

A profitable niche



Narrow-vein and low-profile mining may still represent a small percentage of the overall mobile equipment market, but its customisation opportunities means it remains an enticing option for many specialist companies, Dan Gleeson reports

GHH Group claims to have one of the most comprehensive offerings in the low-profile and narrow-vein mining space, with a product portfolio that includes loaders, drills, bolters, auxiliary machines, complementary scalers and a large range of utility vehicles and cassette platforms.

Its low-profile LHD offering is comprised of the SLP-5, SLP-6 and SLP-8, able to carry payloads of 5, 6 and 8 t, respectively, in the hard-rock mining space. It also has the SLP-14H, with a 14-t capacity, for industrial minerals mining.

GHH says it can support customers in various low-profile mining operations with machines for both production and development ends, covering 1.7-2.4-m-high stopes.

The hard-rock offering has variants of air-cooled and water-cooled engine packages to suit global customer needs, with strong commonality and modularity across the fleet reducing the need for customers to hold significant amounts of spare parts.

The SLP-14H – the largest low-profile loader on the global market, according to GHH – has been running well for years in operations in Europe. Building on this is the new SLP-14E, a tethered-electric loader released earlier this year, which is now successfully running in a low-profile environment.

The brand new, innovative direct drive electric drivetrain on board the SLP-14H will form the baseline for future developments, according to GHH. Its innovative design has significantly less components and hydraulics, resulting in less maintenance, less breakdowns and ultimately reduced maintenance costs and improved availability. The proven vertical coiling cable reel design on board the SLP-14H – proven out on other machines within the GHH portfolio – has

spooling control, which significantly improves the cable life.

“The SLP-14E is not only a technology trend-setter but also provides for improved visibility and comfort for the operator, with a brand-new ergonomically designed cabin and frame layout,” GHH says. “GHH is taking the next steps with this electric drivetrain and battery-electric drive, with full battery drivetrain designs in the development pipeline.”

Battery-electric technology has also come into the GHH Group low-profile portfolio thanks to the **Mine Master** offering of battery-driven drill rigs and bolters. Based off the same chassis for simplified maintenance and with 120 kWh batteries on-board, the Face Master 1.7KE and Roof Master 1.8KE are, GHH says, the perfect choice for low-profile operations where ventilation cost and operator wellbeing are of great concern.

In a drive to constantly improve and develop its products, GHH has also worked on enhancing its 8-t SLP-8. The LHD has recently gone through improvements to enhance performance and assist customers in achieving higher productivity and reduced operating costs. For example, the implementation of a new swing-out cooler aims at providing ease of maintenance, reduced downtime and off-the-shelf harness availability for improved fitment.

The vehicle also boasts a long frame lifetime of over 20,000 engine hours, while the ROPs/FOPs operator compartment is designed with visibility in mind. This is complemented by a camera system and an easy-to-use 7 in touch screen.

The new brake pedal design and air conditioning blower on the machine are just a few of the extras focused on operator safety and comfort. The SLP-8 also comes with Wi-Fi

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connectivity, including full machine condition monitoring, bucket weighing for productivity monitoring, electric brake wear and individual wheel temperature sensors.

Within GHH’s narrow-vein load and haul offering is the LF-3 loader, which features a high lift boom option and is suitable for working at depth as well as high altitudes of up to 4,000 m above sea level.

The largest loader in this offering is the LF-7, a 7-t loader that is payload matched to the MK-A20, GHH’s 20-t dump truck. The LF-7 has a swing-out cooler: one of many design aspects to allow for ease of maintenance.

The LF-3 and LF-7 have various engine packages available including US Tier 2, Tier 3, Tier 4 and EU Stage V cooled engine packages, plus diesel particulate filters, allowing them to be sold into markets with such legislation.

All the low-profile and narrow-vein products come with proximity detection and collision avoidance systems that are Level 9 compliant. They also come equipped with the GHH inSITE digital analytics platform, which can be customised to support specific customer and application needs.

