Northern engineering

The Nordic countries of Norway (where mining and quarrying output grew 33% in June on an annual basis), Sweden, Finland and Greenland are the most important producers of iron ore in Europe; and are among the continent's top producers of lead, zinc, copper, gold, silver and coal. These four Nordic countries account for over half of the annual metal production from the European Union (EU)

Boliden has set a new production record at its Aitik copper mine. On July 14, 2013, 144,912 t of ore passed through the plant, and thanks to steadily increasing average production, July 2013 became Aitik's most productive month to date with 3.5 Mt of ore treated. The mine is now operating at a rate of 45 Mt/y. The target for 2013 is to mine 38 Mt tons of ore in Aitik

Sweden dominates the Nordic mining sector, with over 60% of the total ore output (mainly from its metals mines). Finland and Norway each account for almost 20% of the total. The only other European country of note in terms of mining output is Poland.

Sweden is a major contributor to the EU's self-sufficiency in, for example, iron ore (20%) and copper (55%). In 2011, LKAB shipped 26 Mt of iron ore products and Boliden mined 34 Mt of copper ore, equivalent to 80,000 t of copper metal. The Swedish mining industry contributed SEK26 billion to Sweden's GDP in 2010 and contributes 10,000 direct jobs and 35,000 indirect jobs. In 2010, mining accounted for 13% of all industrial investment in Sweden.

Given growing political support from both the European Commission and the individual Nordic governments, it is highly likely that the region's mining sector will develop at a higher rate than the global average, according to Stockholm-based Raw Materials Group (RMG). Its Founder and Chairman, Magnus Ericsson, has called for the creation of a European Bureau of Mines and for a co-ordinated approach from the Nordic countries to their mining-focused lobbying of the EU.

He repeated this call at the ninth RMG Exploration and Mining Investment conference, last November, and commented that Europe and the European mining industry would benefit from closer co-operation with mineral-rich African countries.

In September 2012 SveMin released the report A vision of growth for the Swedish mining industry. While the global industry has fallen into one of its troughs since then, the vision is still relevant. "In 2025 Sweden could have tripled its mine production. Based on the exploration carried out to date, iron ore shows the greatest potential, where production volumes could more than triple by 2025, corresponding to 90 Mt/y of iron ore products. Volumes for other minerals could be doubled over the same period and continued exploration will generate additional deposits. The mining industry would then account for 3 to 5% of GDP growth and over 20% of industrial investment in Sweden until 2025.

SveMin recommended that work begin on five initiatives:

1. A joint action plan for the regions, industry and universities with national and regional initiatives to make the industry and key regions more attractive and improve the provision of skills
2. A national plan for rail infrastructure to support the mining industry's needs for freight traffic
3. A joint action plan with the relevant authorities for greater discipline and speed in the process of environmental permitting

Mining in Finland 2012

Group	Mines/ quarries	Total (Mt)	Total ore (Mt)	Ore %	Waste rock (Mt)
Metallic ores	12	36.8	19.6	53 %	17.2
Carbonate rocks	18	5.5	3.7	67 %	1.8
Other industrial minerals	11	25.1	1,121,5476	45 %	13,923,323
Industrial rocks	3	268,565	186,845	70 %	81,720
Natural stones*	6	629,654	110,498	18 %	519,156
In total	**50**	**68,378,43**	**34,795,854**		**33,582,580**

* Dimension stones included in the Finnish Mining Law

within the framework of the existing environmental legislation

- 4.A program to maintain Sweden's leadership in R&D and industry expertise along the entire value added chain, in order to ensure the efficient use of resources and sustainable development in Sweden and globally

5. Continued cross-industry collaboration to ensure access to competitive energy, for example, by creating access to natural gas in Sweden.

New records

The new Aitik record, noted in the lead picture caption, marks a significant milestone in the collaboration between Metso and Boliden. **Metso** is responsible for all maintenance in the grinding mill circuit in the concentrator, and has supplied most of the equipment, including two gigantic, 11.6 m by 13.7 m AG grinding mills. In September 2012, the two companies signed a three-year extension of their comprehensive Life Cycle Services contract. The contract is cost-per-tonne based, meaning that Metso gets paid based on Aitik's production. The higher the output, the more both parties benefit.

