Seamless cooperation and mobile equipment help Japan to recover from tsunami
Focus on customers and safe operations

For globally operating organizations like Metso Mining and Construction, last year was rife with challenges that had to be dealt quickly and promptly. In this turbulent business environment, the winners are organizations that are agile enough to adjust their operations quickly and as needed.

To achieve this agility, we were reorganized last year under three business lines. They all focus on serving our customers in the areas of crushing and screening, minerals processing and services.

The new Crushing and Screening Equipment business line gives us a more solid position, but also more responsibility in terms of delivering results for our customers. The change gives our business more attention and increased value, but at the same time it also calls for more attention and customer focus from all of us. We need to deliver measurable results.

Last year we made good progress in a number of strategically important areas, such as growing our services business and our business in emerging markets. Today, services account for some 50% of our net sales. As much as 58% of our order intake originates from emerging markets.

Customer focus is clearly evident in our work, when looking at our global manufacturing overview. We are in a constant process of reorganizing our production portfolio to bring us closer to our fastest growing customer areas. Through an efficient transfer of technology we can secure quality products and services, wherever the customer is situated.

Metso Mining and Construction will maintain its focus on health, safety and environment issues (HSE). As outlined in our new HSE policy, we are committed to taking personal responsibility for our own safety and for the safety of others.

Pekka Pohjoismäki
President
Crushing and Screening Equipment business line
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New Service Centers built in South America

The Service Center currently under construction in Antofagasta, Chile, will have an area of over 12,000 square meters.

Metso is launching construction of new Technology and Service Centers, aiming for the highest standards in the mining industry. These Service Centers with advanced technology will be located in Antofagasta, Chile, and Arequipa, Peru, and will allow Metso to respond immediately to key customers’ requirements in the region.

The top-class automated equipment and manufacturing machinery will be started up in 2012 as part of Metso Mining and Construction’s plan for growth in South America.

Crushing equipment to Camargo Corrêa’s dam project in Venezuela

The new Service Center will be equipped with top-class automated machinery for service and rebuilds.

In Antofagasta, construction is already under way; the installation of over 12,000 square meters, will be the biggest service center in the country.

The Service Center will focus on the manufacture, repair and reconditioning of equipment and components that operate in large-scale mining and industry in South America. Another center with an area of 11,000 square meters has been built in Arequipa.

Aldo Cermenati, Vice President of Services, notes, “During the next 10 years, national mining has good conditions for growth and there are many projects yet to be developed. With our new Service Centers, we want to be close to our customers and reach them with the services and components they need. Mining customers require availability, reliability, quality service, and all that with zero accidents.”

A Nordberg TS series screen in a stationary installation.

Metso has signed a contract with Camargo Corrêa and the Hydrologic Company to supply equipment to a new crushing and screening plant in Venezuela. The new plant is part of the TUY-IV project, which includes the construction of a dam to supply water to Caracas. The project will be built in the northern part of the Acevedo Municipality, the Venezuelan state of Miranda.

Under the contract, valued at approximately EUR 10 million, Metso will supply a complete stationary crushing and screening plant as well as spare parts and automation systems. The contract also includes assembly supervision.

“This contract is further validation of the successful collaboration between Metso and Camargo Corrêa. It is worth noting that this project is unprecedented, as the crushing plant supplied by Metso will be also fully automated by Metso,” notes Dionisio Covolo, Commercial Director for Construction Equipment, Metso.

Delivery is scheduled for the first quarter of 2012 and the project start-up is expected to take place in the same year.

The complete order comprises two C140 jaw crushers, two HP4 cone crushers, an HP400 cone crusher, TS2.2 and Vibraline 60”x72” screens, two TS5.2 screens, two TS6.2 screens, two Barmac vertical shaft impactors, three belt feeders, a structure for the stationary crushing plant for the HP400 cone crusher, and several belt conveyors. The nominal production capacity of the plant will be 800 tons per hour.
Fully automated crushing plant to Consórcio Construtor Belo Monte in Brazil

Metso has signed a contract with Consórcio Construtor Belo Monte (CCBM) to supply equipment for the construction of the Belo Monte hydroelectric power plant (UHE Belo Monte) in Brazil. The project is located on the Xingu River, Pará State, in the northern region of the country. In addition to equipment, the contract also includes services and parts. The value of the order is some EUR 30 million.

Metso’s scope of delivery comprises three automated large crushing plants, two portable plants and two mobile Lokotrack plants.

“This is the biggest contract Metso has signed in the Brazilian construction industry in the last few years. This delivery, with fully automated plants and the latest technology, consolidates our presence in the construction of the largest hydroelectric power plants in the country. Furthermore, Belo Monte is a project that contributes to the development of the country by providing clean, renewable energy and economical growth,” notes Dionísio Covolo, Commercial Director for Construction Equipment, Metso.

The complete delivery is scheduled for the first quarter of 2013.

Metso will supply a tandem rotary railcar dumper to Hamersley Iron Pty Ltd. in Australia. The equipment will be delivered to Hamersley Iron’s Cape Lambert, Port B iron ore operation in North Western Australia. The value of the order will not be disclosed. The order also includes spare parts, technical assistance during installation, pre-commissioning, commissioning and performance testing.

The design of the equipment allows for lower maintenance and higher, more efficient material output flow; ease and safety of maintenance is also improved through a reduction of overall components.

This is the second equipment of this kind delivered to Hamersley Iron for this project. The previous equipment was delivered in 2011. The design of the equipment was achieved by working closely with Rio Tinto and the engineering team of this project.

“One of Metso’s commitments moving forward is to work together with our customers in partnership so that we achieve the best outcome, and we look forward to supporting Rio Tinto on this project,” says Max Wijasuriya, VP, Capital Equipment for Australia and New Zealand, Metso.

Delivery is scheduled for the second quarter of 2013.

Hamersley Iron Pty Ltd is a member of Rio Tinto Group, one of the world’s leading iron ore producers. Rio Tinto has approximately 77,000 people working in over 40 countries.
Helping Japan to rebuild after the tsunami

Metso’s mobile crushing and screening units are in the frontline in the demanding reconstruction efforts in Japan, after the nation was ravaged by the biggest earthquake and tsunami in its recorded history. Tracked, mobile Lokotrails are the quickest way to boost the production of aggregates, an estimated 200 million tons of which will be required over the next decade.

TEXT & PHOTOS Eero Hämaläinen
“In the Tohoku district, demand for aggregates is now clearly exceeding production capacity. Even old quarries are being reopened in order to quickly meet the demand,” says Isamu Yamamoto, Chief Secretary of Japanese Crushed Stone Association.

“In the present economic situation, Japanese contractors can neither afford nor do they have time to invest in stationary applications. Therefore, in terms of economy and time, mobile units are the only way to quickly pick up the production,” he adds.

A severe, 8.9-magnitude earthquake hit the Pacific coast of Japan, 400 km northeast of Tokyo, in the early afternoon of March 11, 2011. Buildings, ships and cars were swept away by a tsunami wall of water rising higher than 20 meters. More than 20,000 people died, many of whom are still missing.

During the first year, work to repair the basic infrastructure, including the road network, was carried out. The actual reconstruction of coastal residential areas is about to begin. The tsunami also left behind huge masses of concrete debris and wooden structures that are now being recycled.

**A year’s production required in a month**

The Goto-Saikosyo company operates a quarry in the Ohzuchi town area, about one kilometer from the Pacific coast where the tsunami hit hardest.

Before the earthquake, the main end product of the company was silica for the local steel mill, produced in a stationary quarry. After the tsunami, demand for road base aggregates grew very fast.

“We normally produced some 90,000 tons of aggregates per year, and now, the same amount is required in a month. The only way to meet the demand was to invest in mobile equipment,” says Goto Rikizou, President of Goto-Saikosyo.

The first two Lokotrack, an LT96 jaw plant and an ST3.5 mobile screen, sold by Metso’s distributor UBE Techno Eng Co. Ltd. arrived to the site in July 2011. They will be followed early this year by the LT200HP cone plant and LT7150 vertical shaft impactor plant.

Today, 70% of the production is generated by the stationary plant, and about 30% using the Lokotrack mobile process.

“We chose Metso because of the close relationship with Metso’s distributor UBE’s Keiji Kadomura and their local agent, Konno Fomio. Since the first cone crushers were purchased in 1999, we have trusted in Metso. In Japan, close, local contacts are highly important,” Goto Rikizou stresses.

Imai Noriyuki, Plant Manager of Goto-Saikosyo explains the rapid change of end product needs:

“In the nine months after the tsunami, we concentrated on producing road base materials needed to rebuild the local infrastructure. From now on, the focus will be more on end products for concrete, as the reconstruction of buildings is being started.”
According to Mr. Noriyuki, the two coming Lokotracks will guarantee the high cubicity and quality of the end products. “We are happy with the performance of the two first Lokotracks. Our feed material, with its high silica content, has been a challenge for the jaw wear parts. By changing the wear profile we hope to extend the lifetime,” he adds.

