mm, tailored to particular applications, such as mining equipment and earthmoving machinery. XAR 400, XAR 450 and XAR 500 plates can also be supplied as cut-to-length plates in thicknesses up to approximately 10 mm. Due to their very close thickness tolerances of ±0.2 mm they offer weight reduction benefits as well as advantages in terms of cold forming.

Through decades of research and compiled data, special steels supplier **Ovako** has found that slightest variations in steel microstructure can dramatically impact wear resistance. Defects within steels, such as non-metallic inclusions, can disrupt the steel's structural homogeneity and initiate cracks and fatigue failure. Ovako says it carefully controls its entire steel production process, from the initial melt phase through to the finished material. By controlling the steel's metallurgical cleanliness, Ovako grades have much smaller inclusion sizes than conventional steels. These innovations have resulted in IQ-Steel, BQ-Steel and WR-Steel (isotropic quality, bearing quality, and wear resistant, respectively). The grades "exhibit higher fatigue and wear resistance and better machinability, hardness, resistance, dimensional stability and tighter tolerances than standard grades. This is confirmed in a large number of fatigue tests conducted by Ovako and in a variety of heavy engineering applications and safety critical applications throughout the mining industry."

Ovako's WR-Steel has greater resistance to abrasion, for prolonged surface life and greater work efficiency

WR-Steel from Ovako is offered as hot-rolled round or flat bar, special profiles and tubes, or as grinding media. Its advantages cover a comprehensive range of hardness levels and hardness intervals (350-650 HV), dimensions and steels grades. Boron steel is a large part of the WR-Steel offering, but it also includes grinding media and other mining solutions offering superior hardness and consistent composition for optimised performance in demanding applications."Ovako created the first boron steels in the 1960s, and the performance of WR-Steel confirms that we are still the market leaders today," said Göran Nyström, Executive Vice President and Head of Group Marketing and Technology at Ovako. "We understand that, in the manufacturing stage, our customers need to be able to form, shape and weld the steel to fit their product production needs. This is exactly what WR-Steel facilitates, along with subsequent quench and temper possibilities to realise the optimum wear resistance. It has greater resistance to abrasion, for prolonged surface life and greater work efficiency. And, of course, longer service life means fewer parts replacements and ultimately a cost reduction." WR-Steel utilises optimised alloy content to allow different end-product applications. Its use allows product manufacturers to reduce costs, save production time and gain wear resistance advantages. Because Ovako controls the entire steel production process, from initial melt to final rolled product, Ovako can, for example, with precise rolling methods, enable more exacting special profiles, worked very close to near-net shape. With these production capabilities, the WR-Steel brand offers special profiles, from single bevel and arrowhead to grouser bar used in manufacturing of ground engaging tools, ploughs and buckets, all of which can facilitate new manufacturing methods.

Most recently, low temperature performance has come under focus where mining equipment must offer greater reliability at -50°C or lower sub-zero temperatures. SZ-Steel by Ovako is proven to retain its properties in temperatures down to -40°C and beyond and, in extreme cases, is well-tested to withstand temperatures down to -101°C. As one of the Ovako attribute brands, SZ-Steel designates a grouping of steel grades across a range of products in the company's portfolio. SZ-Steel, which stands for sub-zero, is a family of steel grades with low impurity levels and controlled grain size that are specifically developed, designed and produced for use in extreme environments with cold climate temperatures and exacting conditions. This helps to reduce risks of embrittlement and fracturing, and also safeguard natural environments while improving safety for workers and service crews."Some of our most demanding customers tell us that safety in cold climates is an increasingly urgent priority...nobody wants to see an accident or unscheduled maintenance when temperatures drop to -40°C and below," said Göran Nyström, Executive Vice President of Group Marketing and Technology at Ovako. Ovako tests and certifies a wide range of its steel grades according to sub-zero standards. At the Ovako plant in Imatra, eastern Finland, tests are performed at -101°C using cryogenic liquid nitrogen and methanol as a cooling media, under which conditions even otherwise well-made engineering steels can become brittle and fall apart. "Ultimate safety and reliability of our high-

performance engineering SZ-Steel is verified in a proprietary 'freezer box'. No other engineering steel company is as focused on highlighting the concerns surrounding sub-arctic operations as Ovako." SZ-Steel grades meet and actually exceed key international safety standards, and their capabilities are proven in cases around the world whether the application is for stud bolts, hydraulic equipment, drilling tools, axles or valves used mining.