The higher-than-expected production rate is a result of the common efforts of both Metso's Life Cycle Services team and Boliden. Metso's service experts have a strong culture of always doing their best to work together with the customer to continuously improve their process.

"Metso has a unique way of not only maintaining, but constantly improving and developing the equipment in collaboration with our customers. This is the reason why Boliden initially chose Metso as its key supplier for both equipment and service in Aitik", says João Ney Colagrossi, President, Services Business Line, Metso Mining and Construction.

The two companies have been working together since the 1930s under various services agreements. Metso says "this one-of-a-kind history has made Metso an expert in maximising mill uptime, a key factor in breaking production records at Aitik."

'Thanks to our experience, we know when to run the mills a little bit longer and just how to get a bit more out of the mill linings. At the moment, we are at 97% mill availability, meaning that only 3% of hours are spent on maintenance annually; everything else is production", says Christer Brännström, General Manager, SBL Operations, Sweden, Metso Mining and Construction.

An indication of the thriving mining industry of the Nordic countries is a Metso fully automated mobile crushing plant that is helping educate a new generation of mining talents. The Taivalkoski unit of Oulu Vocational College (OSAO) has established a new training program in mining and quarrying to serve the industry's growing need for skilled workforce

The DeviShot, seen here with a DeviDrill, is available for purchase or rental now from Devico or its agents worldwide

It has invested in a fully automated, track-mounted Lokotrack crushing plant. OSAO is the first educational institution in Finland to provide a fully automated, mobile crushing plant for its students.

"One key factor in the procurement decision was the provider's ability to offer a comprehensive educational solution. Metso's crushing plant is equipped with the industry's most modern automation. The delivery also includes Metso's crushing simulation tool Bruno to enable digital learning", says Kalevi Hirvonen, who managed the project at OSAO.

"By combining Metso's automation expertise with our advanced equipment and process know-how, we were able to meet the educational goals set by OSAO," says Pasi Airikka Product Manager, Automation, Metso.

The track-mounted plant at Taivalkoski consists of an LT106 primary crushing unit, an LT200HP secondary crushing unit and an ST3.5 mobile screen. The plant is equipped with IC series process control, which is integrated into the Metso DNA plant automation system.

Metso's also delivery includes plant automation applications, data collection and reporting as well as a remote access to the educational institution. Operation and camera screens are installed in the excavator. The touch screen enables the excavator operator to control and monitor the process without visiting the machines, which increases both productivity and safety.

The new degree program in mining and quarrying began in August 2013. The training emphasises working methods, tools, and machinery management. The need for this training program arose some five years ago, as the effects of the mining boom in Finland really began to show. Even though the industry is currently witnessing a worldwide downturn, in a recent report the Geological Survey of Finland predicted strong growth in mining in Finland over the next decades. This would mean an increasing need for skilled workforce especially in eastern and northern Finland.

"We believe that because of its cutting edge design, this new teaching plant for crushing will not benefit our school alone, but also all other rock and mining industry training programs in Finland from vocational high schools to universities. We have also confidence in Metso's ability to make sure that our new crushing plant will remain as an excellent reference in crushing education well into the future", Hirvonen predicts.

Looking for deposits

Devico, a Norwegian company with more than 20 year of experience in directional core drilling and manufacturer of borehole surveying instrument, has added a latest innovative product in a long line of state-of-the-art drill hole positioning solutions. The new, flexible DeviShot magnetic survey tool operates as either a single or multi-shot instrument at constant or variable depth intervals. Devico says, "whether surveying exploration boreholes, grout curtains or blastholes, DeviShot's robust integrated running gear enables operation at exceptional depths."

The rugged and versatile unit is equipped with an integrated IP67-rated Nomad PDA system powered by DeviSoft Mobile software. Using Brilliant Blue Technology (BBT) to communicate wirelessly with PDAs in the field, DeviShot provides quick results which can be further plotted and analysed using DeviSoft, or quickly transferred to clients via a USB flash

drive. User-friendly, it comes pre-assembled for use straight from the box and features a BBT activation system to ensure minimal power consumption and longer battery life. Limited maintenance requirements and integrated survey data quality control features also contribute to getting results in a quick, precise and cost-efficient manner.