A three-year recycling challenge
The coastal city of Rikuzen Takada was among the areas hardest hit by the tsunami. Most of the coastal, residential area was wiped away by the masses of water. Today, the beach line next to the Pacific Ocean is a huge recycling area, packed with material stocks and recycling equipment.

In September 2011, Nishio Rentol launched a three-year project aimed at recycling all the concrete blocks collected from the destroyed housing nearby. The rented equipment includes a Lokotrack LT105 jaw plant, equipped with a magnetic separator, and a Lokotrack LT1100 cone plant.

“The feed we process can include anything from steel reinforcement to glass...”

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Goto-Saikosyo Kamaishi quarry
FEED MATERIAL: silica slate
PRODUCTION, STATIONARY AND MOBILE: 90,000 metric tons per month
MAIN END PRODUCTS: 5–10 mm, 5–13 mm, 13–20 mm
METSO EQUIPMENT
- Lokotrack LT96 jaw plant
  - css 60 mm
- Lokotrack ST3.5 mobile screen
  - upper deck 40 mm
  - lower deck 25 mm
- Lokotrack LT200HP (to be delivered)
- Lokotrack LT7150 (to be delivered)
- Omnicone SX200 cone crusher
- Nordberg HP100 cone crusher

Nishio Rentol with rented machinery at Rikuzen Takada recycling center
FEED MATERIAL: Recycled demolition material
END PRODUCTS: –50 mm for cement production
PRODUCTION: About 450,000 tons in three years
METSO EQUIPMENT
- Lokotrack LT105 jaw plant
  - css 50 mm
- Lokotrack LT1100 cone plant
  - css 30 mm

Tohoku Sekizai Kogyo Tome quarry
FEED MATERIAL: slate and sandstone
PRODUCTION BEFORE TSUNAMI: 500,000 tons per year
PRODUCTION AFTER TSUNAMI: 650,000 tons per year
MAIN END PRODUCTS: –300 mm and 150 mm for land fill; –80 mm, –40 mm and –30 mm for road base materials; 2.5–5 mm, 5–13 mm and 13–20 mm for asphalt aggregates; 5–15 mm, 15–20 mm, 5–20 mm and 20–40 mm concrete aggregates and manufactured sand
METSO EQUIPMENT
- Lokotrack LT125 jaw plant
- Nordberg HP300 cone crusher
- Barmac V7 VSI crusher
- Lokotrack LT105 jaw plant
- Lokotrack ST272 mobile screen
and wood, because it’s collected from destroyed houses. Therefore, some manual sorting is required. We have no problems processing it, because Lokotrack can well be rated as the number one machines in the world,” says Mori Teruka from Yamazaki Machinery, who is in charge of the mechanical support of machinery on site.

“Therefore, I recommend Metso’s Lokotrack to everybody.”

The only challenge Nishio Rentol has is related to the height of the feed pile. If it exceeds five meters, some natural burning of concrete may happen.

“The purity of the end product after the twin process with the Lokotrack is so good that it can be recirculated at a nearby cement factory,” Ishii Koujiro, Operator of Nishio Rentol highlights.

“Mobile equipment adds business flexibility and economy”

Tohoku Sekizai Kogyo runs a quarry in Tome, 50 km inland from the tsunami area, refining slate and sandstone into high-quality aggregates for roads and concrete. The company’s equipment fleet includes both stationary crushers and three Lokotacks from Metso.

“Mobile units provide Japanese customers with a safe and economical solution. If the high aggregates demand caused by the tsunami comes to an end, we can easily sell the mobile plants. In Japan, we also need to pay less tax on mobile units, thus adding business economy,” notes President Miura Masaaki.

“With Metso machinery, we can secure both high performance and excellent end-product quality – even when processing difficult feed like slate. A good distributor guarantees quick service and spares availability, which is a big plus for us,” adds Director Miura Masataka.

The next addition to Tohoku Sekizai’s Lokotrack fleet will be the ST272 mobile screen.

High need for aggregates

“During the first year after the earthquake and tsunami, the main focus has been on producing aggregates for road construction and land reclaiming. From now on, the demand will be greater in concrete grades, as the reconstruction of destroyed buildings and tsunami protection walls is being started,” notes Isamu Yamamoto, Chief Secretary of Japanese Crushed Stone Association.

“In the coming years, the Tohoku region will require some 20 million tons of aggregates every year, which is 10% of the country’s total production. Here, mobile units are the only way to boost production quickly and economically in a sound way,” Yamamoto adds.

The total budget granted for rebuilding Japan’s infrastructure is EUR 190 billion.”

“Testing Metso’s new HP3 cone crusher opened up new potential for us”

I love being at the forefront of innovations, and I am very curious about new technologies. Trusting in Metso to test this new Nordberg HP3 cone crusher, we saw an opportunity with our quarry manager to find new potential, and we immediately accepted the testing challenge.”

This is how Jean-Claude Maroncelli, President of the French quarry Société des Carrières Maroncelli, describes the close cooperation in testing new Metso crushers at his quarry in Avignon, in southern France.

Metso hosted its customers in the hilly quarry site of Piolenc Maroncelli on September 20, 2011, near the city of Châteauneuf-du-Pape. After an exclusive demonstration of the new cone crusher, the Nordberg HP3, the lively conversation continued on a panoramic terrace during a traditional French lunch.

Jean-Claude Maroncelli was all smiles and kindly agreed to answer some questions.
First of all, thank you for having us here. Can you tell us a bit about your quarry?

“Our quarry site is relatively young, having obtained a prefectoral decree in 1998. Its assembly was completed in 2000, and aggregate sales started in early 2001. The site produces 600,000 tons of different end products per year, mainly natural gravel from the Rhône, characteristic of the region.

“Around 30 to 35% of the production is sand, and the rest is above 6 mm to 200 mm, 0-22 mm down to all the cuts demanded by the standards of construction and high-performance concrete. Our products are also used for many applications of hot mix. Our main customers are located within a radius of about 100 km.”

What projects are you working on at the moment?

“Our current project is to create a port. We are fortunate to be along the Rhône, as it allows us to transport our products by barge, at a weight of 2,000 tons – the equivalent of 80 semi-trailers. For this project, we are waiting for a building permit that we hope to obtain this year and be operational by 2013. This would allow us to send a part of our production by barge. It is not a cost-effective alternative, but it is more environmentally friendly, much safer and would reduce the carbon footprint in our balance sheet.

“We are also redeveloping a site, with the introduction of photovoltaic panels on half of our lake of 40 hectares. This will allow us to supply energy equal to the energy consumption of 8,000 local homes. This major project will be carried out with the company Ciel & Terre.”

When did your partnership with Metso begin?

“Our cooperation with Metso dates back over 30 years to the times of Bergeaud machinery. We had a cast-iron Duplex 43 crusher and it worked very well. At the time, we only had a few machines here – not like today. Since 1998, the entire plant and machinery is supplied by Metso. Moreover, we are pleased with our long-standing relationship that works very well.”

Your quarry is often cited as exemplary, modern and clean, with a desire to integrate into the landscape. How do you manage it all?

“There are no secrets. I give all means to my Quarry Manager, Jean-Michel Erard, who is a competent man and continually improves the site. With the help of Nathalie Benista, who is responsible for environmental issues, we have, since 2008, reached the maximum 4/4 position in the Environmental Charter.

“Maintenance is our focus. We must constantly control our image. I repeat it often, but my philosophy is: the more a plant ages, the more powerful it has to become. There are still gaps that we correct over the years. We do not hesitate to change the machines when necessary, which allows the installation to remain fresh.”

What motivated you to embark on the adventure with the HP3; in other words, testing a new and unknown machine?

“By chance, we had an overstock of natural gravel of 6-16 mm. Metso and their technicians ensured us that the new Nordberg HP3 cone crusher could crush it. We didn’t hesitate for a second. And, of course – who can do more can do less – the HP3 can crush up to 200 mm.”

What capabilities of the HP3 impress you most?

“Today we are at the beginning of the testing phase. We expect to realize 400 tests and we have only completed 40 so far. The tests performed with natural gravel 6-16 were very convincing. The HP3 crusher does not fight back or increase the pressure. The end product meets the shape and cubicity specifications for full marketability.”

Any closing thoughts?

“Never change a winning team! We have a great relationship with Metso and very positive experiences. Our relations have always been based on a win-win concept. If I were to open a new site tomorrow, working with Metso would be a given.”