In support of the extremely strong loader offering in “tight” mining spaces, GHH also partners with **UVB**, a utility vehicle supplier, which offers a large portfolio of 4 t, 6 t and 8 t utility vehicles. These are supplied as individual specialised vehicles – like the tyre handler or the road preparation vehicle – or cassette carriers offering a large range of standard and custom-designed cassettes.

One of the newest UVB vehicles developments is the MV U60D Rigid Tracked CBE bulk emulsion carrier. This unit is powered, as standard, by a water-cooled 126 kW DEUTZ TCD 2013 LO4 US Tier 3 engine, with the U60D sub frames adapted

to accept the fitted track frames and tracks, powered by hydraulically-driven wheel motors. As this unit is designed to tackle extreme gradients of up to 25% depending on ground conditions, unique engineering parameters were developed to open new access to areas in mines that are unattainable to traditional trackless mining machines.

As with all UV Botswana utility vehicles, this unit comes fully FOPS- and ROPS-certified, plus has SAHR-type braking systems compliant with SANS 1589. These vehicles also have upgraded CANBUS platforms in line with the current loader offering to allow for easier fault finding and maintenance. They also have optional JIC or ORFS hydraulic fittings to suit customer-specific needs. Lastly, they come with their own range of hydraulically-driven air compressor, grease pump, transfer pump and bulk oil dispenser pumps.

Reinforcing the brand

PAUS is also used to customising vehicles for narrow and tight size envelopes, leveraging several proven platforms and decades of engineering expertise to tailor solutions to customer needs.

In terms of supplying this equipment to the narrow-vein mining sector – one that continues to make up a niche part of its overall mining business – the company is registering demand from existing operations in need of replenishing their fleets and those planning for brownfield expansions.

“The market, when looking on a global basis, continues to be affected by political uncertainty,” Franz-Josef Paus, Chairman of the company, told *IM*. “The conflict between Russia and Ukraine, plus the issues with China and the USA, mean we are not seeing the same excitement for new greenfield projects that we were seeing prior to the onset of these events.”

Still, when it comes to narrow-vein mining, PAUS is one of only a few companies able to compete for this business.

“We can offer them niche products that not too many others can offer,” he said. “We never try to compete with the major suppliers; we focus on the 10% that is left and offer customised platforms.”

A good example of this – while not focused on the narrow-vein market – is work the company has been carrying out for a client in Mongolia.

Given a project brief of coming up with a vehicle to help change out belt idlers on a conveyor at this underground operation, PAUS developed a design that leveraged its UNI 40 carrier as a transport vehicle but included a customised cassette for the idler exchange process.

Similarly, in South America, the company is

PAUS is refreshing the UNI-50 platform (pictured) with the new UNI-55



currently engaged on a project where it will customise the cassette system of its UNI 40, which offers an up to 7-t payload and has a height and width of 2.11 m and 1.75 m, respectively, to help mine a narrow-vein deposit in the region.

“Every now and then we create new machines to solve problems that have never been designed before,” Franz-Josef Paus said. “Around 50% of our work is problem solving of this type and the other 50% is for developing our proven platform technologies.”

Fitting into the latter category is the work PAUS has been doing on its existing UNI-50 platform. This carrier vehicle has multiple uses in underground mining, but, due to its robust design and compact dimensions, is typically seen at underground mines with narrow galleries. Coming with different variants, the UNI-50 can take payloads of 8-16 t and be configured with a width and height of 1.9-2.3 m and 2.26-2.5 m, respectively. These dimensions, along with a plethora of attachments and cassettes, make it suitable for a variety of applications such as material handling transport vehicle, water cannon truck, passenger transporter, tyre handler and concrete sprayer.

Having proven itself as a long-lasting platform, PAUS is now refreshing the UNI-50.

When speaking to *IM*, Franz-Josef Paus confirmed that a new platform, the UNI-55, was in the works, with the first of these new machines currently being assembled.