Devico successfully completed the first phase of the Rockliden directional core drilling project for Boliden Minerals in the middle of August. The goal of the project was to delineate at depth a vulcanogenic massive sulphide deposit rich in zinc and copper located in north central Sweden. Boliden had previously done exploration drilling in the area, and because of the ore deposit's shape and depth, Boliden hired Devico to increase borehole accuracy and make branch holes. Devico's directional core barrel, the DeviDrill, was used to steer boreholes that started to head off target, back in the right direction or to create branches from a mother hole. The ability to steer boreholes gives the project geologists more exploration drilling choices. Boliden carried out its own in-hole continuous geophysical measurements and based on these results, could change borehole direction without completely re-drilling from surface. Making new borehole branches at depth is also a very efficient way to reduce the total drilling program, which was an important reason for Boliden to use Devico.

Devico used the new DeviShot to measure the borehole trajectory. This makes borehole surveying easier and safer by communication through the integrated running gear. No threads need to be opened to download the deviation data from the borehole. Drillers comment that this is much more convenient than comparable tools on the market.

Lower ore grades and smaller discoveries call for equipment to reach deeper and more complicated ore bodies. **Sandvik Mining** has responded by releasing the DE151, one of the most powerful and compact underground exploration core drills on the market today, it claims.

George Tophinke, Sandvik Mining's Global Exploration Equipment Manager, is extremely pleased with the results obtained through the trials. Rigorous field testing took place at a customer site in an underground mine and lasted over thousands of metres. Its close relationships with customers have enabled Sandvik to develop and take the DE150 model to the next step in productivity and design. The focus was on enhancing the machine's rod holder, rotation unit and feed frame in order to achieve even greater operability and productivity compared to the previous DE150.

Sandvik DE151 shares many of the field proven components already used in the DE100 series of core drills. Tophinke comments that: "The components used in this series of drills have been shown to deliver exceptional performance across a wide range of demanding exploration applications. The use of shared components allows us to have a very high availability of spare parts and consumables in stock, enabling us to rapidly respond to our customers' needs out in the field".

The rig's modular design and a feed and pull force of 15 t (33,000 lbf) makes it a truly powerful exploration drill rig, with a unique combination of size and capability, suited for both underground and surface applications. Key specifications:

- Maximum torque of 2,000 Nm (1475 lbf ft)
- H-head rotation unit with hollow spindle ID 103 mm (4 in)
- 1,700 mm (5 ft 7 in) feed stroke
- 2,000 m (6,560 ft) wireline hoist capacity
- Pilot-operated hydraulic system with central control of all drilling functions from the control panel
- Powered by a 110 kW electric motor or a 168 kW diesel engine.

The Scooptram ST7 underground loader is one of the Atlas Copco loaders that are now available with a Cummins Tier 4i engine. The engines will be available as an option on the ST7, ST7LP, ST1030, ST1030LP and ST14 LHDs as well as on the Minetruck MT2010

Mining equipment

Atlas Copco is introducing Cummins Tier 4 Interim engines as an option on five of its underground loaders and one underground truck. The engines provide low emissions and high fuel efficiency. "With the new Tier 4i engines you get lower emissions along with higher fuel efficiency," says Ben Thompson, Product Manager at Atlas Copco. "It means that you will reduce the fuel consumption but also that you can cut down on the required ventilation and that will result in great savings to operating costs. In addition you will get a healthier working environment for all personnel in the mine."

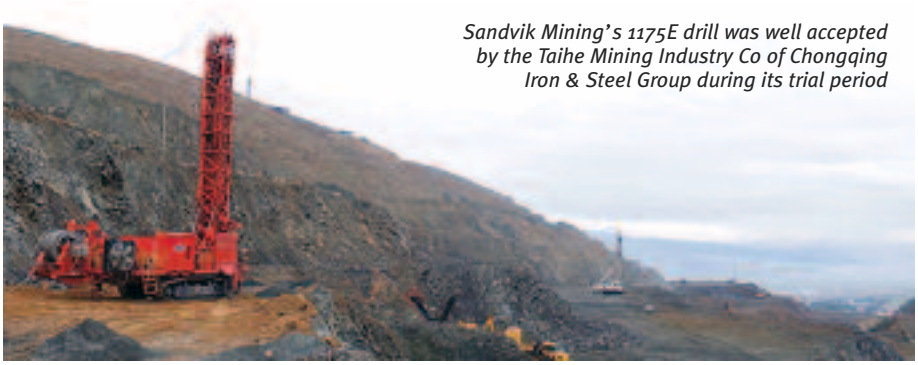
The Tier 4i engines feature improved performance and torque response via variable geometry turbocharging and an enhanced fuel system. This can provide up to 5% greater efficiency than the equivalent Tier 3 engine.