Wear parts

ESCO in recent years engineered the Nemisys lip, tooth and shroud system to maximise machine productivity and increase working cycles. The tooth and shroud systems also has a rugged hammerless locking mechanisms which helps reduce maintenance costs through improved reliability, faster and safer replacement, and improved lip coverage. The Nemisys system offers four system sizes to fit large excavators, draglines and cable shovels, a slim profile lip and tooth system.

The maintenance superintendent at a copper mine in Peru declared a "strong preference" for the Nemisys tooth system from ESCO, following a site trial utilising intermediate N5 points and bridge adapters that allowed a quick and easy upgrade from the Posilok system. The upgraded Cat FS6060 face shovel experienced "a dramatic reduction" in GET related downtime during the trial of five full sets of points. Compared to the existing Posilok GET, the new Nemisys bridge adapters operated for 30% more digging hours before requiring replacement, while the Nemisys teeth delivered an impressive 71% longer service life. Increased machine availability due to fewer GET change-outs wasn't the only benefit experienced by this this mine site; the maintenance superintendent reported the Nemisys system is 50% faster to change-out and also noted that the face shovel's upgraded teeth are "excellent" at maintaining sharpness as they wear. When asked to evaluate various performance elements of the Nemisys system, the mine site concluded that it was "very satisfied" with the system's longer service life, improved safety, ease and speed of installation/removal, and increased reliability. By reducing the frequency and duration of required maintenance interaction and parts replacements on this copper mine's face shovel, the company said that the Nemisys upgrade "appears to be delivering on ESCO's commitment to increase machine availability, reduce associated labour costs, and improve site safety.

Upon learning of the premature GET nose failures that were occurring at a coal mine in Australia, ESCO's technical services team recommended an immediate upgrade from Posilok points and adapters to the new Nemisys points and bridge adapters – confident that the reengineered system profile and enhanced locking system would deliver increased reliability. Following this fast and simple parts replacement on the bucket of their Liebherr R995 excavator – which did not require any modifications to the existing ESCO Loadmaster lip – the customer reported a "dramatic increase in machine availability." The machine's average GET service life went from under a day, to now lasting several months before requiring replacement, according to the mine.

Needless to say, the site was "very satisfied" with the improved reliability and longer service life of the new Nemisys components.

In addition to increasing machine availability, the mine site's Production Superintendent reported that they were "very satisfied" with the increased digging efficiency of the Nemisys components – noting that they are "excellent" at maintaining sharpness as they wear. The mine was also impressed by the new integral locking system, which has reduced the number of separate parts that the maintenance crew is required to manage and has resulted in fewer installation delays caused by missing or mismatched locks or pins. The mine site has voiced their "strong preference" for the Nemisys system upgrade – providing this customer with increased machine availability and reduced maintenance interaction.

Spain-headquartered **MTG**, which has equipment in use in over 60 countries, recently launched a range of wear protection products at the Intermat in Paris. It included the European release of a complete range of MTG Systems Starmet Rope Shovel products, including teeth, adapters, lip and lateral protectors to equip the buckets of P&H 4100 and a Cat 7495 rope shovels. MTG's electric shovel adapters, which allow the use of wear caps where necessary, have been designed with the StarMet tooth-and-adapter fitting system and a conventional two- or three-part lip fastener system. MTG is currently developing a hammerless fastener system for these adapters. The new range includes specific self-sharpening teeth designs featuring the MTG Twist hammerless locking solution to offer the perfect balance between penetration and resistance to abrasion. They are stronger and have more wear material to guarantee increased bucket productivity with such machinery. The new wing and blade shrouds, in combination with a conventional mechanical fastener system, complete the full bucket protection.

MTG's new StarMet teeth

MTG also offers a range of templates allowing correct lip reconstruction and ensuring the correct installation of adapters and shrouds to extend the bucket's working life and prevent incidents during loading. The new products have been successfully tested under the toughest conditions on several applications, highlighting the test performed at a copper mines in Sweden and Chile.

MTG has also developed a U-design bucket side protector for its ProMet range, which includes the MTG twist hammerless locking system. The new protector offers up to four times more resistance than the MTG LS/LA shrouds and keeps robust and stable with wear material ratio over 70% compared to MTG LS /LA shrouds. The protector has an increased contact surface that reduces plastic deformation to the sides of the bucket as well as the fact that they are reversible, which allows changing their position and therefore increasing wear life. They boast a new design for an optimum distribution of the wear material and increased protection of the locking system. The new ProMet bucket protection shroud has been specifically designed

for 30, 40, 50 and 60 mm blade thickness excavators.

