# Designing FOR THE MODERN DAY

**Audrey Beurnier, Aramine, France,** examines the future of drill rigs to meet increasing health, safety, and environmental standards.

In the past, mines with narrow veins were only able to use manual drills as there were no small drill rigs on the market. Even today, the smallest drill rig on the market starts for a 3 x 3 m gallery section mine.

These manual techniques, whether for explorative drilling or development drilling, present different safety challenges because of the close proximity of the worker to the drill and the strong vibrations endured by the operator.

When Aramine created its narrow vein range in 2006, the company was only selling small loaders. The feedback asked for a solution to replace the manual drilling and mechanise the mine.

At first, the company created a replacement kit that was adapted to be installed on the base of the loader instead of the bucket. The kit allows to easily convert a miniLoader® into a hydraulic miniDriller®. As a result, only the bucket needed to be changed, allowing for the rationalisation of the fleet and easy maintenance management.

Not long after the creation of this drilling kit, the company created and launched its first drill rig, the D130D miniDriller. This rig is a simple, efficient, and reliable drilling machine for underground mines with narrow or medium galleries that uses diesel power. Its small size of 1040 mm enables this machine to go into narrow vein mines. Utilising the carrier of the L130D miniLoader, the D130D miniDriller can help increase productivity and safety without the need of special skills.

Designed with an easy to manipulate remote drilling control, the miniDriller offers safety by allowing the operator to be 5 m (long cable) away from the machine without enduring vibrations or risking rocks fall.

This drill rig has a clean and complete drill panel control to have a constant view on the evolution of the operation and offers a drifter lubrication system integrated, with self-tank filling manually activated. The integrated hydraulic system in the front base and the use of the L130D miniLoader carrier allows operators to keep control of their parts inventory and fleet rationalisation.

A lot of different types of feeds can be adapted on Aramine's miniDriller to make a hole depth from 1000 – 2200 mm. An aluminium type feed with adjustable

Figure 1. Aramine's first drill kit operating in a mine.

Figure 2. Aramine miniDriller D130D.


Figure 3. Aramine expert technician testing the miniDriller D130D.


Figure 4. Aramine miniDriller DM901 HDE.

end-play is suggested in order to enjoy a better precision. However, the feed choice depends on the hole depth and application. With no air compressor and water pump on board, the drill rig comes with connectors to be quickly connected to the mine air and water supplies.

This machine also offers stability when operating due to the two front telescopic hydraulic stabilisers bolted on to the chassis. Designed to go where the others cannot in order to avoid hand drilling, the D130D allows a full rotation of the feed in a 1.6 m gallery width and can cover up to 12 $m^2$ of gallery section.

The targets of this miniDriller are non-mechanised mines that would like to increase their productivity, and mechanised mines that want to reduce the size of their galleries.

This machine is therefore a possible solution for non-mechanised narrow vein mines as it allows operators to carry out safe, clean, and efficient face drilling for better blasting and increased productivity.

## The electric drill rig

The miniDriller D130D is fully diesel powered and emits a lot of gas emissions. Over the last couple of years, the need to reduce gas emissions has become increasingly more important, especially in underground mines, in order to reduce the infrastructure and cost of mine ventilations and improve the air quality for the workers within the mine.

Unlike the D130D, which was created on the existing basis of the miniLoader's driveline to be able to respond quickly to the need, the DM901 has no connection with the machines previously created by the company.

For this new drill rig, the company's R&D department has focused on developing a real added value on this drilling machine while keeping a width of 1.1 m to complement its narrow and medium section range. The actual added value is an arm that is as short and handy as possible in order to allow for space-saving. This is especially important when operating in small sections of the mine, as it helps with ease of movement.

The R&D team decided to use existing and proven component modules on the market to find the perfect balance between performance and handling in an ultra-compact machine. In 2019, Aramine launched the miniDriller DM901 HDE, a drill rig with a dedicated frame, transmission, and drilling system.

The rig is designed with various modular elements, enabling for easy assembly and disassembly in mines so as to be able to squeeze through the narrowest mines. It also has a diesel engine for tramming and drills electrically plugged directly to the mine electricity.

This machine has a very low gravity centre which offers optimal stability and, despite its narrowness, its two front stabilisers allow for perfect drilling conditions for both face or vertical drilling.

As a result of the company's partnership with Epiroc, it also offers an exclusive version with the company's drifter and feed. Although the rig is ideal with Epiroc RR14 drifter and feed, the machine can be adapted to the client's wishes and mine requirements,

particularly the drifters which can be chosen among a large panel of choices.

The ideal customer for this new drill rig is an electrified mine with narrow veins or, in civil engineering, a small section tunnel or even for cross passages (service tunnel/link between two large sections) in larger mines or public works.

## Battery powered drill rigs

Following the launch of the company's battery powered systems and diesel drill rigs in 2019, Aramine is currently working on the development of a battery powered drill rig, which is scheduled for release at the end of 2021.

The company will rely on its technology from the battery powered system which was used for the miniLoader L140B to develop its first battery-powered drill rig. To adapt its battery technology to the rig, the company's R&D department has redesigned the kinematic chain to optimise the machine energy consumption.

The DM901HBE will use battery technology for tramming and hydraulic controls for steering brakes and boom, and mine electrical network for drilling. The battery pack will be fixed with chargers mounted on board, eliminating the need for a quick replacement system as the batteries will recharge themselves autonomously during drilling phase.

The new drill rig will be adaptable to each mine's requirements and the drifter can be specified by the customer.

Nowadays, there is a need for zero emission machines in underground mines and particularly in narrow vein operations. Zero emission machines, such as Aramine's, are of particular interest in countries such as South America, Australia, and Europe where pollution standards are getting stricter.

There is increased concern among mine operators regarding environmental issues and their ecological footprint, as well as health and safety for their workers.

Concern regarding environmental issues and working conditions for operators are just some of the reasons why battery powered machines are a must-have in the industry, both in order to reduce ventilation and infrastructure costs and to improve the air quality in mines to protect the health of workers. As companies make it easy to adopt and use daily, battery powered technology will surely become more and more present in the future of mining.

## Conclusion

Mining industry players are becoming more and more concerned about environmental and health issues and their impact on the planet.

Being able to have smaller sections in the mines helps reduce dilution, and the arrival of equipment on the market, such as miniDrillers, combined with battery powered technology, means the mining industry will soon be able to reduce its impact on the earth and on the health of its operators even further. GMR