By Kyran Casteel, European Editor

With the new standard Scooptram ST7 now joining the low-profile Scooptram ST7LP version, Atlas Copco's small load-haul-dump vehicles will be demonstrated in key markets in the coming months.

In Örebro, Sweden, at the time of writing, Atlas Copco is putting the finishing touches to the first series production standard Scooptram ST7 following extensive field trials of a prototype. This latest addition to the Scooptram range complements the ST7LP low-profile version of the 6.8-mt-capacity loader discussed in the March 2009 issue of E&MJ. The company can now offer both conventional small—typically narrow vein—mines and low-headroom operations a highly competitive loader featuring significant advantages over its predecessors and over competitor LHDs.

Designed for Superior Productivity

Atlas Copco says the new standard Scooptram ST7 is a robust LHD built for demanding underground applications where small size combined with high performance is the key to superior productivity. Atlas Copco's product manager for underground loaders, Erik Svedlund, explained the Scooptram ST7 and the Scooptram ST7LP were developed at the same time and are identical in many crucial respects. But, without the height restrictions imposed on the low-profile version, the designers have been able to combine the robust and nimble characteristics of the basic machine with a conventional-sized operator's cab and a full-height, front-end loading system. The result is an agile LHD that maximizes machine and operator performance.

The key features of the standard Scooptram ST7 that enhance its performance relative to Atlas Copco's other small loaders are, according to Svedlund:

- Very compact machine with robust frame for easy maneuvering in 3.- to3.1-m drifts (shorter than the Scooptram ST710, lower than the ST3.5);
- Increased payload of 6.8 mt, greater than ST710 (6.5 mt) and ST3.5 (6 mt);
- Higher bucket lift with wide tipping angle and better raising, dumping and lowering times give excellent truck loading performance—best in class and also better than for the ST1030;
- More comfortable full-sized ROPS/FOPS approved, climate controlled cab that is no higher than canopy models. Together with the low (1,390-mm) back height this cab provides excellent operator visibility;
- More environmentally friendly, fuel efficient engine, sophisticated transmission with fuel- and wear-saving de-clutch and traction control systems, proven axles; and
- More convenient access to service points.

Svedlund said the new rubber-mounted cab design incorporates ergonomic multi-functional

joysticks, air suspension seat, Rig Control System multi-function display and intuitive operator interface, providing the operator with a high degree of control over the machine's performance and status. Safety is further enhanced by an upgraded SAHR braking system with automatic brake testing, diagnostics and logging. The high-lift boom can raise the standard bucket to a maximum height of 4,710 mm in 5.3 seconds. Dumping takes 2.1 sec and boom lowering 3.5 sec. The standard bucket width is 2,180 mm and nominal heaped volume is 3.1 m3. The mechanical breakout force is 11,750 kg as compared with 10,347 kg on the Scooptram ST710. The EPA Tier 3/EU Stage IIIA-compliant Cummins QSB diesel engine also meets MSHA Part 7 ventilation limits, the ventilation rate being 241 m3/minute and the particulate index 269 m3/min. The Scooptram ST7 loader is intended to replace the Scooptram ST710: the two models will be produced in parallel during 2010 but by 2011 the ST7 will have replaced the ST710, said Svedlund.

Testing at Lovisagruvan

Whereas the Scooptram ST7LP prototypes were taken to Anglo Platinum's Waterval mine in South Africa and to Beralt Tin & Wolfram's Panasqueira mine in Portugal for testing, Atlas Copco was able to find a suitable trial site for the Scooptram ST7 not only in Sweden but just 60 km north of the Örebro factory. The company approached Lovisagruvan, which owns and operates the Lovisa zinc-lead-silver mine in Lindesberg, Västmanland, in central Sweden.

The mine was happy to have the use of the prototype machine and to allow Atlas Copco full access to carry out checks on the designed-for gains in performance, productivity, serviceability and comfort that the production team wanted to. The new Scooptram ST7 started work in January 2009. Although the Lovisa engineers did not input to the design of this machine in the way that Waterval and Panasqueira engineers influenced the ST7LP project, the mine did have a say in the design of the larger cabin on the standard ST7. The mine's operators and maintenance staff have been doing the routine servicing, with Atlas Copco technicians doing checks.