While the physical dimensions will not change, the machine will have spring suspension on the front axle as standard. It will also be equipped with many of the electronic aids the company has in its arsenal – such as a bird’s eye camera, tyre pressure monitoring, gas monitoring system and others.

“What remains is the robust, easy-to-repair and durable nature of our products,” he said. “This is what PAUS is renowned for.”

Battery is best

Aramine has a range of equipment dedicated to narrow-vein mining powered by various sources – diesel, electricity and battery – yet it continues to advocate for using battery-powered equipment in physically-constrained mining galleries.

During The Electric Mine 2023 conference in Tucson, Arizona, Jose Bueno, Equipment Sales Manager, made a compelling case for these machines.

Comparing its battery-powered miniLoader L140B with its diesel-equivalent – the L150D – Bueno showed a higher capital cost – +40% – for the battery-powered loader, but a 50-60% reduction in operating costs. He added that the battery-powered vehicle had no issues operating at high altitudes, while the diesel-backed machine needed specific adaptations. He also said the L140B came with an eight-year life: an improvement on the five years offered by its diesel equivalent.

On top of this, the L140B comes with an efficiency of 90%, compared with the L150D’s 40-45%, and – of course – zero emissions, lower heat generation and reduced noise and vibration issues.

“The real cost (TCO) per year for battery-powered underground equipment is 33-49% lower than the diesel counterparts,” the company stated in the presentation.

What was obvious from Bueno’s stint on stage was the impressive advancements made in battery technology since the company first introduced the L140B with a Quick Replacement System in 2016.

When plotting the cycle results of a 2016 generation L140B to a 2022 L140B – the former leveraging a 24 kWh LFP-based cylindric battery cell and the latter using a 42 kWh LFP-based prismatic battery cell – the evolution was clear.

In 2016, going 50 m from the point of loading and unloading on a 10% incline as part of a 350 m cycle application case, the L140B was able to

Aramine's Jose Bueno showcased how far the company's battery-electric offering has come at The Electric Mine 2023 event in Tucson, Arizona



load and discharge 82 t of material using three energy modules.

In 2022, using the same distance and incline parameters, the newest version L140B was able to load and unload 140 t using two battery modules: one less module and a 70% boost in material.

With the launch of the L440B battery loader, which comes with a 4.6 t tramping capacity and 2.1-2.7 cu.m bucket volume and is about to start field trials, the company says it is looking to set new standards in term of efficiency and performance, all with zero emissions.

Three tonners

Some of the biggest OEMs in the mobile mining space have also recently made changes to their narrow-vein mining portfolio.

Komatsu says its new WX03 LHD is engineered for the most demanding mining environments. This 3-t diesel-powered heavy-duty machine is designed for especially small, narrow-vein applications with limited manoeuvring space.

"This solid LHD features simple operation controls and a rugged long-life structure specifically designed for ease of use and ease of maintenance with an onboard self-diagnostic user interface," Komatsu said. "With an efficient powertrain and hydraulic system designed for improved performance, as well as a modern operator compartment with easy-to-use controls, this small-class LHD can offer big performance."

Cited benefits of the Komatsu WX03 LHD include:

- A 74 kW water-cooled engine for low environmental heat;
- Outstanding breakout power for fast bucket filling; and
- Pre-engineered options to suit most

applications and requirements.

Komatsu adds: "Engineered for reliability, the WX03 is built with a high-strength steel frame design and a heavy-duty, all-mechanical powertrain, to help hit production targets while controlling costs. It is designed for long component life with mining-grade components, a proven powertrain, severe-duty electrical system and collet-style pins."

The WX03 offers multiple features including a ROPS-/FOPS-certified enclosure, a spring-applied braking system, operation interlocks, three-point mounting, anti-slip steps and hot component isolation.

"With its intuitive controls and ergonomics, this LHD is built for operator comfort and visibility," Komatsu said. "Easy-to-use two-handed controls simplify training and operation, and the unique bucket geometry is designed to optimise efficient filling with less spillage."