In addition, MTG launched the new StarMet Wear Bottom Leg Shroud, designed to extend the service life of the adapter in abrasive applications. The main advantage of the StarMet Wear Bottom Leg Shroud is that it duplicates the wear material of the bottom leg adapter and therefore reduces the down times of machinery related with GET. This product is easy and fast assembling and has already been satisfactorily tested for almost one year in highly abrasive applications.

MTG has also launched an iPad app of the sector of wear parts for earth moving machinery. Mining sites are often located in remote places with limited connectivity. "Our clients, partners and company representatives often experienced difficulties reaching information such as wear parts/machine compatibility; quote requests, or direct access to MTG's expert team for questions and advice. With the goal of creating a mobile communication system to simplify the access to all this information, regardless of your location and internet availability, MTG produced the first iPad application of the sector of wear parts for earth moving machinery." MTG is expecting this innovative application to be understood as an advance in the way its users share information. The MTG app has been specifically designed to transform what has traditionally been considered to be quite complex information, into a simple and user friendly experience.

Urethane and plastic protection

The **ACR Group** has been manufacturing wear and impact resistant products for almost half a century, ranging from rubber lined steel pipe to moulded wear lines in weld, bolt on or magnetic styles. The ACR Magna-Skin™ Magnetic Liner is used in place of other traditional lining systems when installation and change out time are a concern. Magnetic liners from ACR install without welding, bolting or adhesives, fastening with magnetic force alone. Bolt on liners rust and are difficult to remove without cutting, making it impractical to reposition them as they wear. Repositioning of the ACR Magna-Skin™ Magnetic Liners is quick and easy when some have worn more than others, stretching the life of the overall lining. Bolt on liners have a tendency to allow liquid to find a way behind them and out of the equipment. ACR magnetic liners effectively seal the equipment surface off, since they have rubber on all sides, rather than steel. A trial was recently carried out at the Esperanza mine, which is a large copper mine located in central-northern Chile, to see whether ACR's magnetic plate could prevent unwanted stoppages at the mine. Cesar Mendoza Vasquez, Chief of Plant Maintenance at the Esperanza Mine said that "The principal purpose is to prevent unwanted stoppages that affect production, reliability, costs and the safety of personnel."

Esperanza mine testing with ACR's Magna Skin Red magnetic liners (above the first trialk, below observed wear)

The mine currently has a Raptor XL1100 cone crusher which processes 500 t/h with a granulometry of p80 under half an inch. The belt that feeds the transfer chutes, cv0013, carries 1,000-1,400 t/h of material. The project chutes were delivered with T500 wear plates which lasted 20 days. The tests with bimetallic plates where then carried out which managed to have a life of 35 days. Due to the low availability of the equipment, a second trial was carried out using MAGNA-SKIN URETHANE 70 magnetic plates. The test plates had a polymer base (polyurethane) and hardness of 70(±5), a tensile strength of 4,170 PSI, an elongation of 800%, and a tear resistance (PLI) of 225. A MAGNA-SKIN RED high abrasion plate was used which has a resistant proprietary urethane blend for sharp materials causing impact and/or sliding abrasion where rubber is less suitable or where better release properties are needed. The new lining obtained a substantial improvement, with the MAGNA-SKIN URETHANE 70 magnetic plates lasting 60 days. There was a reduction in the time of repair and exposure of people in confined spaces, a reduction of costs as well as an improvement in reliability, availability and useful life of the equipment.

UK-based **Kay-Dee Engineering Plastics** manufactures the highly resistant Kaylan formulated plastic which offers unique hard-wearing properties set it apart from other traditional materials. Whilst being incredibly strong, Kaylan is also extremely lightweight and offers impressive load-bearing properties in both tension and compression. Its resistance to corrosion, as well as many oils, greases and other potentially harmful chemicals means Kaylan elastomers are often specified for critical parts. Product applications in mining include truck body linings, hydraulic-hose reels, drill guides, buffers, wear strips, cable clamps, impact bars, wheels, tyres and conveyor scrapers. Kaylan formulated plastics can be supplied in any colour as well as any shape or form which means parts made from Kaylan can complement existing designs or match company colours. A brand name or logo can even be incorporated. Kaylan mouldings are available in sizes up to 10 m in length, up to 2 m in diameter and from just a couple of grammes in weight to in excess of 2,000 kg.