The passive regeneration of the diesel particulate filter is automatic with no operator assistance while still maintaining high machine performance. In addition, no diesel exhaust fluid is required for the Cummins Tier 4i which will also contribute to lower costs and fewer production stops.

Atlas Copco Underground Rock Excavation is a division within Atlas Copco's Mining and Rock Excavation Technique business area. It develops, manufactures, and markets a wide range of tunneling and mining equipment for various underground applications worldwide.

Sandvik Mining recently unveiled its electric-powered 1175E drill at a customer event held in Xichang, China. Developed as an adaptation of Sandvik Mining's D75KS rig, the drill was engineered for emerging mining markets and addresses safety and efficiency concerns. The Sandvik 1175E is an electric-powered rotary blasthole drill designed for drilling in the toughest operating environments in the world. It can be operated by a single person and delivers increased productivity, particularly while drilling overburden soft rock and hard rock found in coal and metal mining.

Recognising its customers' challenge to effectively slash operating costs, Sandvik Mining embarked on a journey to create an electric-powered rotary blast hole drill that would stand up to some of the toughest mining



Sandvik Mining's 1175E drill was well accepted by the Taihe Mining Industry Co of Chongqing Iron & Steel Group during its trial period

environments in the world. The 1175E drill rig was born from this initiative.

Electric-powered drills are in high demand in Asia and offer several benefits over diesel-powered rigs, including lower operating and maintenance costs. Additionally, electric drills generate a smaller environmental footprint than their diesel-powered counterparts because of the lack of carbon emissions.

The 1175E was designed with safety in mind. Highlighted features include:

- Operator's cab: The two-person cab is air conditioned and heated, equipped with an ergonomic, rotatable seat, and was designed to provide the operator with great visibility of the drilling operation. The cab is shock-mounted, FOPS-certified and large enough for the operator to stand and use wall console-mounted controls for tramming
- Main frame: Sandvik designed the 1175E with an open, well-designed work deck area complete with handrails, kick plates and multiple access ladders
- Cable reel: The 1175E's cable reel is automated rather than manual, making this mining process safer and quicker
- Programmable Logic Controller (PLC) system: The PLC system is designed for the complicated control functions, such as logic circuit control of regular relays, analog and digital control, calculation and comparison with input setup after data collection, proportional valve control and logic interlock control. It's easy for wire collection and service.

Commenting on the drill launch, Ken Staplyton, Vice President of Rotary and DTH Drilling, Sandvik Mining, said, "Our engineers at Sandvik's Jiading facility have worked tirelessly alongside local customers and mining officials to bring to market an electric rotary drill that will enable mining companies operating in China to achieve enhanced safety, increased productivity and peace of mind."

In December 2012, the first 1175E rig was delivered from Sandvik's Jiading facility to Chongqing Iron & Steel Group's Taihe iron ore mine just outside of Xichang City. Per the contract acceptance clause, the rig achieved 90% machine availability and an average instantaneous penetration rate of 40 m/h in different geological conditions in the Taihe mine.

Reporting on the results, Xiaobin Luo, Deputy Team Leader at the Taihe mine, explained, "Sandvik's 1175E rotary drill exceeded our performance expectations, and is more efficient than the domestic drills we currently have on site. Features such as the advanced control method, efficient pipe handling, automated cable reel and the powerful undercarriage designed to move easily and quickly – are improving our drilling operations."

A heavy-duty cooling package and a heavy-duty cabling harness concept are two innovations from **Volvo Penta** that will substantially improve the performance of its engines working in extremely harsh and dusty working environments. The cabling harness is already standard on all its industrial engines, and the cooling package will be launched by Volvo Penta as optional equipment in 2013.

