A large yellow Liebherr RL 64 conveyor belt shifter is the central focus of the image. It is a tracked machine with a large boom and a hook at the end, used for lifting heavy components. The machine is positioned on a sandy construction site with mountains in the background. The title 'LIFT AND SHIFT' is overlaid on the top left, with the 'L' and 'S' being particularly large and stylized. The text 'The Liebherr RL 64 conveyor belt shifter.' is in the top right. A quote from Paul Waanders of Maats is in the middle right. The main text block is at the bottom left, and a company description is at the bottom right.

The Liebherr RL 64 conveyor belt shifter.

LIFT AND SHIFT

Paul Waanders, Maats,
the Netherlands, outlines
the case for using Liebherr
conveyor belt shifters.

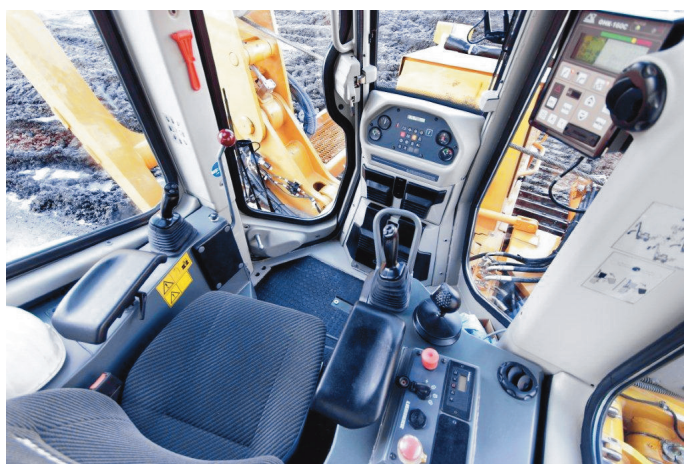
Technical evolution in conveyor belt systems have made many opencast operations reconsider the use of such systems against more traditional truck hauling. The reasons for choosing to install or continue using conveyor belt systems become more obvious as the shiftable systems present clear benefits in costs, flexibility and reduction of carbon footprint. However, to gain the best advantages and make most of their flexibility, these shiftable systems require equipment that is fully specialised for its application.

Maats Pipeline Equipment has a full range of special machines for use with shiftable conveyor systems. These machines are simply called conveyor belt shifters and are purposely engineered for the job. With lift capacities ranging from 45 – 90 t, there is a solution available for virtually every size conveyor belt.

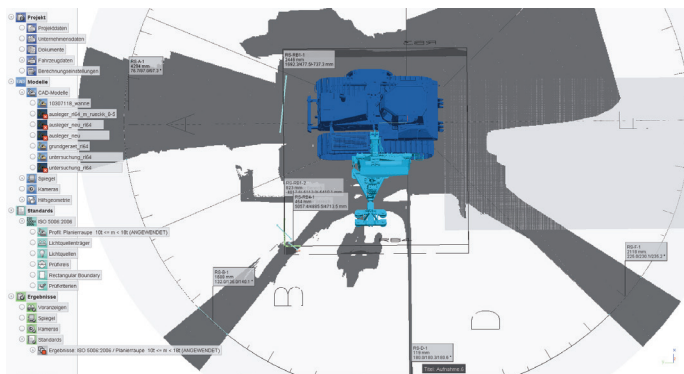
The company has its origin in the world of (cross-country) pipeline construction. Maats is the exclusive global dealer for Liebherr pipeline equipment. Liebherr pipe layers have a



The hydraulic roller head is powered directly from a PTO on the machine.



The operator's seat is angled 15° towards the load side.



Operator's view is optimised according to ISO 5006:2006.

number of benefits that make them suitable for use as a base for the conveyor belt shifters. The result is a machine for shifting operations that can also be used for relocation of pulleys, as well as transport and assembly of new belts. The relatively compact machines are specifically designed to obtain high lift capacity, which means they can be used for additional applications that are all heavy lift operations in mostly rough terrain. The Liebherr RL64 is the largest machine in the range and at 4 m can lift up to 26 t.