Plant expansions, partnerships and new facilities

CMS Cepcor, following the commissioning of their Technical Centre in 2013, plan to expand their purpose-built corporate head office building in Coalville. When complete the new facilities will incorporate their corporate and administration functions alongside research and development, quality inspection, crusher training facilities and a substantial expansion of their existing crusher parts storage and distribution warehousing. The last few years has seen substantial investment at their expansive premises in Coalville which has enhanced all aspects of the business; including the manufacturing, inspection and repair facilities in order to meet the increased demand for their parts and services. With approved UK manufacturing facilities which include CNC, milling, turning, boring, slotting, grinding, drilling, pressing, welding, co-ordinate measuring, material testing and assembly, CMS Cepcor not only offer replacement crusher, screen, feeder and coating plant spare parts but also crusher rebuild and component repair services. Lee Hodges, Commercial Director, commented: "After years of sustained growth and an increasing workforce further expansion of our site were essential to allow the business to continue fulfilling its potential. Our new facilities will allow us to continue to grow whilst enhancing our ability to serve customers at the highest level ensuring we remain the genuine alternative."

GIW Industries, the specialty pump manufacturer has just opened a new iron foundry in Grovetown, Georgia. This completes part of a five-year, $75 million expansion and improvement project which is being carried out to handle a rising level of demand from mining operations worldwide. The new facility which is approximately 50,000 ft2 started up in April and is in the process of reaching its full capacity of

10,000 t/y. GIW Industries, formerly Georgia Iron Works, is a subsidiary of The KSB Group, based in Frankenthal, Germany, and a specialty manufacturer of industrial pumps and valves. The centrifugal pumps it produces are used to transport slurries of earth and water in mining and wastewater processing. GIW currently has two foundries casting white iron, stainless alloys, heat-resistant alloys, nickel-based alloys, and carbon and low-alloy steels, which are offered as-cast, pre-machined, or finish machined for pressure, process, mining, and industrial machinery applications. According to the manufacturer, the new foundry in Grovetown includes sand storage and handling systems, moulding equipment, melting furnaces, heat treating furnaces, and six cranes to handle the castings produced for GIW's line of slurry pumps. Within the larger expansion project, the new foundry represents a $40 million investment. The next stage of the development will be a 45,000 ft2 distribution centre that will open in 2016.

Australia-based **Keech**, which entered the South American market in 2011, has now signed a partnership with one of Peru's leading mining supply businesses, Recolsa. The Recolsa group is a stand-alone subsidiary of the family-owned Australian steel foundry, which was set up in 2012 to market and distribute Keech products to the Chilean underground copper mining market. Formed in 1980, Recolsa has specialised in manufacturing and reconstruction of parts for a wide range of primary and secondary industries, including mining. Widely known and respected in Peru's mining industry – and also with industry leaders in Australia – the company was a logical fit for what Keech wants to achieve, said Mark Adams, Keech's Export Sales Manager. "We talked to a few reasonably large companies that we have an association with here in Australia and asked who they dealt with in Peru. They were all saying 'our mines there are serviced by Recolsa; you should talk to them'. It's always better to find reseller/dealer businesses that are well established, so rather than starting from scratch, we've expedited the process and aligned ourselves with a reputable, well established business that, like us, is family-owned and well-known and respected in the industry," said Adams. "We did our homework and looked at four companies over there, but Recolsa was the perfect match for what we want to do."

Keech is planning to continue expansion into South America, with Brazil next in sight. Once the Peruvian partnership is working smoothly, Argentina, Bolivia and Colombia are also on the list, and hopefully the relationships will be similar to the partnership deal signed with Recolsa. "This is a service-based industry, so you need people on the ground, at the coalface – literally – hence we're looking for distributors and dealers of our products around South America, which will allow us to have a more robust network. "So we've based ourselves in Chile, and built up our base with an office and a warehouse that can also supply other countries in the region. Now we are spreading our reach into other South American countries and the best way forward is to use local businesses with local knowledge." The paperwork for this new partnership with Recolsa was signed just before Christmas, with the new business effectively opening its doors as of this year. Adams said Recolsa is already reporting interest in Keech products.

"Out of everyone, Recolsa had the coverage we wanted," Adams says. "They can cover the whole of Peru and all of our mining and engineering product range which includes everything from underground mining to open pit mining. Some of the others were focused just on open pit, or just on underground, whereas Recolsa handles the whole spectrum of mining, so that was a major consideration for us." The move into South America is described as a natural progression for Keech, with representation in Canada for around 12 years and an associate in South Africa for over a year. Keech exports around 20% of our products to international markets, which includes Chile, Canada, Kazakhstan, Japan and the Middle East.