Coolers and harnesses on machines like crushers and screening machines, concrete pumps, air compressors and other off-road equipment are daily put to the test due to vibrations and external forces, and not least the fine stone dust in mines.

The newly developed, heavy-duty cooling packages for the Volvo Penta VE engines are specifically adapted for harsh and dusty workplaces. The heavy-duty coolers are available on Volvo Penta D5, D7, D13 and D16 Stage IIIB/Tier 4i engines as well as D13 and D16 Stage II, which covers a range from 129 kW up to 565 kW. They will also be offered for the new Tier 4 Final range; D5, D8, D11, D13 and D16 in 2014.

"Our number one priority within this project was to develop a range of radiators suitable for crushers and screeners," says Johanna Borgudd, Product Manager Industrial Engines.

The new side-by-side, heavy-duty cooling packages withstand cleaning with high-pressure water, and will be offered as suction- and pusher-type cooling system available for all heavy-duty radiator units.

The D5–D7 packages is available as a kit including hoses, brackets for engine mounting, pipes, expansion tank, and mounting instructions. The D13–D16 packages are available as a kit including hoses, pipes, expansion tank, and mounting instructions. The customer can also choose to get it transport-mounted from the factory.

Cabling harness is another engine component that is particularly exposed in e.g. crushers and mining equipment. The problem here is often the traditional manufacturing technique, where the tubing is being thread on the cables with the cable terminals mounted. This means that the tubing cannot be completely filled and that the cables, at high vibrations, move inside the tubing and are torn against the ribs of the tube walls. Stone dust penetrating the tubing increases the wear considerably, which potentially can result in worn-out cable insulation and malfunction.

Volvo Penta's new, heavy-duty cable harnesses are based on a different manufacturing concept that is better adapted to these applications. Here, a split, synthetic polyester tubing (Roundit) is used as cable protection. The tubing, which has a smooth and soft inside, is simply wrapped around the cables. This means that the tubing is completely filled and that the cables inside the tubing are practically immobile, even at high vibrations.

Comparing standard cabling with this new, heavy-duty cabling shows that general qualities like e.g. wear and temperature resistance, are – on the whole – equal. The big difference is obviously the wear from the inside.

In such an equipment example, Sandvik has developed a new generation UH450E track-mounted tertiary crusher. The choice of engine power fell to a Volvo Penta TAD1651GE. The unit has an innovative structure aimed at guaranteeing high screening performance. This new unit now fills a gap in the Sandvik range of crushers.

Unlike previous product generations, the UH450E is electrically powered. The process is powered by a Volvo Penta power pack model TAD1651GE power generation engine installed in a soundproof container. Compared with previous models, this much-requested feature improves the energy efficiency of the unit. Low fuel consumption, uptime and the good reputation of Volvo Penta engines were Sandvik's main reasons for selecting a Volvo Penta engine for the new crusher.

Volvo Penta's TAD1651GE engine offers 505 kVA, prime power, and 556 kVA, standby power, at 1,500 rpm. The engine provides low maintenance and fuel-consumption costs for the end users. The engine meets Stage IIIA/Tier 3 emission legislation which provides an environmentally conscious choice.

Ruukki, a manufacturer of steel, supplies

special steels for all applications requiring wear-resistant or high-strength steels. Its direct-quenched Raex wear-resistant steel is made in a range of thicknesses from 2 up to 80 mm. Raex steels can be used, for example, to manufacture parts for heavy machinery and equipment designed for excavation, loading, transporting and crushing ore. Such parts include the buckets for excavators and front-end loaders, tipper bodies for heavy earthmoving machinery, mine conveyor systems, crushers, silos and hoppers.

Raex wear-resistant steels prevent the wear and damage of structural parts and decrease repair costs for machinery. Rukki says, "the lifetime of a bucket made of Raex can be between two and three times more than that of structural steels. In applications that require increased payload, the use of wear-resistant Raex and high-strength Optim steels can reduce the thickness of steel and the weight of tipper bodies by 20%.