Over the years, Maats has supplied Liebherr conveyor belt shifters to customers around the world, including mining operations for copper, gold and lignite in Europe, as well as in South and North America.

Giving the customer what they want

Given the extensive possibilities of building the machine according to customer requirements, every new conveyor belt shifter is built in close consultation with the customer. Besides applying the technical adjustments to fit the pipe layer for its purpose as a conveyor belt shifter, the machine is also built to comply with all applicable laws and health and safety regulations.

Another major requirement can be a high availability of the machine (as much as 90%), as the continuous haul of overburden, coal and minerals is essential to the profitability of a mine. This is why all the added options and adjustments comply with the standards that Liebherr maintains in constructing its equipment.

A recently supplied Liebherr RL64 conveyor belt shifter showcases the capabilities of both Maats and Liebherr. The Liebherr RL64 pipelayer was heavily modified and now passes as a full options machine. The ultimate goal of Maats, Liebherr and the customer was to create a comfortable and safe working environment for the operator and people working around the machine, as well as reducing the chance of damages to the conveyor belt rail, which often leads to costly downtime and can bring the entire mining operation to a standstill.

Making shifting easier

One of the essential options on the machine is the automatic rope strapping system. Presetting the correct pulling force of the system does not only depend on the weight of the conveyor belt system itself but also depends on soil conditions. Pulling a belt system that has its sleepers in heavy mud will require more pulling force than a system on hard rock. The automatic rope strapping system ensures a constant pulling force on the roller head, regardless of the terrain. This prevents misalignment of the roller head and damage to the rail system by applying too much pulling force or by dropping the roller head/lifting hook onto the rail system.

Another helpful feature is the asymmetric drive. This system creates a diagonal drive, ensuring a constant



Machine prepared for operation. The machine features include a special boom, walkway, automatic drawbar coupling, cameras and beacons, as well as extra LED-lights.



The previous model Liebherr RL52 conveyor belt shifters, complete with Trimble GPS antennae.

lateral force on the roller head and, therefore, on the conveyor belt. It is usually the operator's task to create this diagonal drive; however, in the Liebherr conveyor belt shifter, this can be created by a simple turn of a button. When the operator pushes the drive joystick for moving straight forward, a constant diagonal drive is automatically created by the machines' intelligent electronics.

Health and safety

The sophisticated electronic systems of the Liebherr machine allows for a variety of helpful options, while the hydrostatic system provides the possibility of adding an extra hydraulic circuit. This circuit is used for operating the roller head straight from a hydraulic power take off (PTO) on the machine. Power is directly taken from the existing hydraulic power supply; the connection is thus immediately ready for use and no extra power source is needed for the equipment that is being attached to the hydraulic PTO. This means that the operator can hook up to the rail on the conveyor belt

without needing to leave the cabin. This helps create a safer working environment, as there is no need for people to manually operate the roller head or to work under the hook.

Other safety options include:

- A ROPS cabin according to ISO 3471.
- The addition of an emergency exit to the cabin, opposite the normal entrance.
- The use of safety glass (Lexan Margard polycarbonate, complying with DIN 52290 Part 4) to prevent injuries by falling objects, especially when the machine drives under conveyor belts for relocating.
- A camera system: cameras are mounted on the far side of the counterweight facing both forward and backward. The monitor is mounted in the direct line of sight of the operator, meaning they can keep an eye on the load side of the machine (actually on the rail on the conveyor belt) but still see if there are persons or vehicles on the opposite side of the machine.

An optional walkway on the rear of the machine serves both health and safety. The walkway provides a safe mounting onto the machine, as well as a safe level working space when refuelling the machine. This walkway includes access to the cabin from the rear of the machine and has room for a fire extinguisher (one of two on the machine).