Dragline buckets

Earlier this year a 90 m3 class 'Omega' dragline bucket was fitted to a to a Marion M8750 dragline at Wesfarmers' Curragh mine. The bucket was designed and engineered by SIMCO Mining Products and Services with a targeted carry capacity of 190 t each load. Curragh mine is located 14 km north-west of Blackwater and about 200 km west of Rockhampton, Curragh mine is one of Australia's largest independent coal producers. The design of the bucket features low sidewalls compared to conventional buckets for weight reduction and material flow assistance. It is lightweight without compromising mechanical strength and integrity. The Omega 90 Metre Class Dragline Bucket has been carefully engineered using the latest in software systems Finite Element Analysis (FEA), using this high powered sophisticated piece of software allowed SIMCO the ability to fully FEA a whole bucket for mechanically integrity and fatigue life. The 90 Metre Class is the fifth Omega Dragline Bucket commissioned at Curragh mine to date.

CQMS Razer recently delivered a brand new 57 m class Hurricane dragline bucket to a coal miner in the Bowen Basin

Another Australian company, **CQMS Razer**, has been developing fixed plant products and wear parts for the mining industry for over thirty years. CQMS Razer recently delivered a brand new 57 m class Hurricane dragline bucket to a leading global mining house, with operations throughout the Australian Bowen Basin coal fields. This bucket was developed to lift performance of the 8200 class dragline beyond the already impressive production rates being delivered by their fleet of CQMS Razer Hurricane buckets. Through collaboration with their engineering staff to analyse and target how performance gains could be made, CQMS Razer delivered an optimised 59.5 m3 rated capacity bucket. Installed onto the 8200 class dragline in November 2014, CQMS says it has powered the dragline to be the mining group's highest performing dragline in the world through the month of January 2015. Additionally, through a fleet of CQMS Razer buckets at this site, all seven of their draglines feature in the top 12 highest performers in the miner's global fleet.

Chinese offerings

Many well established OEMs have moved their foundries to China due to cost saving and improved economies of scale, but now many Chinese companies are offering products that are

competitive with some of the big players. Some of the Chinese companies involved with GET , wear products and heavy engineering made an appearance at Intermat Paris during April 2015.

Ningbo Lingfeng has a factory that is located in the Hehua Bridge Industrial Zone in the Yinzhou District in China, and was established in 1988 since when it has been producing wear parts and ground engaging tools, such as bucket teeth, adapters and protectors. The company has over 1,800 employees and has a current annual production capacity of 60,000 t which will increase to 70,000 t in 2015. The company originally developed spare parts for excavators, but now additionally manufactures parts for bulldozers, loaders and graders. This includes cutting edges, curved blades, end bits and shanks. The company states that it uses high-quality wear resistant steel, which is tested at the production facility, and has developed a relationship with Komatsu, Sany and other machine manufacturers. Much of the equipment that Ningbo develops is used in coal, iron and copper operations around the world.

Jiangxi Aili Casting Co is located in the Xiangtian Industry Park, in the Jiangxi Province of China and offers a range of GETs for mining equipment. This includes teeth, side cutters, and protectors. With a plant area of 160,000 m2 and a team of 500 employees, the company is capable of an annual output of over 20,000 t of GET casting parts. The company has advanced production equipment as well as testing equipment and experimental facilities. It also encompasses a top-ranking Materials Science research & development laboratory which continues to test various properties of alloy materials, such as alloy steel, wear-resisting alloy steel, high-strength steel and high-tensile steel. ShiGen Xiong, Chairman of Jiangxi Aili Casting is a Director of Jiangxi Foundry Association, and a member of China Foundry Association. The company says it has developed a reputation for reliable quality as well as competitive prices. The company has also set up more than 30 offices and has entered international markets with products being sent to Southeast Asia, Middle East, South Africa, Australia, European and South America.

Hubei Wainxin Precision Casting and Forging is a relatively new company, having been formed in 2003, but was the product of a merger by Yidu Wanxin Precision Casting Co and Yidu Wanjia Precision Forging Co. The facility for the casting and forging covers an area of 40,000 m2 with more than 200 staff ,including 50 technical personnel and 21 engineers. It is located in Yichang City, Hubei Province and castings from Hubei are often used on excavators and bucket loaders. Items such as teeth and adapters as well as side cutters and drive sprockets are manufactured at the facility that has an annual capacity of 5,000 t/y. ***IM***