"Raex wear-resistant steels have excellent cutting, bending and welding properties." Made using a direct quenching method developed by Ruukki, Raex wear-resistant steels have a hard steel surface and strong microstructure. The method improves the properties of wear-resistant steels and makes them consistent in quality. Ruukki's technical customer support offers technical advice and co-operation to customers.

Doofor reports some interesting operating experience with its drills. Nordkalk's Tytyri underground limestone mine in the south of Finland acquired a new Doofor DF550S drifter in 2012. Since August 2012, the drifter has operated for over 250 hours, drilling 64 mm holes in mine production. The drilling speed is 30m/h and the drill operates on several levels down to 350 m. The DF550S is a special version of the DF550L drifter, explains Kalle Kuusento from Doofor. "The DF550S has the rotation motor on the 'top' for easy access, which is valued a lot by some customers."

"This particular long-hole drilling unit was taken into use already more than 30 years ago. The reason for acquiring a new Doofor drill was that the earlier drill had come to the end of its useful life and while considering the pros and cons of a substitute drill, we ended up with the Doofor drill due to its excellent combination of cost-effectiveness and drilling performance", explains Sampsa Sysilä, mine manager.

Doofor DF550S operating for Nordkalk

NCC Ab, a Swedish contractor, has used the Doofor DF420S in their bolt hole drilling operations for the past five years. NCC is drilling 32 mm diameter holes for rock stabilisation with bolts in the Gällivare underground iron ore mine in Sweden. Stig Nilsson of NCC says that the Doofor DF430S has been a good choice for the job. Only the flushing seals have been changed after "thousands of bolt holes" have been drilled. The Doofor DF420S is a rock drill with a male threaded shank adapter and percussion power of 5 kW. The lubrication media in this rock drill can be water, air or air-water mist. The DF420S and its heavier piston sister, the DF430S are proven to be good tools for stabilisation and other small-hole drilling.

Another drill manufacturer from the region, Finland's **Junttan** makes the innovative ExcaDrill excavator-mounted rock drilling attachment. ExcaDrill rock drills are designed to be used on a variety of job sites such as quarries, rock bolting, construction works, etc. ExcaDrill rock drills' percussion hour to engine hour ratio is exceptionally good at 60 %, which is substantially higher than what can be achieved with conventional drill rigs, Junttan reports. "This is possible thanks to the excellent reach and fast, yet precise movements of the excavator´s boom. All ExcaDrill models are equipped with a unique control system, AutoDrill, which gives automatic control for drilling variables and makes drilling a lot easier and more efficient. AutoDrill also offers an intelligent anti-jamming feature which prevents drilling tools from getting jammed in the hole.

"ExcaDrill's capabilities are best proven in difficult conditions where other solutions fail to drill holes without the exceptional reach of the excavator's boom. Besides demanding conditions, ExcaDrill can also be used as a normal top hammer rock drill like conventional drilling rigs, but at the same time it allows the base machine to be used in other tasks while there is no need for drilling. The change from rock drilling to excavating and back can be done in just five minutes."

Moving heavy equipment around open pits can be an arduous task. The **Sleipner** system is changing excavator logistics and making the task simpler. It enables the moving of excavators safely and much faster; "every spin of a Sleipner wheel saves you money as well as time to be directed into productive work. This cleaver system is simple in idea, simple to acquire and simple to use," the company says.

The latest Sleipner model, the E550, is a system for excavators between 450 and 565 t. A series of tests took place in Sweden where the combination used for these tests was E550 - PC5500 - CAT793. "We are proud to announce that it was an absolute success, and after this the first E550 unit has been delivered to Africa. E550 features a new frame structure and traditional easy to use logistics.

Sleipner's engineers keep looking for new solutions and applications all the time. One of

Juntann's ExcaDrill package is complete containing all that is needed to operate the drill; drilling unit, compressor unit, dust collector and control unit. A strong and well-designed steel structure makes ExcaDrill a long-life attachment

Sleipner E550 on a field test in Sweden. This E550 was made for PC5500 and tested with PC5500-CAT793 combination

the latest innovations is a towing application for demanding conditions. It consists of a kinetic rope, which is easy to use, safe and light. This allows the towing of a Sleipner with two trucks when facing e.g. heavy up-hill pulls on steep slopes (10% - 15%) or when extra towing capacity is needed.

maximatecc, the new company formed through the merger of CrossControl, Maxima Technologies and Turotest, has developed a concept for replacing expensive and inflexible operator panels in industrial vehicles. Dr Mikael Åkerholm, Head of Product Management, explains: "Touch screen, computing and software technology has been pushed forward by the Smartphone explosion and then adopted by the automotive industry, meaning it is now available for industrial use. In the new concept, maximatecc adapts these technologies for the industrial vehicle market; enabling modern human-machine interaction solutions that help the human operate a vehicle more efficiently and safely."