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Crushing with the new Nordberg HP3 cone crusher did garner a lot of interest among Metso’s French customers.
Karzok is about 225 kilometers from Leh in Jammu and Kashmir, and at an altitude of 4,860 meters above sea level. Only five months of accessibility, a scarcity of oxygen and water, and absolutely no infrastructure to execute projects sum up the challenges Metso faced recently.

Commissioning a modular plant at the world’s highest altitude in just 35 days surprised Anusha Projects Pvt Ltd, and at the same time delighted them at their decision to choose Metso as their preferred partner to execute the project.

**Indo-China border road project**

The Indo–China road project was released by the BRO (Border Roads Organization) in 2010. Anusha Projects sub-contracted the order and needed a partner with the best technology as well as the ability and know-how to execute a project like this in difficult terrain. Several reference checks and discussion rounds led them to Metso.

Anusha Projects Pvt Ltd, a Hyderabad-based company, is a mining, drilling and blasting operations company founded in 2002. With diversified activities, they entered the quarrying and crushing business in 2007 to meet the demand of crushed aggregates required by infrastructure development companies.

“When we got this project, we knew about the difficulties that lay ahead of us,” recalls Mr. A Jalandhar Reddy, Managing Director, Anusha Projects. “The working conditions were very challenging and, to top it all off, there are not many project management teams gutsy enough to handle such climatic conditions. Our quest to select the right partner ended with Metso and, in my opinion, the real reason was the commitment level of both Anusha and the Metso teams. We succeeded really well.”

The tough terrain required technology that can withstand the natural landscape and the difficulties that Anusha faced in this project.

“We couldn’t compromise on the quality of the technology or expertise. Our best choice was Metso. We needed sound technology to back the project, as the working conditions and timelines were quite challenging. Metso’s jaw and cone crushers have a proven track record and have performed in difficult projects – that was clear motivation for selecting them,” Mr. Reddy adds.

With the requirements of the project in mind, the Metso team suggested a modular crushing plant. The reason was simple: Metso’s modular design plant has a high degree of flexibility and is perhaps the most compact offering in the industry, with great ease of transportation and erection. The 235 tph modular plant was fitted with a C106 jaw crusher and a GP11F cone crusher.
Unexplored territory
In December 2010 the discussions started moving forward, and the site location Karzok in Leh was announced. This project challenged Metso on several fronts. Heading 4,860 meters above sea level was definitely exciting, but the proportional challenges were not very clear. Scarcity of oxygen, logistical inaccessibility, and extreme weather conditions are only the most common problems.

The site in Karzok, Tso Morori, which is 225 kilometers from Leh, is a place with no connectivity, any way you look at it. No telecommunications and no roads get the adrenaline pumping, not to mention that the area was prone to landslides. Adding to the problems were the very narrow roads, which further limited the cargo-carrying capacity and choice of vehicles.

The road to Karzok is accessible for only for five months a year, from June to October, so Anusha wanted Metso to finish the supply, erection and commissioning in two months so that production could be started in the next three months. To ensure the schedule-bound sufficiency of supplies, the Supply Chain Management (SCM) team ensured the timely delivery of structures and other parts, as any short supplies would result in huge losses of time and money.

Tough gets even tougher...
Despite structured planning, the project was full of challenges, from supply right up to commissioning.

“When we first started transporting material to the site, it was discovered that the permissible load per vehicle on the hilly terrain of Zojilla pass and onwards to Leh is 7 tons,” recounts Alok Jha of Metso India. “This was a nearly insurmountable obstacle in transporting the crushers to the site, as the crushers suited for this modular plant were as heavy as 16 tons. A quick decision was made to dismantle the crushers and transport them in parts. The jaw and cone crushers were taken to our Faridabad warehouse, where they were dismantled and then transported to the site.”

“Like any other project, unexpected delays did creep in; however the sheer grit, dedication and determination of the team ensured the completion of this project in a record 35 days. I recall that at the time of commissioning, the customer could not provide us with a lifting crane. However, the Metso team found a solution to this problem and commissioned the plant with an excavator until the crane was made available. That was quite a challenge,” Alok Jha says.

The only way to communicate with the team at the site was via a satellite phone, which could be accessed twice a day. No cellular network is available in that area. Extreme climatic conditions were one of the major hurdles. The temperature sometimes plunged to 40 degrees below zero, icy winds sweep the area and it is always dangerous to work at heights with no vegetation around. People fell sick easily, due to mountain sickness, lack of oxygen and cold winds.

“So we always had to be prepared with backup resources. The extreme cold weather also restricted everyone’s working capacity. As a result, three days of work on site at one time had to be reduced to one day. Some of these hurdles could not be anticipated; It wasn’t until we started working at the site that we experienced them.”

Mr. A Jalandhar Reddy of Anusha Projects concludes:

“This was my first project with Metso and I found the team highly competent, committed, and focused. It was not an easy job but what Metso demonstrated was nothing short of a miracle. What impressed me most was their skill in planning and project management, which resulted in the project being completed in just 35 days, despite the tough conditions. They were highly proactive and always ready to go the extra mile in every situation. We were ready for production within a few weeks, and the plant is now performing according to our expectations.”

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The secondary crushing section of the plant is operated with a GP11F cone crusher.
Northland Resources – a mine is born

The first iron ore concentrate deliveries are scheduled to leave the mine site in early 2013. Annual production of 5 million tons of dry iron ore concentrate is planned as an open-pit operation. The first iron ore deposits to be extracted are Tapuli, followed by Sahavaara, and then most probably Pellivuoma.

Northland Resources is also planning to re-open another iron ore deposit in Finland, near the Swedish border, as a brownfield project in Hannukainen.

The new mine will have a significant economic impact in the Pajala district. The miners will continue the historical work of their colleagues of decades ago: casting Swedish crown coins using local iron ore.

Hectic removal of overburden
In late autumn 2011, an uninterrupted convoy of huge dumptrucks of the contractor Peab could be seen transporting the 10-12-meter layer of overburden covering the “black gold” iron ore at Tapuli. 20,000 cubic meters were being moved out during one 14-hour day.

The removal will take a full year, until summer 2012, and will include up to 9 million cubic meters of materials.

Some of the overburden is crushed as aggregates needed for the different construction projects at the mine site. For that, a sturdy, track-mounted Lokotrack LT140 jaw plant is being used.

Two main production lines
The Kaunisvaara project will occupy two production lines, both equipped with long conveying systems and huge primary gyratory crushers. The grinding circuits in the concentrator building consist of one primary AG/SAG mill for each line, and the process includes Metso’s popular Vertimill™ vertical grinding mills.

TEXT & PHOTOS Eero Hämäläinen
With a total of 7 Vertimills™ to be assembled, Kaunisvaara will be home to the most vertical grinding mills of any mine site in the world so far. For safety reasons, the large process building is only being constructed during the night shift.

To ensure the supply of the considerable amount of fresh water required for ore processing, a 40-km-long water line is being built between the mine site and the Tornio River, situated on the border of Sweden and Finland. A comprehensive water recycling system will also be built.

Iron ore concentrate to Norway
Northland Resources plans to use a two-step transporting system for the concentrate. Big trucks will travel the 120-km distance from Kaunisvaara to Svappavaara. Six to eight full truckloads will be shipped every hour.

Between Svappavaara and the Norwegian harbor city of Narvik, the concentrate will be transported by train. Northland is building its own shipping terminal to the harbor of Narvik.

“Close Nordic cooperation”
More than 400 people will be employed at the Kaunisvaara mine site in 2013. With the global mining boom also reaching the Nordic countries, one challenge for opening the mine is to find professional workers.

“We believe we can secure the required resources through close Nordic cooperation. Professional miners from Sweden, Norway and Finland will come work for us,”
In addition to the over EUR 200 million equipment contract, Metso signed a separate contract with Northland Resources concerning a five-year mill lining service and inspection program. The value of the order is EUR 19 million.

"We are pleased to have concluded this contract as it maximizes the availability of our grinding line," says Shane Williams, Vice President, Projects, Northland Resources AB. "As this is a cost-per-ton contract, we will be able to forecast expenditure over extended periods of time. It will be a very useful asset in view of the total investment involved."

Eric Mella, Quality Manager of Northland Resources, says: "And with the nearby city of Pajala building new flats, people from other Northland offices will move here," he adds. "Cooperation with the local residents is highly important to us. We have held open days for our neighbors to show our activities, and we will pay special attention to all environment-related issues," Mella stresses.

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Sturdy dumptrucks are being used to remove the overburden from the Tapuli deposit and to transport the aggregates needed at the mine site.

**Life-cycle services for grinding mills**

Besides the minerals processing equipment, the Kaunisvaara iron ore project includes a major services contract. Erik Mella (right), from Northland Resources, inspecting the Sahavaara deposit with Sami Laitila of Metso.