On maintenance, Komatsu says it offers exceptional serviceability: "The WX03 has vital maintenance components conveniently accessible from the ground level that are designed to help your service crew make fast, efficient repairs."

Customisable to meet operational needs, some of the available options on the WX03 include an automatic lubrication system, ejector bucket, fire suppression system, quick-attach coupling system, radio remote control and recovery hook.

In that same size class, **Sandvik** recently upgraded its 3-t loader for narrow-vein applications, offering the newly rebranded Toro™ LH202 with an EU Stage V compliant engine.

The Toro LH202 loader is, Sandvik says, a reliable workhorse designed specifically for such

applications. With its robust structure, very compact size and 3-t payload capacity, the loader is tailored to meet productivity targets in challenging environments and is optimised to fit tunnel widths between 2 m and 2.5 m, to reduce dilution.

Due to its relatively light weight and the possibility to disassemble the equipment for transport, the Toro LH202 is ideal for projects located in remote areas with challenging access, according to the company.

The new Stage V engine from DEUTZ on board the machine delivers best-in-class MSHA and CANMET ventilation rates with ultra-low-sulphur diesel fuel while maintaining performance and fuel efficiency, Sandvik says. The Stage V engine aftertreatment is a diesel particulate filter (DPF), which uses passive regeneration during normal engine operation to oxidise the soot trapped in the DPF core. The other available engine configuration is a 50 kW air-cooled turbocharged direct injection diesel engine, also from the engine manufacturer DEUTZ, with catalytic purifier and muffler, the company added.

In addition to traditional fossil diesel fuel, the Stage V engine can use paraffinic diesel fuels, meeting the requirements of EN 15940, which reduces emissions of CO, CO₂, HC, NO_x and diesel particulates. Further, these engines can also use biofuel blends (such as FAME) meeting requirements of EN 590. Higher blends may also be used after consulting with Sandvik representatives, the company says.

DUX machines in demand

A little bit bigger but still in the same market, **DUX Machinery** is in the process of completing the build of three DT-26N dump trucks equipped with Cummins QSM11 engines able to supply 298 kW of power at 2,100 rpm for customers.

This 26-t payload truck has a bucket capacity of 11.4 cu.m (heaped), a length of 9.45 m and a width of 2.29 m, making it the perfect fit for medium-high throughput narrow-vein operations.

It also comes equipped, as standard, with Bridgestone 18.00R25, 2-star, E-4 VELS tubeless radial (or equivalent) tyres, a four-wheel POSI-STOP totally enclosed multi-disc, liquid-cooled, spring-applied hydraulically-released service/emergency parking brake, with its own independent circulating cooling system and accumulator back-up. It also has an automatic brake applicator that applies the brake in case of engine failure or pressure drop in the torque converter.

In terms of steering, it can rely on articulated frame hydraulic power steering with pilot monostick control. This comes alongside two double-acting steering cylinders with built-in cushion valves.

The DT-26N is equipped with articulated



DUX Machinery's narrow-vein mining equipment is in demand: the company is in the process of building three DT-26N dump trucks (left), while it has recently dispatched a P1-DBB14 boom truck (right)

heavy-duty frames made to withstand the high impact and torsional stress associated with mining applications, DUX says. The clean shell dump body is made from impact, wear-resistant alloy steel plates that substantially prolong service life, according to the company. It also allows for a 65° dumping angle.

DUX also recently shipped a P1-DBB14 boom truck, which shares the same platform (engine, axles, transmission) as the company's DT-12 dump truck.

This aerial self-levelling boom truck can navigate narrow galleries with length and width dimensions of 9.1 m and 1.98 m, respectively. At the same time, it can reach the high levels operations require, with a boom extension able to support 454 kg up to heights of 9.3 m.

In the basket, operators have access to the full boom controls (except stabilisers). It also has two 180° pivot saddle devices on the basket for handling short and long pipes.

DUX said: "[The] spacious operator compartment is ergonomically designed for maximum visibility and bidirectional tramming, [meaning the] operator can safely control and monitor machine functions at a glance."