Operator panels and armrest controls are traditionally realised with electromechanical components like push button matrices and assemblies of push buttons, lamps/LEDs, switches and knobs. This way of achieving an operator interface means that there is a "hardwired" connection between the interface component and respective machine function – i.e. the interface component is used for one task/function only. With the many functions of an industrial vehicle, this design requires a lot of space and it is hard to have the functions located in a good ergonomic way. There are many examples of where bulky operator panels steal valued cabin space and also limit the eye-of-sight. To reduce the space needed, one can design these panels by introducing 'mode' switches that change the function of an interface component depending on which mode is chosen. However, this means that you cannot apply symbols that help the operator intuitively find the needed function - the operator must keep track of mode/function configurations, his or her brain is occupied with processes that do not add value and the operation of the vehicle inevitably becomes less efficient.

With surfpads and Smartphones soon being products that virtually everyone uses, industrial vehicle operators will expect more from the operator environment in their working machine. They will, or do already, have higher expectations on usability and functionality when interacting with the machine. The limitations of traditional operator panels and the needs of a new generation of operators has been the basis for maximatecc to develop a new, innovative concept for the next generation operator panels.

The new concept for maximatecc operator panels uses a 4.3" PCAP touch screen, enabling a Smartphone-like user experience

The concept proposed by maximatecc is based on a 4.3" Projective Capacitive (PCAP) touch screen, offering the same touch interaction features as found in Smartphones, e.g. fast tap response, sweep navigation, multi-touch for zoom in and out. With the glass surface, the touch screen has a high resistance to wear and abrasive particles, making it suitable for use in industrial vehicles. The small form factor of the screen makes it ideal for armrest mounting and it requires little space when fitted into a panel.

The computing behind the screen consists of a low-power ARM cpu with high processing power to enable implementation of sharp and user friendly graphics. The computing component is equipped with CAN and Ethernet interfaces for communication and easy integration with the vehicle system.

The concept has an open software platform based on Linux where the system developer can use the programming tool of preference. Åkerholm says maximatecc has "in its software platform for displays carefully avoided creating a proprietary solution but instead set up an architecture that combines and integrates the most powerful, yet easy-to-use, commercially available frameworks for GUI and machine control. In the standard packaging, the concept uses Qt for programming of the graphical interface. Qt is an open, mature, and hardware independent framework that supports really advanced GUI functions and mimics, and has a drag-and-drop type of programming environment that requires only basic programming skills. The concept comes with ready-made graphical components for buttons, gauges, slide bars, navigation etc. The appearance of these components is easily configured by skin settings so that the GUI is made to fit with company graphical identity and cab interior design.

With the proposed concept, operator panel functions are realised in software. This means that the operator interface is easily adaptable for different machine configurations and options. The functions of a vehicle are defined in the vehicle controller program and the program running in the touch screen-based operator panel can be made to detect what functions it needs to support. This means tremendous savings in engineering effort compared to designing operator panels with traditional technology, where you need to make drawings of the panel, handle a number of component supplies etc. Then there is the advantage of not having to handle the assembly of the panel and test it. With the touch screen-based panel, the operator interface is 'assembled' only through simple software configurations.

Furthermore, the touch screen-based operator panel concept means that the functions on the panel can be made dynamic, i.e. that the visible set-up of functions changes based on what operating mode the machine is in, meaning that the operator only sees the controls he needs for a certain operating mode. This 'task adaptation' reduces the space needed for controls and aligns with one of the core aspects of interaction design: an interface should only contain the information and interaction possibilities that the operator needs.