In addition to the over EUR 200 million equipment contract, Metso signed a separate contract with Northland Resources concerning a five-year mill lining service and inspection program. The value of the order is EUR 19 million.

Metso’s Life-Cycle Services (LCS) program at Kaunisvaara includes both the supply and installation of mill liners and technical and maintenance support for the semi-autogenous mill on the Tapuli process line. Metso’s on-site resources will also conduct liner inspections to maximize mill availability.

"We are pleased to have concluded this contract as it maximizes the availability of our grinding line," says Shane Williams, Vice President, Projects, Northland Resources AB. "As this is a cost-per-ton contract, we will be able to forecast expenditure over extended periods of time. It will be a very useful asset in view of the total investment involved."

**Northland Resources**
**Kaunisvaara mine**

**LOCATION:** Pajala, northern Sweden, 100 km above the Arctic Circle

**TAPULI OPEN PIT:** 2600 m long, 750 m wide, 350 m deep

**SAHAVAARA OPEN PIT:** 2100 m long, 750 m wide, 360 m deep

**AVERAGE IRON GRADES:** 26% (Tapuli), 41% (Sahavaara)

**NUMBER OF EMPLOYEES DURING 2013:** 430–440

**METSO EQUIPMENT FOR TWO PRODUCTION LINES**
- 1+1 Primary gyratory 54/75 crushers
- 1+2 Screens
- 1+2 Grizzly screens
- 1+6 & 1+6 Apron feeders
- 1+1 Vibrating feeders
- 1+1 AG/SAG mills, 34’ x 18.75’
- 3+4 Vertimills, VTM-3000-WB
- 20+29 Magnetic separators
- 3+4 Cyclones
- 0+6 Flotation cells, RCS 200
- 2+2 Screw classifiers, SVC 150-LB-DP
- 1+1 Thickeners
- 3+3 VPA filters, VPA 2040-54
- ~ 50 Slurry pumps
- ~ 75 Other pumps
- ~ 4700 m Conveyors (Tapuli ~ 1600 m, and Sahavaara ~ 3100m)
Metso’s mill lining in the biggest AG mill in the world.
Metso mill lining solutions – a total cost approach

Metso’s mill liner systems are designed to maximize service life as well as mill utilization. Customer objectives are important factors when designing successful mill applications.

TEXT Håkan Stålbrost  PHOTOS Fredric Alm
Mill lining design
When selecting suitable mill lining designs, there are certain application-related factors that must always be considered. The type of mill, the mill size, the feed size, ore type, mill speed (rpm), pH-value, temperature etc. are some of the more important selection criteria. In many cases the grinding circuit design (open or closed, pebble crusher etc), discharge capacity and, of course, whether the mill is operated in single or dual rotation also need to be considered.

SAG and AG mills typically treat coarse, angular feeds and hence normally exhibit relatively high wear rates. Linings for these mills must be quite highly profiled to lift the charge enough to achieve the required impact, and also to maintain an adequate profile throughout their service life. Ball mill liners are normally less profiled as compared to SAG and AG mill liners, and primary ball mills are also generally of overflow type.

The method of installation and available installation equipment should always be considered when designing a lining. The overall plant layout, as well as the maximum size and allowable weight of the individual lining components must be taken into account to ensure quick and safe installations.

Metso always tries to meet the customer objectives and to design for their specific application. There is no such thing as a generic liner or a typical lining wear life, because applications, customer objectives and maintenance schedules vary widely from case to case. A lining of high and uniform quality that is properly sized and balanced in design ensures that maintenance is minimized, mill availability is maximized, and that maintenance intervals and necessary stoppages are easily predicted.

Metso’s range of mill liners for different mill types
Metso’s product range covers almost all mill sizes and types irrespective of brand name. There are, however, a few unusual applications that need to be considered on a case to case basis. Mills with very high temperatures, extreme pH-values or generally chemically hostile environments can in some cases require special liners or liner materials.

Metso has a range of different types of lining materials (rubber, metallic alloys) that perform differently in different applications. Some are formulated for optimum resistance to impact, cutting and tearing in primary applications, while other compounds have been tailored for maximum abrasion resistance in fine grinding applications, while still others are designed to resist high temperatures.

Metso has recently developed and delivered a new liner concept for big AG mills called the Megaliner™. The Megaliner™ is an entirely custom-made lining system that integrates multiple rows of lifters and shell plates into one large piece, covering up to 4 square meters per liner element. These liners use a minimum number of attachment points, and the liner is bolted from the outside of the mill. This is an entirely new concept that not only substantially shortens the liner installation and change-out time, but also significantly

Product and application chart

<table>
<thead>
<tr>
<th>Type of mill</th>
<th>6</th>
<th>10</th>
<th>14</th>
<th>18</th>
<th>22</th>
<th>26</th>
<th>30</th>
<th>34</th>
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Discharge systems, trunnion linings and trommel screens are suitable for all sizes
reduces the risk of injury, since the liner handler operator is the only person who needs to be inside the mill while stripping worn liners and installing new ones.

**Process optimization**

Grinding efficiency is influenced by the lining design. A mill has a certain size and available power, and this means that any mill has a theoretical maximum grinding capacity. Since the lining forms the final link of power transmission to the tumbling load, it must be profiled in such a way to achieve the correct balance between impact and attrition grinding. On a broad scale, the design of a lining will also affect media and energy consumption, while on a finer scale close attention to fit and tolerances allows for quick liner change-out, as well as providing superior protection to the mill itself.

Metso's mill liner systems are designed to maximize service life as well as mill utilization. Computer simulations are conducted based on operating parameters and wear profile histories. 2D-DEM modeling is routinely used for general design selection, from which different lining design alternatives can be compared and media trajectories calculated. 2D-DEM modeling provides reliable comparative values for power draw and media to liner impact.

To further optimize and fine-tune lining designs 3D-DEM capability is used. This tool allows a possibility to predict the performance of a lining over its entire service life, and to calculate trajectories, full energy spectra, media to liner impact and power draw with a very high degree of accuracy. These services are generally available for all mills with Metso liners regardless of brand name, but when a customer purchases genuine Metso equipment, many of these services can be rolled into a package. Metso also offers process audit services, up to and including full 'mine to mill' optimization.

**Mill liner inspections and maintenance planning**

When Metso ventures into new applications, best effort is made to conduct regular and frequent inspections to determine specific wear patterns. Metso can use these inspections to estimate upcoming liner replacement, and to identify if any design improvements are possible. With opportunity and adequate notification, three or more inspections are often conducted over the life of an initial liner set. For well-documented mills with stable operating conditions, one or two inspections between liner change-outs are generally sufficient to permit accurate forecasting.

Based on several decades of experience with all types of mill applications, Metso's engineers and technicians know when a lining has reached a critical thickness or can predict whether the remaining lining profile will survive until the next planned service stop. Wear rates tend to increase when the lining profile becomes too low. Once a lining loses its 'grip' on the load, the solids and slurry begin to slide over the worn lining surfaces, causing increased abrasion and poor grinding performance. Linings also need a certain minimum thickness to withstand media impacts, although this varies widely from case to case. If worn too thin, a lining will begin to spontaneously fail, so it is critical that replacement takes place before these limiting thicknesses are reached.

Availability of parts and maintenance schedules must also be considered. The cost of lost production due to unnecessary downtime can often be many times higher than the cost of the lining. It is therefore often economically favorable to replace larger portions of the lining according to schedule, even if some parts are not completely worn out, rather than to replace liners piece by piece or to postpone maintenance and be forced to make unplanned production stoppages.

**Mill lining service concept**

Metso can provide installation supervision, or in many cases execute the complete installation or change-out using Metso’s own expert installation crews. Expertise at drilling or re-drilling mills as required, to optimize the lining configuration, can also be provided. Mill lining installation supervisors can train the customer’s own maintenance crew or a local contractor to do maintenance and lining inspections. This training is often conducted in conjunction with a typical installation at site, but Metso also often arranges on- or off-site seminars for managers, supervisors, and operators on a more technical and theoretical level.

Long-term service contracts seem to be set up for a minimum of two years, then often extended or open-ended by customer request. All contracts are individually packaged for each specific customer, based on application and client preferences. Scopes range from on-demand inventory, to consignment stocking arrangements, to complete mill lining service packages on a cost per ton basis, with Metso handling supply, inventory management, liner inspections, maintenance planning (together with the customer) and installations, including provision of the complete installation crew. It is perhaps worthy of note that some of these service contracts have been in place for more than 25 years.

Metso can also offer full-blown Life Cycle Service (LCS) contracts covering several different products (pumps, belting, crushers, mills etc.), which include not only wear parts, but also capital equipment spares, training, support, service and maintenance.

