

## FACTORY VISIT

*This Sandvik DT820 jumbo, or underground drill, is one of a range of machinery produced at the former Tamrock factory in Tampere, Finland.*

# Jumbo underground drills

**Steven Downes reviews the underground mining drills – known in the trade as jumbos – produced by Sandvik in the former Tamrock factory in Finland.**

The Sandvik group was founded in 1862 by Göran Fredrik Göransson, who was the first person to use the Bessemer method to produce steel on an industrial scale. Today their main factory is located in Sandviken, Sweden. Sandvik mining and construction was formed in 1998 with the acquisition of the Finnish company Tamrock, combined with their in-house rock tools business.

Over the years Sandvik has become a major player in the design and manufacture of equipment for rock drilling, rock excavation, processing,

demolition and bulk-material handling. They continue to acquire companies to expand their product range, including the UK-based Extec and Fintec crushers and screeners.

Sandvik's Tampere factory – the former Tamrock site – produces a range of mining and tunnelling jumbos (underground drills), production drill rigs, surface top-hammer and down-the-hole drill rigs. It is said to be the widest range of underground drilling products in the industry, split across four main categories: mining jumbos,

production drills, tunnelling jumbos and rock support drills.

The DT and DTi series tunnelling jumbos allow fast cycle times and their high levels of automation make them highly productive for drilling large cross-section tunnels and caverns, with a capability to carry between two and four drill booms along with an optional charging basket.

The DT1130i is the latest of these machines, constructed with three imposing telescopic booms housing high frequency HFX 5T rock drills with



*Main and Inset Pictures: The operator can choose to work in automatic mode, with the machine positioning the three drills according to the designed pattern and sequence.*



*Top: A DL420 production drill, mounted on a TC7W articulated carrier, with a boom that allows a 360-degree rotation of the LF1500 drilling module.*

*Above: A DS410 rock support drill equipped with a telescopic boom with universal bolting head on the drill and the optional second meshing boom.*

75kW power packs that give the machine the ability to drill tunnels to a width of over 18m. The machine utilises a sophisticated CANBUS control network, which greatly reduces wiring requirements and thus lowers maintenance.

The user-friendly controls integrated into the seat's armrests, along with the control monitor, provides the operator with a good working environment in the circumstances and instant display of the machine's intelligent systems at the touch of a button.

The DTI series of jumbos feature systems to record drilling and production, and process data that can be used to increase productivity and plan scheduled maintenance. But the system takes this one stage further, in that the automatic mode controls the machine to the designed drill pattern and sequence.

The automatic mode has a number of features that allow the operator to take control of the process, rapidly finding the correct hole position

thanks to the 'Lock-To-Target' system. 'Dynamic Correct' continuously redirects drilling when the booms are moving and the 'Quick Step' control fine-tunes the drilling progress steps as required.

The jumbo is positioned in the cut using its on-board diesel engine and, once in place, an electric cable is used to power the drill operations. In addition, a water supply is needed to expel the loose rock material from the drill head during the drilling process. The actual cutting action is achieved as the jumbo hammers the bit into the rock at a very high frequency and, as the drill bit rotates, the point of impact of each carbide tip changes, breaking away tiny fragments of rock.

For surface drills, compressed air is fed down the centre of the rod to flush the pulverised rock from the hole, expelling the material along the void between the drill rod and the sides of the hole. When drilling underground, the process is essentially the same, with the use of high-pressure water to expel the rock fragments, preventing dust build up in the tunnel.

As well as tunnelling jumbos, Sandvik produces a range of smaller mining jumbos that are available in a choice of five carrier sizes with the option of between one and three drill booms. Each machine can be equipped with various levels of instrumentation that provides data on the drilling process, along with advanced hydraulic controls or sophisticated electric control systems depending on the drilling task being performed.

## Accuracy

For general-purpose drilling, the DL series of production drills offer exceptional drilling accuracy when combined with laser positioning systems and advanced controls. The machines are extremely versatile, with the option of three different boom types and a choice of three carrier sizes that allow the best match to the individual mine's requirements. The main role of the production drill is its ability to drill in any direction in confined spaces,

while the compact ZR30 boom design allows 360-degree rotation of the LF1500 drilling module.

Once drilling and blasting are complete, the DS series rock support drills move in to install various types of rock support bolts. They are equipped with a telescopic boom and hydraulic rock drill with universal bolting head allowing a single operator to control the entire sequence from the safety and comfort of the air-conditioned cab. If required, an optional meshing boom can be fitted to the carrier to allow the easy installation of mesh roof supports without the need for a second support machine.

The factory is only half the story of the Tampere site, as it also houses a fully operational test mine with an amazing labyrinth of underground tunnels where testing of the underground drills, loaders and haulers takes place. The underground complex comprises training facilities, research and development areas, mechanics' workshops and tunnels used for drill testing and AutoMine operations testing.



*Left and Above: Sandvik's AutoMine automated underground loading and hauling system is the world's first commercially available solution to removing an operator from a very dangerous environment.*

*Below: This Sandvik underground drill is for export outside Europe. EU guidelines require a fully-enclosed cab for increased operator safety.*

Sandvik began the development of an automated load and haul system back in 1990 and today, the AutoMine automated loading and hauling system is the world's first commercially available solution, already in use in several mines around the world. Its main benefits are to increase safety and profitability of underground mining applications by removing the operator from the machine and placing him in a safe and comfortable control room where he can monitor the operation of the haulers and loaders deep underground.

The haulers are equipped with a wireless communications system, on-board video camera system and navigation system that together allow fully automated cycles utilising the

MineLAN communications network to navigate the tunnels. The loader is semi-automated, with the operator controlling the machine via remote controls from the control room during the loading cycle, after which the driving and dumping are automated.

## Automated

Profitability is increased by full traffic control, allowing several automated machines to operate in the same production area. The clever navigation system uses laser scanners fitted to the vehicle to scan the tunnel wall profiles to verify the position of the machine at all times, removing the need for

additional infrastructure in the tunnels. The system can also identify rocks and debris in the path of the machines and can ensure that all traffic either slows down or stops until the debris is removed, thus reducing costly damage to the machines.

Safety is critical when the machines are running so access barriers are used to isolate the areas of the mine that are used by the automated machines to ensure no one can enter the area and any breach will immediately stop the autonomous machines. The Tampere test mine has a fully operational AutoMine system, which is used as a platform for the continuing development and testing of future systems, along with demonstrations of the system using an LH410 (Toro 7) underground loader. 