Also, with centralised service points and a modular design, the P1-DBB14 offers easy service access and fast component exchange, according to the company. All of this is supported by service and parts back-up on a worldwide basis.

Reshaping a niche mining technique

Another company focused on the narrow-vein market that has recently been making headway with battery-electric drive options is **Resemin**.

The Peru-based company has made plans to offer all of its fleet with battery power, following the launch of its battery-powered jumbo, the Troidon 55-EV. This battery-equipped electric powered face drilling rig is designed for face

drilling up to 39 sq.m. It is equipped with a single 75 kW electric motor for traction and drilling, and three packs of FZSONICK batteries. The batteries are used only for tramming, with the machine plugged into a mine's 380/440/550/1,000 V AC power grid during the drilling process. This allows the jumbo to drill while charging the electric batteries.

When it comes to narrow-vein mining, it is Resemin's MUKI family of drilling rigs often mentioned. More than 220 MUKI mini jumbo drills have been sold, with the machines present in over 20 countries on five continents – a "hallmark for a disruptive machine that reshaped the mining technique for that niche", Resemin says.

The MUKI family has models for three applications: the MUKI FF for tunneling development from 2 x 2 m up to 4 x 4 m; the MUKI LHBP for longhole production drilling; and the MUKI Bolter for full mechanised roof support.



The MUKI FF is designed for tunneling development from 2 x 2 m up to 4 x 4 m

AARD joins Epiroc

Epiroc, in the process of buying South Africa-based AARD Mining Equipment, has increased its exposure to the low-profile mining sector.

AARD, based in Chamdor near Johannesburg, South Africa, designs, manufactures, services and supports a wide range of mining equipment, specialising in low-profile underground machines for mines with low mining heights.

Its products include drill rigs, bolters, loaders, scalers and more, with the company's customers mainly in the southern Africa region where its machines are present in over 30 large mining operations from gold to platinum to diamonds, including the Venetia underground project.

Epiroc first announced on August 25, 2022, that it had agreed to acquire AARD, with Helena Hedblom, President and CEO, saying at the time: "AARD has reputable and reliable products that complement our underground product portfolio well. This acquisition will further strengthen our



growth ambitions in Africa and beyond.”

All new AARD machines come standard with Level 9 collision avoidance technology, making them 100% compliant with the latest DMRE legislation. In addition to new machines, AARD also has a rebuild business, which brings opportunities to equip units with Level 9 collision avoidance as well as other technology such as DPFs.

AARD has also been carrying out its own work towards making its vehicles more intelligent and connected.

In 2021, Vodacom Business together with its subsidiary, IoT.nxt, ran a 5G connected mining vehicle trial with AARD. An intelligent edge gateway was installed on one of AARD's newly manufactured mining vehicles.

AARD also has battery-electric experience having developed the AARD eCruiser battery light vehicle based on a converted Toyota Landcruiser.

DOK-ING XLPD at work in Saskatchewan

DOK-ING has had a major win in the North American potash space recently, with one of its XLPD Extra Low Profile Dozers finding its way into Mosaic's Esterhazy K3 operation in Saskatchewan, Canada.

This machine is being used in tele-remote mode for mucking underneath the belt lines at the operation, with Certified Sales and Rentals, part of the Northern Strands Group of companies, putting the machine into operation as the Czech Republic-based company's local dealer.

The XLPD dozer presents a very low-profile remote-controlled machine with the goal of increasing productivity and safety in material handling operations, DOK-ING says. It has been designed to withstand the most severe working conditions in the mining industry, and has previously been trialled and deployed in Australia and southern Africa, among other places.

As part of DOK-ING's Extra Low Profile segment, the dozer is suitable for activities in construction works, cleaning of production panels, sweeping and vamping activities, cleaning under conveyor belts and other hazardous environment operations, it said. This is where numerous attachments such as bucket, ejector bucket, dozer blade, brush and gripper tools are of use. 