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Karelpriodresurs, Russia – a leader in quality

Russia currently has some of the strictest aggregates quality requirements in all of Europe, specified in detail in several nationwide standards. Using Metso’s mobile and portable crushing and screening plants, Karelpriodresurs has exceeded the quality demands, in addition to increasing the quantities it produces.

TEXT & PHOTOS Eero Hämäläinen

After blasting, the hard gabbro feed is crushed by the Lokotrack LT125 jaw plant.
Only the best granite and gabbro deposits, processed into highly cubical end products, can meet these strict Russian quality standards. Therefore, Karelpriodresurs carefully studies the rock quality in the quarries to be opened. Every plant built is exploited using Metso’s modern, three-stage crushing and screening process.

The company’s target is to open one portable plant every year. With its four existing ones, Karelpriodresurs targets production in 2012 of up to 6 million tons of high-quality aggregates. The fifth quarry will be built this year in Ihala, in the Leningrad region, some 200 kilometers from the multi-million city of St. Petersburg.

“We are the quality leader”

Sergey Popovich, responsible for the operations of Karelpriodresurs’ quarries, proudly explains the company’s quality achievements:

“We can honestly say that we are the quality leaders in aggregates production in Russia. Recently, our company won a nationwide competition held among the main producers.”

“In fact, our quarries were the only ones accepted to supply aggregates for the new Sapsan speed train network, operating a 200 km/h network between Moscow and St. Petersburg,” Popovich stresses.

In addition to railway networks, the aggregates produced by Karelpriodresurs are widely used in demanding highway projects executed by VAD, one of Russia’s leading road construction companies.

Standardized Metso portable plants

In close cooperation between Karelpriodresurs and Metso, a standard for a portable crushing and screening process has been developed. It usually consists of a track-mounted Lokotrack jaw plant at the primary stage, a secondary stage operated with a cone crusher, and a vertical shaft impactor to guarantee cubicity at the tertiary stage.

The Kaalamo portable plant features a MetsoDNA automation system. Sergey Horyy has excellent visibility over the whole plant from the automation cabin.
"Metso’s general plant design has been good and reliable for us, and our cooperation is seamless. Metso listens to us carefully to solve any problems that may occur," Popovich notes.

"For example, Metso’s experts have been willing to redesign some product conveyors for more stability during the assembly and operational stages."

**A new MetsoDNA automation system**

The new Kaalamo portable plant, delivered by Metso, was started in late August 2011. Today, it refines hard gabbro into a wide variety of end products at a rate of 5,000 tons per 12-hour working day.

For the first time, the whole plant process is steered using the new MetsoDNA automation system. The control cabin is placed so that the operator, Sergey Horyy, has, in addition to the crystal clear process screens, a direct view of most of the plant.

"MetsoDNA software looks good. Some fine tuning will be done with Metso to achieve the best functionality," Popovich adds.

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Preventive maintenance

To keep the quarries running in the middle of the remote Karelian forests, preventive maintenance is a key issue to ensure the availability of the equipment.

All wear parts for the jaw, cone and vertical impact crushers are stocked at Metso’s warehouse in Petrozavosk. Karelpriodresurs’ own service personnel usually handles changing the wear parts.

Every three months, Metso’s engineer goes through the quarries, and opens and checks the functionality of all the crushers. This minimizes the risk of sudden failures.

"Actually, spare part deliveries are our main concern. Customs clearance between the Finnish and Russian border usually takes too much time," says Popovich.

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**Karelpriodresurs Kaalamo quarry**

**LOCATION**: Karelia, western Russia

**FEED MATERIAL**: Hard and heavy gabbro

**FEED SIZE**: 0–900 mm

**PRODUCTION 2011**: 600 000 tons

**QUARRY LIFETIME**: 50+ years

**MAIN END PRODUCTS**: 0–5 mm, 5–10 mm, 10–20 mm, 20–70 mm, also 10–15 mm and 10–20 mm for the upper level of road base materials

**METSO EQUIPMENT ON SITE**

1. Lokotrack LT125 jaw plant
   - css 110–120 mm
2. NW550GP portable plant
   - css 38–41 mm, coarse liners
3. NW2060CVB portable screen
4. NW7150 portable plant
5. CVB1875-4 screen
6. 2 hoppers, 13 conveyors

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The Nordberg NW550GP, featuring Metso’s biggest GP series cone crusher, handles the secondary crushing.

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**Sergey Popovich** (right), responsible for Karelpriodresurs’ quarries, with Kaalamo Quarry Manager Igor Vladimirovich following the performance of Lokotrack LT125 jaw plant.
Recently, partnership cooperation between Metso and concrete maker Extrabase Extração, Comércio e Transporte, identified an alternative crushing approach that enhances cost effectiveness for companies in the field using a Nordberg HP4 cone crusher.

Extrabase has a history of cooperation with Metso. Between 2008 and 2009, one of its crushing plants located in the city of Capivari, in the São Paulo state, purchased an HP4 crusher for the production of fines. The application was a success because the gravel it produced met the requirements of the markets for concrete and asphalt.

In 2011, Extrabase looked into replacing the VSI that was installed at the company’s large manufacturing plant in the city of Porto Feliz. The equipment was being used in the production of aggregates for the company’s concrete production units.

The Nordberg HP4 increased the capacity and improved the end product quality at Extrabase, Brazil.

HP4 proved its cost effectiveness
Upon meeting, Metso and Extrabase engineers concluded that replacing the VSI with the HP4 would be a good alternative. After installation and start-up, the HP4 proved to provide truly greater cost effectiveness and the equipment met the customer’s expectations.

“Normally, Metso manufactures and recommends its VSI for applications such as the production of fines for industrial minerals manufacturing processes and extremely abrasive fine materials. However, upon analyzing the operation and the material processed by Extrabase, we realized that switching to an HP4 could add value to the company’s product – and that’s just what happened,” explains Technical Salesperson Luiz Maronato, from Metso.

Although the initial investment in the HP was higher, operating costs were reduced since there was an increase in production and superior quality in the final product,” he points out.

According to Alfredo Reggio, Head of Sales, the technology employed in the VSI is designed to improve the shape of any type of aggregate.

“However, we have recently discovered that particularly the HP4 cone crusher is very well suited for our production, achieving good results in product quality and productivity, and it also has a good benefit-cost ratio.”

According to Edson Pechio, owner of Extrabase, the cooperation with Metso went smoothly during the trials that preceded the launch of the HP4 in the Brazilian market.

“We talked a lot, and adjustments were made to the crusher. With the HP4, we now have greater productivity and a reduction in costs, both in terms of electrical power and the maintenance of parts. The switch was highly advantageous for Extrabase,” he states.

There are currently more than 30 HP4s installed in Brazil.

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TEXT Luiz Oliveira and Alfredo Reggio  PHOTO Luiz Oliveira
In the retail business, finding the right location can be the key to success. When a large discount department store chain purchased a site for a new store, they knew they had an excellent location. The prime 19-acre parcel of land in suburban Hendersonville, Tennessee (USA), is located directly across the street from a busy shopping and entertainment complex. However, the proposed site needed extensive preparation work before construction could begin.

TEXT Linda Bergmann  PHOTOS Bob Allan

Lokotrack LT1213 impactor plant feeding ST358 mobile screen.
The project’s general contractor selected the site-preparation pros at Highways, Inc. to do the job. Highways, Inc. was founded in 1960 in Brentwood and Cookeville, Tennessee, as a grading, storm drainage, and earthmoving contractor. Over the years, the company has moved millions of cubic yards of earth on grading projects. These projects have included state highways, site developments for large corporations, and federally funded projects. Today, in addition to the grading business, Highways has asphalt, bridge, aggregate and sand manufacturing divisions.

Working together

“We like site preparation work,” said Scot McDonald, Assistant Vice President of Highways’ Grading Division. “It keeps our crews busy and we see it as similar to road construction. You have to perform under tight deadlines, the project’s progress is at the mercy of the weather, and our people and equipment have to work in harmony to get the job done on schedule.”

Highways was given just 2½ months to deliver the initial phase of the project, which included the building pad and its immediate surrounding area. To make sure they had the right equipment, Highways contacted Chris Flake, Sales representative with their Metso dealer, Scott Construction Equipment in Lavergne, TN.

“Because every bit of material we have to move or crush will be used on the site, we looked at all the competitor mobile plants with Chris. Because we knew what needed to be done, we both agreed we needed the best. We wanted Metso Lokotracks,” McDonald said. “Chris immediately contacted Tom Sewell, the Metso Southeast Distributor Manager.”

Site challenges

While the site was ideal for a new store, the hilly terrain of Central Tennessee and the area’s unique sub-surface rock formations presented a number of challenges to transform it into flat, usable land.

