

Aiming High with a New Conveyor System

Liebherr has invested in a new coating line for its crane components, some of which weigh several tonnes. A heavy-duty power+free conveyor ensures that the parts, which are more than 12 metres high, can be transported smoothly.

The Liebherr tower crane business unit is one of the world's largest suppliers of tower cranes. Its portfolio of products includes machines of all sizes and types for the building industry. Liebherr's cranes can be found on construction sites all over the world, including at Europe's highest building in St Petersburg, on the top of the Zugspitze, Germany's highest mountain, at the new airport in Istanbul where 58 cranes were in operation and at the world's longest cable-stayed bridge in Scotland.

As part of a replacement investment programme for its surface coating facilities, Liebherr planned to install a new paint shop at its plant in Biberach in Germany, which needed to be completed within a year. The special feature of the paint shop is the vertical coating of tower crane components which are 12.5 m long, 2.5 m wide and 2.5 m high and weigh a maximum of nine tonnes.

A solution that is far from standard

The engineering company Heroplan was responsible for designing the paint shop, which has spray booths and dryers up to 14 metres in height. Liebherr decided on a heavy-duty power+free conveyor from Caldan as its transport system at the Biberach plant. Caldan was able to make use of its experience with a transport system for painting truck mixer drums at Liebherr-Mischtechnik in Bad Schussenried.

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A tower crane component leaving the automatic blasting booth.



The approach lines to the top coat booths.



A tower crane component about to enter the base coat booth.

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Caldan was involved with the project during the entire planning phase and supplied the P&F 420 power+free system complete with the accompanying control system. The conveyor is designed for a maximum load of nine tonnes and includes the stages in the process described below with a cycle time for each painted part of 12 to 15 minutes.

In the loading station the steel parts that are ready for painting are loaded onto wagons positioned at a height of 14 metres using a crane system specially manufactured by Liebherr for the purpose. The lifting gear is fitted in advance in the materials department. The transfer process is monitored by the operator via a camera system. All the wagons are fitted with a rotating head, so that they can be turned if required during the subsequent stages of the process.

Full blasting coverage

During the first stage, the parts pass through a specially designed blasting machine from Rump which operates automatically. This is followed by a manual blasting system from the same manufacturer. Depending on the blasting programme, the power+free conveyor can position and rotate the components in both the blasting booths in order to ensure full blasting coverage. The Caldan PLC positions the parts in the predefined blasting position and in the rotated position during the individual blasting processes.

After this pre-treatment phase, the steel parts move into the base coat booth. Here the parts can also be rotated during painting and positioned using a transfer. In the base coat dryer the trolleys are timed during the paint curing process. The same applies to the subsequent cool-off buffer zone. The parts

can skip the base coat phase via a bypass section.

The parts then move automatically into the two top coat booths. Each booth can apply a different colour, for example one can use the standard colour and the other special colours. The conveyor system is the same as in the base coat booth. After the top coat has been cured, the wagons move through a cool-off buffer zone or another power+free buffer zone to the unloading station.

Another bypass enables the steel parts to pass through the coating process again if more than one colour needs to be applied.

Assembly at a height of 14 metres

The complete steel structure was designed by Caldan and then integrated by Liebherr and Heroplan into the construction of the 21-metre-high production building. The entire conveyor system and all its functional components were incorporated into the structural engineering concept for the building and fitted to the building's steel structure. The installation process represented a challenge and support was provided by assembly engineers trained to work at heights. Specialists from Caldan planned the entire control system for the conveyor and implemented it using a Siemens PLC. The process data is sent to the power+free trolleys in the loading station and guides the wagons through the system.

The power+free conveyor is monitored by a SCADA system (supervisory control and data acquisition) and the relevant data is sent to the management team for each shift.

The paint shop has been in operation for more than a year and guarantees a high-quality coating for the Liebherr tower cranes. "The choice of a vertical system for transporting and coating the tower crane

An overview of the power-free system at Liebherr in Biberach

Power+ free conveyor	Caldan P&F 420
Maximum trolley capacity	8000 kg/9000 kg
Cycle time	12.5 min.
Conveyor length	650 m
Number of stoppers	45
Number of wagons	45
Rotation units	8
Companies involved	Caldan Conveyor Heroplan Gema FreiLacke Statikbüro Hamann

components was unusual and rather brave, but it was the right decision in the light of the space requirements. You only need to think about how much room would be needed for the dryer alone with five spaces each 12 by 2.5 metres in size," says Günther Hardock from the Liebherr plant in Biberach. The conveyor is currently being loaded with weights of nine tonnes and the first test runs have already taken place. This will allow Liebherr to coat heavier components in future. //

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