Lovisa may be the smallest base metals mine in Sweden with just 17 employees but it is efficiently run and has been rather successful since production started in 2004. The deposit was discovered by a joint venture between Sweden's LKAB and the British-based BP Minerals during 1985. The orebody is a dipping 0.8-1-m-thick slice that has been traced down to 300 m below surface. The starting resource estimate was 400,000 mt. The main base metal minerals are sphalerite and galena.

While this orebody was not of interest to either discoverer, nor to Sweden's major base metal miners, a group of highly experienced Swedish mining people led by John Berge, a former Granges geologist, developed a mining concept they believed would be economic and set up the Lovisagruvan company. Berge served as CEO until his retirement in 2007. Göran Nordenhok is chairman of the board, his fellow directors being Torsten Börjemalm and Ingemar Skaret. Jan-Erik Björklund is now CEO. Ore production rose from 13,314 mt in 2005 to 27,675 mt in 2008.

The orebody is accessed by a ramp which has been driven to a depth of 190 m and is worked on a number of levels. There is an underground workshop at the 100-m level. About 75% of the

ore production comes from cut-and-fill mining and 25% from the 4.2- x 4.2-m access drifts. In each cut-and-fill round approximately 100 mt of waste rock is drilled, blasted and used to fill the previous ore cut so that little waste haulage is required. Then about 50 mt of ore is blasted and loaded for haulage to an intermediate stockpile. The ore is later hauled up to 200 m for loading on to trucks for the journey up ramp to the crusher on surface. Prior to the arrival of the ST7, Lovisa was using one Equipement Minière CTX4 and one CTX5 LHD for the loading job.

The crushed ore is shipped to the Boliden concentrator at the Garpenberg zinc-lead-silver operation, approximately 110 km from the mine. In 2009 Lovisa produced 32,000 mt of ore.

Both Atlas Copco and Lovisagruvan have been pleased with the outcomes of the trial operation. The manufacturer reported the loader passed all of its tests by a wide margin while Mine Manager Jan-Erik Björklund said the Scooptram ST7 provided a dramatic productivity increase in loading operations as well as improvements in the working environment.

“The Scooptram ST7 is just great,” said Björklund. “It has now run for more than 2,000 hours and we have seen a productivity increase of almost 100%, going from two loads per shift to nearly four. In addition, we previously had two loaders in operation and now we only need one, the Scooptram ST7. Only a few modifications have been required during the test period and our operators are very happy with it. They think it is more comfortable to drive and easy to service, so we think it’s a good investment for us.”

Although the first production specification for the Scooptram ST7 has been finalized—and includes some changes from the prototype including different filters—Lovisa will continue to use the prototype. Atlas Copco wants the machine to run for as many hours as possible and will continue to check for any problems that may still occur. And the mine is looking forward to further increasing tonnage as well as revenues in 2010. The machine will be upgraded to the production ST7 specification if Lovisagruvan decides to keep it.

The Package
Since the two versions of the Scooptram ST7 were designed starting from the same clean sheet, they are very similar. And they also both share construction and rig control concepts used for the Scooptram ST14, which was the first of the new generation of Atlas Copco loaders to be introduced. Apart from the cab, the rear section of the two ST7 models is essentially the same while the RCS control system is also very similar to that on the Scooptram ST14. This commonality is a great advantage when it comes to spare parts and training, Erik Svedlund pointed out.

The standard Scooptram ST7 is 8,620 mm long, the cabin/canopy height is 2,160 mm and width over tires is 1,920 mm. The typical operating weight is 19,300 kg, the front axle load is 8,600 kg and the rear is 10,700 kg—different from those on the ST7LP which are 9,300 kg and 9,800 kg respectively.