“Preparing the site and creating the building pad was a huge challenge in itself,” says Tom Sewell. “Plans called for four feet of 12-inch minus rock, covered by one foot of four-inch minus rock. Plus, materials demands had to be met for a drainage field, and foundations and backfill for 30-foot by 1000-foot landscaping walls on two sides of the main pad site. And it all had to happen at the same time.”

Site discussion, Chris Flake of Scott Construction Equipment (left) and Scot McDonald from Highways, Inc. with Tom Sewell, Metso Southeast Distributor Manager.
With Sewell’s help, Highways selected a Lokotrack LT1213 impact crusher to feed a Lokotrack ST358 mobile screen to produce three end-product sizes. The LT1213 is outfitted with a Nordberg NP1213M impact crusher engineered specifically for mobile applications, with a reinforced frame and larger feed opening. Additionally, a Lokotrack LT106 jaw plant was selected for the project and dedicated to producing only base #12 stone.

Seven feet of soil had to be removed before getting to the proper rock to be used. “If the land wasn’t tough enough, the weather was against us,” observed Todd Martin, the Site Supervisor. “It seemed like it would never stop raining.”

A hilly worksite and wet conditions weren’t the only tests that Highways had to face. Just under the surface, a limestone karst formation had to be removed. Karst rocks have fissures that naturally gather clay and soil, something that only gets worse in the rain.

“Mud seams certainly made the crushing and screening tougher,” said Scott Equipment’s Flake. “At times, a couple of the excavator operators got a little too comfortable because the Metso crushers seemed to handle everything thrown at them. Mud and clay will gunk up even the best crusher. But you learn, shovel it out once and you never forget to keep an eye on the conditions.”

**Right combination**

Fortunately, the combination of Metso equipment was the right choice to handle the job.

“We were already very familiar with Metso’s reputation of quality and for the equipment’s ability to handle tough projects,” Highways’ McDonald said. “We’re not disappointed.”

From July 1 to August 15, the Highways team moved an incredible 400,000 cubic yards of material, crushed 300,000 tons of rock, and screened 125,000 tons of limestone into 12-inch minus, six-inch minus, four-inch minus, 1.25-inch minus, and quarter-inch minus. “We are using everything for this project even the screened fines,” McDonald said.

McDonald points out that for Highways and their Metso equipment, the work continues. “My team is strong and committed to get the job done,” he said. “They worked 80 hours a week to get us to the pad release date on time. But, we still have more to do and more rock to crush before the store opens in early 2012. For this job, we’re glad we went with Metso.”

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_Lokotrack LT106 jaw plant processing aggregates_ at the construction site for the new department store in Hendersonville, Tennessee, USA.
About a year has passed since the second earthquake, and Christchurch is still suffering. Large sections of the city have been abandoned and suburbs left deserted. Throughout the city there is a constant reminder of the damage; however, there are signs of recovery. In many cases the recovery begins with the demolition of buildings that are beyond saving.

The building situated at 300 Manchester Street in the Christchurch central business district housed The National Library of New Zealand and the Asian Food Warehouse. It was damaged beyond repair. The violence of the earthquake caused the building to collapse and the floors to split apart.

Breen's Demolition Limited, a Christchurch demolition company, with the help of a Lokotrack LT96 mobile jaw crushing plant, was in charge of the demolition and clean-up of this building. In order to process the job, the building needed to be stripped to a concrete shell, which meant removing all the timber, steel and any other building remains. The crushing of the destroyed building began in October 2011.

The LT96 was rented from MIMICO, Metso’s New Zealand distributor.

**Over 3,000 tons of debris recycled**

The concrete and brick debris was processed at a rate of 60 metric tons per hour, with rates as high as 80 tons per hour being reached by the LT96. By the mid-November completion of the project, more than 3,000 tons of debris had been recycled.

Many features of the LT96 have made it the ideal machine for the job. “The open design of the crusher allows for great accessibility around the crusher,” says Darrell Breen, owner and operator of Breen's Demolition Limited.

The accessibility makes the machine easy to clear out. This is very important, especially due to the amount of metal in the concrete that once served as reinforcement for the library walls.

It is vital that machines are easy to operate, especially for those being rented for quick jobs. “The crusher is simple and easy to use; it’s easy to load, as the jaw is the same width as the buckets on our diggers, so if it fits in our bucket, it will fit in the jaw,” says Mr. Breen.

In the middle of the central business district it was vital that the operation had minimal impact on the residents. “The machine is pretty quiet when operating. We have had no complaints from the residents surrounding the demolition site,” says Mr. Breen.

Perhaps the most significant advantage Breen’s Demolition has gained from the use of the LT96 is that the high quality of the crushed material allows the final product to be used as fill on site without further processing and, most importantly, without extra costs.

What does this mean for Breen's Demolition? Very simply, no additional transport costs. Other companies operating in the area not only need to transport the demolition material to a landfill, they then need to purchase additional product to use as a fill. By crushing and dropping the final product on site, Breen’s Demolition has been able to cut significant costs. The result is huge savings not only in diesel and oil costs, but also reduced wear on their vehicles.

The LT96 has received a positive review from Mr. Breen. “I swear by the crusher. I’m all for recycling; we don’t do enough of it in New Zealand.”

**TEXT & PHOTO** Scott Parsonage

After the severe earthquake in Christchurch, Metso’s Lokotrack LT96 handled the recycling of over 3,000 tons of debris.

**Lokotrack helps rebuild earthquake-struck Christchurch**

In the early hours of September 4, 2010, New Zealand’s second largest city, Christchurch, with a population of approximately 400,000 people, was devastated by a magnitude 7.1 earthquake. Just six months later, on February 22, 2011, tragedy struck again. At 12:51 pm a magnitude 6.3 earthquake shook the city violently and claimed the lives of 181 people. The resulting damage from the earthquakes has been estimated at approximately EUR 12–20 billion.

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**REPORTING RESULTS**

RESULTS MINERALS & AGGREGATES 1/2012 29
“The Lokotrack LT1110 is very reliable in operation, and we are happy with its productivity,” says Kaya Turan, Board member of Dere Madencilik A.Ş.
Kaya Turan, Dere Madencilik, Turkey:

“We enjoy excellent service both from Metso and its dealer Borusan”

As one of the biggest aggregates producers in Turkey, Dere Madencilik A.Ş operates Metso stationary and mobile crushing and screening plants near the city of Izmir. The annual production of more than 5 million tons is used for the company’s asphalt and concrete production, and for nearby road and railway works.

“We enjoy excellent service both from Metso Turkey and Metso’s dealer, Borusan Makina, representing the Lokotrack product range,” says Kaya Turan, Board member of Dere Madencilik A.Ş.

“Whatever questions we have, Metso replies quickly, on the same day. Borusan’s people, with an office in Izmir, are very helpful with all Lokotrack-related tasks. In addition to machines, Metso provides us with process planning expertise.”

“Reliable mobile impactor plant with good productivity”

Recently, Dere Madencilik received a contract to produce large volumes of 0–70 mm sized ballast to be used as road base materials. While the stationary plant was busy making asphalt and cement grades, the company decided to purchase a Lokotrack LT1110 impactor plant.

Turan has positive comments about the Lokotrack:

“The machine is very reliable in operation and we are happy with its productivity. We run the LT1110 normally up to 18 to 20 hours per day with no extra stoppages. In just six months, the Lokotrack has operated more than 1,500 working hours, and it has produced almost a quarter of a million tons.”

With the same ceramic hammers, LT1110 can crush up to 500,000 tons of limestone.
Ceramic hammers increase the lifetime of wear parts

For testing, the LT1110 impact crusher has been equipped with special hammers with a ceramic outer layer.

“Crushing feed material like our limestone, these hammers provide us with a very long wear lifetime. We estimate that up to 500,000 tons of material can be crushed with the same hammers,” Turan reckons.

“Even though the purchase price is higher than normal hammers, the overall economy in use is better for us. As a bonus, we will avoid several service breaks required to change the hammers,” he adds.

Ballast production to be expanded

In early 2012, Dere Madencilik will further increase its ballast production, thanks to good demand.

“The planned expansion to our existing stationary installation will enable a significant increase and will use a new C110 jaw crusher and HP200 cone crusher,” Turan says.

“Upon completion, we will have two separate ballast production lines. If needed, the track-mounted LT1110 can be easily moved to another quarry nearby,” he adds.

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In early 2012, the stationary quarry in Izmir will be expanded with a new jaw-cone process line.