Another advantage with controls implemented in software is the possibility to

create different profiles, graphical looks and behaviours of the controls that the operator can choose from, i.e. ability for the operator to customise the controls. Examples of such are setting of button tap response, LED/lamp lighting behaviour, text and symbol sizes etc. This addresses another aspect of interaction design, making the interface fit the user - don't force the user to fit to the interface. Industrial vehicle OEMs often state that their products are not used to full potential, even when operated by skillful, well-trained operators. "We believe that having the possibility to customise the operator interface is a way of improving vehicle utilisation," says Åkerholm.

Making metal

Outotec has been awarded a contract by Philippine Associated Smelting and Refining Co (PASAR) for the modernisation of its copper smelter in the Philippines. The contract value exceeds €12 million. PASAR's copper smelter is based on Outotec® Flash Smelting technology. The original Flash Smelting license dates all the way back to 1977. Over the years PASAR has regularly upgraded the smelter together with Outotec.

The scope of modernisation work this time includes equipment deliveries such as modern proprietary concentrate feeding system and burner, process advisor, furnace cooling system and anode casting shop including the supervision services.

"PASAR and Outotec's long-term relationship is a good example how the smelting technology can evolve by working together. By renovating and upgrading the older generation smelting plants with latest technology developments and our rebuild services, our customers can meet the increasing efficiency and environmental requirements and ensure their competitiveness far in the future", notes Robin Lindahl, head of Outotec's Metals, Energy & Water businesses.

PASAR owns and operates the only copper smelter and refinery in the Philippines. Their location in Leyte in the central Philippines has advantages for the company and its partners. Electric power is readily available from various sources of energy within the area. PASAR is equipped with its own port, a deep-harbor facility which can accommodate vessels with a displacement of up to 50,000 t. It is a multi-purpose port that is composed of two berths which handle both inbound and outbound cargoes. The smelter and refinery lie at the center of the Philippine archipelago.

Outotec is also to supply the latest flash smelting technology improvements to the upgrade of Rio Tinto's Kennecott Utah Copper smelter in the US. The contract value is approximately €14 million. Kennecott has operated the Utah copper smelter since 1995 using a combination of Flash Smelting technology and Kennecott-Outotec Flash Converting technology, which has been jointly developed by the two companies. Outotec's scope of work on this latest contract includes equipment deliveries such as proprietary feeding system, concentrate burner, process control, furnace cooling and anode casting upgrade.

Once completed the upgraded flash furnace will ensure highly efficient production combined with a long campaign life. Flash Smelting combined with Flash Converting is the world's cleanest technology for primary copper smelting. Outotec states: "Since it makes use of the reaction heat of the feed, copper sulphide concentrate, minimum amount of external fuel is needed in the process. Owing to low volume of process gas and compact and sealed equipment, sulphur capture exceeds 99.9 %. Thanks to its environmental performance the Kennecott smelter has been the world's benchmark smelter and the upgrade will further improve its position."

"During our long relationship with Rio Tinto Kennecott Utah Copper since 1984 we jointly developed the Flash Converting technology, built a worldclass smelter in Utah, and now continue cooperation in upgrading it with the latest Outotec technologies. We believe that these types of smelter renovations aiming at highly efficient operations and meeting the strictest environmental standards will bring both parties considerable benefits and strengthen cooperation", noted Jari Rosendal, head of Outotec's Americas region.

Kopar Group, a Finnish manufacturer of process equipment for smelting operations, has designed a new steam dryer to dry the concentrate before it is conveyed to the smelting furnace. According to the company, the new dryer, which has a European patent, offers many features that enhance the drying process in comparison to existing dryers.

Most smelting operations produce steam as part of the process, and therefore using the plant's steam is an economical solution compared to using outside energy sources. Another positive aspect is environmental. Since the new dryer works at lower temperatures, the process also produces fewer emissions.

The European patent basically is about the arrangement of the heat pipe system consisting of heat transfer elements. The heat pipes are co-rotating, which means less mechanical wear of steam tubes. Therefore the maintenance intervals are longer. The structure includes quite a few new features: no pressurised pipes in supporting contact; no massive construction inside the dryer; less steam distributing hoses; high heat area to drum volume ratio; and low length to diameter ratio.

The dryer is aimed primarily to copper smelters but other ores can be processed as well. The dryer range includes several sizes. ***IM***