Power Train
The clean-burning QSB 6.7-liter, water-cooled and turbo-charged diesel engine with high pressure common rail injection reduces fuel consumption and lowers emissions. A rock tough

catalytic purifier is standard and the Finnkat exhaust cleaning system is available as an option. The fuel filtration system exceeds the engine manufacturer's requirements. The low fuel consumption enabled Atlas Copco to fit only a 190-l fuel tank to the loader. The engine cooling package, sized to allow operation at ambient temperatures up to 52°C (125°F), uses the L&M V-tube Core radiator.

The "Intelligent" Funk DF150 transmission with integrated torque converter has automatic declutch and proportional control for smooth shifting and improved drive train life. It has four forward gears and four reverse. A transmission control unit (TCU) controls the proportional valves for the six separate clutches. To improve loading performance, minimize wheel slippage and reduce tire wear, a traction control system limits the power transferred to the wheels when mucking. The traction control can be turned off if necessary.

One component proven on the Scooptram ST710 that has been retained on the Scooptram ST7 is the Rock Tough 406 axle. The rear oscillating axle allows 7° of movement on each side. However, the SAHR multiple wet disc brakes have been upgraded and are 25% stronger that those on the ST710, said Svedlund. Based on experience from the ST710, the expected life time before a brake rebuild is more than 10,000 hours. The automatic brake test system checks the brakes daily and any malfunction or performance loss will be logged for future reference.

The articulated steering has a soft stop function that will slow down the steering movement before it reaches the mechanical stops at 42.5º. The system also detects worn mechanical stops that can lead to steering cylinder failures.

Operator's Cab
The ISO and ROPS/FOPS approved oil-free cabin features the Atlas Copco foot box that provides increased leg room. The RCS system provides for logging of production data, number of buckets and accumulated payload and there is a radio remote control interface.

The cabin is placed on rubber mounts and the operator's seat is air-suspended, together reducing vibrations during tramming. In addition, the "soft-stop" feature reduces vibrations from the steering and boom components. There is an interlock on the cab door that disables any hydraulic movements including steering and prevents the parking brake from releasing. This device ensures there are no undesired machine movements when entering or stepping out of the cab. Once the machine is moving above 4 km/h the function is disabled but will still give the operator a warning to check that the door is properly closed.

The transmission provides the operator with the option to drive the machine in automatic or semi-automatic mode. In automatic mode the operator selects the desired highest gear and the machine will chose the optimum gear depending on the load factor, speed, throttle position etc. In semiautomatic mode the operator manually selects a preferred gear and limits the up shifts. The transmission is constantly monitored and any detected problem will be displayed for the operator and logged on the machine.

The automatic declutch feature helps the operator to save fuel and improve the life of drive train components when using the bucket while the loader is stationary. When declutch is activated,

the machine operates normally until the operator pushes the brake pedal, the machine is stopped and the transmission is disengaged. The transmission will stay in “declutch” mode as long as the brake pedal is depressed. As soon as the brake pedal is released the selected drive gear is then re engaged.

When the traction control function is activated the torque transferred to the wheels is electronically limited. Consequently the operator can attack the muck pile at full throttle and focus on filling the bucket.

The Scooptram ST7 provides easy access to service points, filters and valve blocks. Experience with the Scooptram ST7LP shows that centralization of service points for easy access has simplified the daily checks and shortened the time it takes to perform preventive maintenance. The most common 250 hour preventive maintenance, including change of engine oil, oil filter, fuel filters and air filter, takes less than 20 minutes.

A large number of optional equipment items are available as well as the Finnkat system. These include a cold weather package, Ansul fire suppression systems, Lincoln automatic lubrication, Wiggins fast fuel fill, electric pump for filling the hydraulic tank, LED lights, optional buckets including EOD buckets, parts kit and tool sets.

ST7 Scooptram Set to Tour

In addition to the new standard Scooptram ST7, Atlas Copco has prepared a production Scooptram ST7LP and these two machines will be demonstrated in key target markets. Latin America is a major market for the standard size loader so the standard ST7 will go to Peru. South Africa is the main market for low-profile equipment and naturally the ST7LP will go there. In each country, the Scooptram ST7 will first be displayed at the Atlas Copco country headquarters and will then be taken to a number of mine sites. In Peru, one of the test sites will be at about 5,000 m above sea level.