**Dere Madencilik Izmir quarry**

**LOCATION**: Izmir, southern Turkey

**FEED MATERIAL**: limestone, Los Angeles index 25–26

**FEED SIZE**: 0–500 mm

**PRODUCTION STATIONARY QUARRY**: 20,000 tons/day (2 shifts)

**PRODUCTION, LT1110 IMPACTOR PLANT**: 3,000 tons/day (2 shifts)

**MAIN END PRODUCTS**: 0–5 mm, 5–13 mm, 13–19 mm for concrete and asphalt production, and 0–60 mm and 30–60 mm ballast for road and railway base materials

**NUMBER OF EMPLOYEES**: 120

**METSO EQUIPMENT**

- Lokotrack LT1110 impactor plant
  - css 50 mm
  - average production 158 tons per hour
- Lokotrack ST4.8 mobile screen
- Nordberg B13-56-2V feeder
- Nordberg NP1415 impact crusher
- Nordberg CVB2060-3 screen
- Barmac V400 VSI crusher
- Nordberg T55.2 screen

Plant extension:
- Nordberg C110 jaw crusher
- Nordberg HP200 cone crusher
To make a ton of aluminum, two tons of alumina are needed, for which, in turn, four tons of bauxite are needed. The extraction process of alumina is known as the Bayer process – alumina is extracted from bauxite in digestion using caustic soda at high temperature and pressure. In this process, many filters are used in different functions.

Making alumina requires many filter fabrics
Security filtration is the main activity in the Bayer process. In this process, all possible solid impurities should be retained. The filter fabric has to be able to retain fine particles and allow a good flow rate while not compromising production.

Another important stage is red mud filtration. Red mud is the main waste produced during the Bayer process. Many plants don’t have filters for this purpose, although it is an important environmental and economical issue, as the filters can remove soda from mud to be reused, and the mud can be discharged with less caustic content.

In seed filtration, filters are used in the precipitation process, adding alumina particles (known as seeds) to increase the precipitation speed. The filter fabrics have to allow good soda recovery and a good production rate.

Hydrate filtration, also known as product filtration, is the last stage before the hydrated alumina (hydrate) goes to the kilns to ensure that it is water free. The filter fabric has to help the hydrate retain as little water as possible so that less energy is used during calcination.

Development work around the world
Filtration holds major importance for the alumina production process. Choosing the right filter fabric can optimize the process and produce better results. Metso has a wide range of high-quality filter fabrics and solid experience in solving customers’ problems.

Our unit in Brazil began developing fabrics that were suitable for alumina filtration seven years ago in cooperation with one of the world’s biggest alumina and aluminum producers. We were able to prove that our solution was better than the one the plant was using in the most important and delicate filtration stage in the Bayer process, namely in security filtration.

It bears repeating that it is very important at this stage to avoid the passage of solid materials through the process liquor. Metso’s fabric gave the best filtrate and the best flow rate in the customer’s process. After this successful case, we were able to reach other important alumina producers, too, in the same position. The development work continues with some large alumina plants, and we expect to achieve good results.

China is today the world’s biggest alumina producer. Two years ago we started development work in China. Metso has also started fabric development at alumina plants in Greece, Spain and Venezuela. In addition, we have people working in Metso’s filter fabric business in Australia and India, two of the world’s largest alumina producers. Cooperation is starting also in Brazil, Spain and other European countries.

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The word “alumina” stands for aluminum oxide, that is a white powdery substance similar to granulated sugar. It is the main raw material for metallic aluminum in an electrolytic reduction process known as smelting (the Hall-Heroult process). It is also used, for example, in chemicals to purify water and to produce refractory bricks, ceramics, adhesives, catalysts and fire-retardant fillers for fabric and plastic.
Metso’s modular plant guarantees lower energy consumption in Yantai, China

From a single Metso crusher in 2005 to a complete modular crushing and screening system in 2011, the cooperation between Yantai Zhongjia Mining Industry Co., Ltd. and Metso is getting closer all the time, a clear indication that customer confidence in Metso continues to grow.

TEXT & PHOTOS Ou He

What has Yantai Zhongjia Mining Industry’s experience been with the newly mounted Metso modular crushing and screening system? We visited Mr. Kong Fanzhong, Board Chairman of Yantai Zhongjia Mining Industry Co., Ltd. to find out.

**From a single crusher to a modular system**

Compared with individual equipment, the lump-sum investment in a modular crushing and screening system is much higher. What, then, motivated Zhongjia Mining Industry to try the modular system?

**Can you give us a general introduction to your company?**

“Yantai Zhongjia Mining Industry Co., Ltd. was incorporated in March 2005 and is a Sino-foreign cooperative enterprise founded by Canadian Majestic Gold Corp and Yantai Mouping Gold Mine. In addition to mining and producing sand and aggregates products, our company is also engaged in prospecting and developing gold and precious metals.

“Our gold mine is an open pit mine and has a daily processing capacity of 6,000 tons of gold ore and an output of 400 tons of gold concentrate. The aggregates produced are mainly supplied for capital construction in the railway, expressway and real estate industry.”

**When did cooperation between Zhongjia and Metso start?**

“Our first purchase from Metso was when our company was established in 2005.”

**What was your impression of Metso?**

“We were quite satisfied with the advantages that Metso’s products brought us and with its after-sales services.”

**Why did your company select Metso’s modular crushing and screening system this time, as opposed to purchasing a single crusher?**

“The modular crushing and screening system we selected this time is customized by Metso according to the actual needs of our projects. The total investment is more than RMB 30 million Yuan, and it includes two separate projects: one involves aggregates production and the other gold ore. The aggregate production project is divided into three stages for crushing. The main crushers include one C125 jaw crusher for primary crushing, one GP300S cone crusher for secondary crushing and...
one GP300 cone for fine crushing. The crushers used for the gold ore project are mainly two HP500 cones, one C140 jaw and one HP100 cone.

“The change from selecting a single device to purchasing a modular system not only reflects the deeper cooperation between Zhongjia and Metso, it also shows our trust in and acceptance of Metso’s expertise. The long-term cooperation we have built up is what ultimately led to our strong confidence in Metso.”

**Benefits up, energy consumption down**

**How is the new modular crushing and screening system able to meet the demands of your company?**

“Instead of simply offering equipment, the customized modular solution supplied by Metso is a complete package. The delivery also included services, from technical design, equipment purchase, implementation and installation to final commissioning, all under the responsibility of Metso. We received a complete crushing and screening system and were able to immediately begin highly efficient production.

“The new plant is operated intelligently by computers that feature simple operation, fast installation, easy maintenance and a small operating profile. Additionally, thanks to the modular design, the plant can be easily dismantled and conveniently moved to other projects. Meanwhile, thanks to its small size and operational efficiency, it is able to realize a higher return on investment, which means the user is free from worries and troubles.”

**How much can it increase the return on investment?**

“Compared with similar domestically purchased equipment, the entire system can increase the benefits by 40%, while its energy consumption is much lower.”

**How much can it reduce energy consumption?**

“By about 20–25%.”

**How well has the system been operating so far?**

“Since it was put into operation in April, whether in the gold ore project or aggregates production, the entire system has been running very well. By June, although it is still in the trial-run stage, its output already reached the designed capacity of 350 tons per hour. As market demand reaches the peak period, the potential capacity of the system can be fully released so that the actual production capacity will reach a new high.”

**Have there been any failures during operation?**

“Yes. However, this was basically an operational problem that is often seen in the breaking-in period, so not a problem of the system itself.”

Mr. Kong Fanzhong, Board Chairman of Yantai Zhongjia Mining Industry Co., Ltd.

**How about the quality of the aggregate products produced by the modular crushing and screening system?**

“The system produces aggregates that are very high in quality, with an even grain size, superior particle shape, and less powder and flakiness content.”

**So, will you continue to cooperate with Metso in the future?**

“We are going to sign a long-term technical services agreement with Metso so that its rich professional accumulation can provide better technical support for our projects.”

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The Nordberg HP500 cone crusher, processing gold ore, being serviced on-site.
The new Stirred Media Detritor (SMD) model, SMD-1100-E, offers an optimum solution for fine grinding when requiring large-scale throughputs.
Maximizing profitability in ultra-fine grinding

In the mining industry, the need for efficient fine-grinding processes is increasing rapidly. As demand for ores with finer mineral intergrowth rises, grinding technology is being developed to keep up.

TEXT Keith Ference  PHOTOS Metso

Jon Allen, Metso’s Project Manager for Stirred Milling Technologies, notes the shift in the industry: “All the high-grade, easy ore bodies are already being developed,” he says. “What we’re seeing now are deposits that have more finely disseminated valuable mineral. The fact is, those deposits require finer grinding to achieve adequate liberation.”

The challenge in fine and ultra-fine grinding applications, however, is the increasing energy requirements and the diminishing returns that occur as operations approach smaller product sizes. The solution: energy-efficient stirred milling machinery that maximizes wear life and availability – all while achieving the desired product size and maintaining profitability. This solution has evolved into the most cost-effective fine grinding technology – from the VERTIMILL® to the latest Stirred Media Detritor (SMD) E-Series, featuring the SMD-1100-E, Metso’s largest-scale SMD.