Other health and safety options mainly concern features in the operator's cabin. The many hours that an operator spends on a conveyor belt shifter come with specific health risks. One specific hazard comes from the fact that the machine mostly runs at full speed, while connected to a more or less static object (depending on the size/weight of the conveyor belt). This kind of exposure to vibrations and shocks can have a large impact on the human body. Beyond certain limits of exposure, legislation indicates that working hours should be reduced or extra breaks added in order to prevent the operator from developing health conditions or picking up injuries. In this specific application, the maximum value for whole-body vibration emission was 0.5 m/sec^2 . Exceeding this value would have an effect on the continuity of the operations and there was no choice but to look for solutions. Extensive testing with a number of different operator seats (evaluation according to ISO 2631 and EN 1032) resulted in a special air suspended seat with automatic weight adjustment and a special seat top, providing the operator with a comfortable and ergonomically correct working environment.

In addition to the seat elements, the seat as a whole is angled 15° towards the load side. This is a standard feature on all Liebherr pipe layers and allows the operator to keep a constant eye on the roller head and conveyor belt rail without any additional stress on the neck, shoulder and back areas.

The cabin is fitted with a heater and air conditioning system, which make working in winter and summer equally comfortable. Moreover, the cabin has positive pressure ventilation, which keeps dust out and ensures a clean working environment in the cabin.

As with vibration emissions, the noise level in and around the machine must be taken into account. Noise level can be an inconvenience, but – more importantly – it is an outright health risk. For all Liebherr machinery, the operator sound exposure (according to ISO 6396) and the exterior sound pressure (according to 2000/14/EC) are known. However, working with the machine connected to the conveyor belt system adds to the noise level. Although the sound reduction value (according to DIN 52210-75) of the used safety glass is slightly different from normal glass, the standard cabin isolation with the addition of the safety glass resulted in an adequate noise reduction to 72 dB(A) at the operator's position during shifting operations.

Making work easier

A good view on the roller head, which is connected to the conveyor belt system, is essential for smooth shifting. The first step in guaranteeing a clear view is taken by angling the operator seat 15° towards the load side. This ensures an unobstructed view of the roller head. The second step was taken by completely modifying the standard pipelayer boom. The view on the load can often be slightly obstructed by cabin pillars or the actual boom. By

widening the base of the boom and switching to an asymmetrical design, nothing is left in the way of an absolute clear view of the connection to the conveyor belt system.


Equipping the machine with a GPS system was one of the last major options. Even with poor visibility conditions, such as heavy fog or during night time, the GPS system enables the operator to shift the conveyor belt exactly in the planned position. By adding extra lighting, for example on the tip of the boom, the operator is provided with increased visibility. By using LED instead of halogen, the lights have the additional advantages of low energy consumption and a long lifetime.

Optimising economy

Creating a clean, safe and comfortable working environment for the operator and providing them with the correct tools helps to accelerate and optimise both production and productivity. Though many of the described options may sometimes be regarded as luxuries for – or pampering of – the operators, they can truly help improve production by preventing incidents, accidents and damages to conveyor systems. An operator that works in a conditioned, comfortable environment is able to

perform their work with greater levels of concentration. With complete focus on the job, instead of being distracted by external influences, such as the weather or poor terrain conditions, an operator will be able to work more efficiently, with less risk posed to themselves or people working around the machine. If operators are given the right tools, they are able to perform their work to the best of their abilities, regardless any external conditions.

Conclusion

Not only can conveyor belt shifters be used for conveyor belt shifting, the machines can also be used for (heavy) lift operations. This extra application means more frequent use of the machine is possible. To add more flexibility, there is the possibility of supplying the conveyor belt shifter with a generator platform. Mounted on the rear of the machine, this platform can hold a hydraulically powered 125 kVA generator and has room for welding machines or even a vulcanising unit for connecting or repairing conveyor belts. The force feed lubrication of the engine means that the machine can function fully on inclinations up to 45°, completing the characteristics that make this machine a versatile shifting, lifting and servicing unit. 

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