

Extremely mobile – with loads up to 500 tons - igus energy chains in an 'XXL' size process crane

Kranbau Köthen GmbH has built a crane with a lifting capacity of 500 tons and a special design whereby the weight distribution in two axes can be finely balanced using a special shaft end support. Here, signal and energy transmission take place via energy chains and cables from igus.

'Anything but standard': this describes the development and production programme of Kranbau Köthen in a nutshell. The company has been manufacturing cranes since 1934 and specialises in sophisticated process cranes that are carefully integrated into production systems. One application example is for the steel industry where the company builds and supplies cranes for slab, charging and foundry applications.

These cranes often work under tough environmental conditions such as heat, dirt, and high mechanical stresses. However, for a recently built process crane these conditions didn't apply but the requirements are unusual and extreme in many other respects. It is used in an ABB plant in Sweden, which manufactures large transformers. And 'large' here means massive: while the predecessor type series weighed a maximum of 300 tons, the new transformers, which offer higher performance and improved efficiency, weigh up to 500 tons.

This weight increase required the investment in a new crane, and Kranbau Köthen was commissioned for its development and production. A special feature had to be considered in that the centre of gravity of the transformers is distributed very unevenly. The crane therefore must adapt accordingly to ensure smooth and delicate lifting and lowering of the heavy load.

Based on these requirements, the Kranbau Köthen engineers developed a crane with a lifting capacity of 500 tons (Fig. 1) and a special heavy-duty shaft end support (Fig. 2). It consists of two carriers whose spacing is changed by lead screws. The two attachment points on each carrier are also adjustable so that each of the four winches can be positioned separately. The transformer can therefore always be attached in such a way that the weight (up to 500 tons) is evenly distributed over all four attachment points. In addition, the entire shaft end support is rotatable. It is suspended on a very large load-measuring bolt.

In addition to its extremely high load-bearing capacity, the crane itself also has some other special features. These include three auxiliary strokes, each with a loading capacity of 20 tons, and an extraction system on the trolley travelling winch. The reason for this is that if impurities get into the transformer during the assembly process, this can have serious consequences for its function. For this reason, ABB produces these plants in a very clean environment and demands that the crane does not generate any abrasion debris during operation.

The cables are guided on the crane girder to the 30-metre-wide bridge; here a standard igus E4 4040HD energy chain is used. This type of chain has proven itself worldwide in crane technology. The chain links feature a special undercut design, which absorbs high push-pull forces and also provides very good strength to absorb lateral forces. And the material of the energy chain – igamid G with an "HD" design – ensures optimised sliding properties and, as desired, a very long service life with low abrasion.

The energy chain integration follows a standard process at Kranbau Köthen. Dipl.-Ing (FH) Tom Kuhnt, in charge of electrical projects, explains: "We filled in the online form with details of all the necessary information, such as specifications, installation type and options. This allows igus to design the chain quickly and reliably." In this case, the extras included double strain relief and a floating moving end, to compensate for any lateral misalignment and wheel clearance in the trolley drive. Kranbau Köthen has already had good experiences with this system in other projects.

Tom Kuhnt adds: "From our point of view, it has proven to be a complete system, which is designed precisely for the specific conditions." Here the collaboration with igus has been well established. The chainflex cables were developed specifically for use in mobile systems and, because of the benign environmental conditions (normal climate, no high travel speed), cables with PVC outer jacket can be used in the ABB crane. They are more cost-effective than TPE cables and also generate less abrasion debris than PUR jackets (ensuring cleanliness).

The electrical connection between the two shaft end supports, which can be moved towards each other, is also ensured with energy chains and chainflex cables from igus. Here, E4 e-chains are also used. The undercut design provides firm grip in lateral acceleration and inclination of the shaft end support. An integrated brake offers very smooth running.

At the rotating joint of the shaft end support, an enclosed triflex R energy chain with twistable cables from the chainflex product range ensures mobility in the rotary axis. This energy chain was originally developed by igus for robotic arm applications. In the process crane, it is under very low dynamics, but protects the cables reliably in the rotary movement.

Before a crane leaves the Kranbau Köthen facility, a factory acceptance test takes place. Here, the crane is fully evaluated and tested jointly with the customer. This elaborate test is a standard procedure at Köthen and shortens the commissioning time of the crane system at the customer's site. Then the crane was distributed over several flat-bed trucks and transported to Sweden. Part of the route was by sea, so ferry loading of the fragile cargo was inevitable.

Kranbau Köthen received support for the project from its local sales and service partner Svenska Lyft AB. The company, which has a high level of expertise in crane electronics and works regularly with the Swedish igus subsidiary, will oversee the crane's service in the future.

The test and final inspection of the process crane at ABB also posed special challenges to those in charge; 625 tons of test weight (corresponding to 125 percent of the maximum nominal load) had to be provided for the acceptance test. Tests of the emergency stop device at full speed were also part of the test series. At the customer's, the acceptance was carried out thoroughly. Maik Stern, Head of Production at Kranbau Köthen: "After all, as a globally leading technology company, ABB is also a specialist in the field of crane technology and therefore also a critical customer."

For more information, please visit: www.igus.co.uk or call igus directly on: 01604 677240

Images and suggested captions



Fig 1: Still on the ground: the 500-ton crane in Kranbau Köthen's production facility. The energy chain from igus can be seen well.



Fig 2: The heavy-duty shaft end support allows the flexible positioning of all four winches or attachment points.

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Based in Northampton in the UK and with global headquarters in Cologne, Germany, igus is a leading international manufacturer of energy chain systems and polymer plain bearings. The family-run company is represented in 35 countries and employs 4,150 people around the world. In 2018, igus generated a turnover of 748 million euros with motion plastics, plastic components for moving applications.

With plastic bearing experience since 1964, cable carrier experience since 1971 and continuous-flex cable since 1989, igus provides the right solution based on 100,000 products available from stock with between 1,500 and 2,500 new product introductions each year. igus operates the largest test laboratories and factories in its sector to offer customers quick turnaround times on innovative products and solutions tailored to their needs.

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