Allen notes that the VERTIMILL® and the SMD are not competitors, but were “developed as complementary products. They each have their niche and can work together to offer an optimum equipment solution for fine grinding” (The VERTIMILL® from six mm to 20 microns, and the SMD from 100 to five-micron feed size).

And now, the SMD-1100-E is bringing efficient ultra-fine grinding to large-scale throughput. This machine is the future of fine grinding because its efficiency and specialization enable it to provide the lowest total cost of ownership to operators who need to achieve fine grinds.

Debunking the myth of consumption
Manufacturers and marketers of stirred milling equipment often tout lowest total media consumption as a major influence of lowest total cost. However, if a machine requires less media – but at a higher cost per ton (sometimes up to $5,000) – the “savings” afforded by lower media consumption are eclipsed by the material cost. In fact, the high-intensity grinding implemented with many of these machines requires frequent replacement of liners and the expensive media itself. “Just because something doesn’t use a lot of media doesn’t mean it’s the most economical,” says Allen. “The value of the consumables is a big part of what drives total cost.”

And it’s the consumables – the grinding media – that is the number-one operating cost in a mill. The entire SMD-E-Series, including the SMD-1100-E, offers the lowest cost per ton processed (between USD 300–1,300 from recommended suppliers). By employing this lower-cost, low specific gravity media, the cost of consumables is decreased significantly, and any slight increase in consumption doesn’t affect your bottom line.

Lower intensity, longer wear life
High-energy intensity (a claim that is often used to support efficient stirred milling technology) “doesn’t necessarily mean efficient grinding,” says Allen. “It’s just the result of operating in a smaller vessel. You need to have a certain intensity to get fluidization, but beyond that point, it’s not beneficial to operate at a higher intensity.”

Higher intensity does have an effect on one aspect of operating cost: wear life. High-intensity grinding results in the frequent replacement of high-cost media and liners. And with lower energy inside the SMD-E-Series mills, the wear life is extended. Allen observes, “The wear life of the SMD-1100-E, for example, is about twice as long (in similar applications) compared to our closest competitor.”

The increased volume of the SMD-1100-E is key to maximizing the cost-saving potential of lower-intensity grinding. But space is also an important consideration in a plant, and the solution, says Allen, was to “go vertical. By doing this, we can make use of a larger volume without worrying about affecting the footprint of the unit.”

An additional benefit of a vertically configured machine, when compared with the horizontal unit, is a simpler mechanical design. Because the vessels are pressurized, horizontal stirred milling machines require shaft seams, feed pumps for slurry and media, plus additional shaft bearings, and more concrete for the foundation. The SMD-1100-E is a streamlined unit that can achieve higher availability.

A close-up of an impeller of a Stirred Media Detritor.
Reach the highest availability with simplified maintenance

“Nine times out of 10, the most energy-efficient system is the lowest total cost of ownership,” says Allen. And while the SMD-E-Series offers the highest energy efficiency in ultra-fine grinding applications, maintenance factors – because they’re directly correlated to mill uptime – have also been optimized. Maintenance of the SMD-E-Series is the simplest in the marketplace, with several mechanical improvements from the standard SMD.

Access is the most important concern with regard to maintenance, and every wear component of the SMD-1100-E can be changed with the mill in place – without removing or disassembling the shell. Additionally, the top plate can be rotated in 45-degree increments, and side plates are interchangeable for multiple feed arrangements. The payoff, Allen notes, is significant: “By making these improvements, we’re able to maintain the highest level of efficiency and further decrease total ownership cost through improved availability and maintainability.”

Metso also kept ancillary equipment to a minimum with the SMD-E-Series. “Pumps are a maintenance nightmare,” says Allen. “Feed the mill by gravity – and then you only need one pump per SMD – not five or six like other stirred mill designs. Maintaining one pump is much simpler and less expensive.”

The right application: the SMD-1100-E brings efficient fine grinding to Anglo Platinum

Major platinum producer Anglo American is always looking for ways to improve recovery in their large-scale mining operation. And as it is for many in the industry, fine and ultra-fine grinding is becoming a priority. So after installing an SMD-355-E at Mototolo Platinum Mine in South Africa and seeing the operational benefits of the SMD (including significantly increased energy efficiency and long wear life), Anglo American knew they wanted to scale up.

“The SMD allows us to achieve fine grinds at a high level of efficiency,” says Chris Rule, Head of Concentrator Technology at Anglo Platinum, “and the mechanical improvements with the E-series result in more uptime. In any operation, that’s how you achieve long-term success: the more tons we get through, the more revenue we’ll see, and the SMD-1100-E is going to help us do that. It always comes back to our bottom line.”

Anglo Platinum expects the SMD-1100-E to provide the longest wear life and highest uptime of any fine grinding technology they have trialed. The unit is scheduled for startup in September 2012 at the Anglo Platinum Union Mortimer concentrator.

The most cost-effective balance of grinding efficiency, cost, durability and wear

The SMD-1100-E was developed to meet growing demands now and in the future, as ultra fine grinding applications become more vital to large-scale mining operations around the world.

This machinery changes the way miners approach applications that have not been economical in the past. “Our customers are looking at the grind recovery curve,” observes Allen. “They know that in most cases the finer you go, the more recovery you get. But the diminishing returns are a problem.

“Now, with this SMD, we’re ready to supply larger-scale machines that meet greater throughput needs,” says Allen, “and that’s what we’re doing with Anglo. We’re shifting that recovery curve and allowing them to get more valuable minerals out of the ore without decreasing profitability. Our technology continues to deliver the highest energy efficiency, but total cost of ownership is even lower now.”

Allen knows that not every mine currently needs an SMD. But, he says, “The way things are going, you probably will in the future.” And even if the answer isn’t an SMD now, Metso has a full grinding product portfolio to objectively offer the right solution to customers and, Jon says, “That’s something we’re very proud of.”

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The delivery is a repeat order from Fabrica De Papel San Francisco. They already successfully operate two Advantage tissue machines at their Mexicali facility, one of which started up in 2006 and the other in 2009. The company’s PM 4 set a world-record speed of 2,160 m/min in 2009 and their PM 5 achieved a record-breaking rapid start-up in 2009, reaching a production speed of 2,100 m/min only 12 days after start-up.

The new tissue line will use 100% recycled paper as raw material and will increase the company’s existing production of bathroom tissue, napkin and towel grades by 30,000 metric tons per year.

Power
Metso to supply world’s largest recovered fuel fired boiler to Mälarenergi’s heat and power plant in Sweden

Metso will deliver a new recovered fuel fired boiler system to Mälarenergi’s combined heat and power plant (CHP) in Västerås, Sweden. The new boiler, with a fuel input of 167 MW, will utilize circulating fluidized bed (CFB) technology and will serve as a base unit to meet the district heating power needs of the municipalities of Västerås and Hallstahammar. Metso’s delivery will account for about 30 percent of the approximately EUR 300 million modernization project of the CHP plant.

The modernization is a significant investment for the city of Västerås, as the existing CHP plant is in need of a comprehensive upgrade. Compared with current boilers, the new system will give the plant a more flexible fuel mix. The new boiler’s principal fuel will be recovered fuel prepared from municipal waste, but it also has the possibility to burn biofuel.

“The modernization is an important investment for Mälarenergi and the city of Västerås, as well as for our customers,” says Kenneth Jönsson, President, Mälarenergi AB. “The investment will give us greater fuel mix flexibility. We chose Metso because they fulfilled our requirements regarding price, technology, availability and experience.”

The modernized CHP plant will be commissioned in mid-2014 and, once it is up and running, it will be the largest recovered fuel-fired boiler in the world.

Recycling
HKS Scrap Metals upgrades its Metso scrap shear

After using a Lindemann LU scrap shear intensively for 21 years, the Dutch firm HKS Scrap Metals chose Metso Recycling Services to carry out a comprehensive machine upgrade. The motor and controller, as well as the old operating terminal, have been replaced and new piping was installed.

Since the five-week-long renovation was completed, production capacity has almost doubled compared to before the upgrade. “The shear will keep going for another 20 years,” says Marco Disco, Technical Director of HKS. “The results have exceeded our expectations.”

Paper & fiber
Fabrica De Papel San Francisco places repeat order with Metso

Metso will supply a complete 2.6-m-wide Advantage tissue machine for Fabrica De Papel San Francisco S.A. de C.V., in Mexicali, Mexico. The tissue production line will start up in the second quarter of 2013.
Expect results

Expect results is our promise to our customers and the essence of our strategy. It is the attitude we share globally; our business is to deliver results to our customers, to help them reach their goals.