

GOING BEYOND LIMITS

David Moosbrugger, Managing Director, Kuenz, Hard, Austria



Kuenz has a long history of designing and building rail-mounted gantry (RMG) cranes for river harbours, which are often known as barge cranes. In their earlier form, barge cranes were usually designed as single girder lattice cranes and operated in a similar fashion to a ship-to-shore (STS) crane. The main movement was done with the trolley and hoist, while gantry movement took place slowly. Today, barge cranes are usually operated almost like an intermodal crane, meaning that the equipment is moved in trolley and gantry direction with high acceleration values and high speeds. Most of the time, these motions overlap. To do so requires a certain stiffness of the gantry structure, including both the legs and the main girder. This is a major disadvantage of the single lattice

girder, as it is effective vertically but less so horizontally. Additionally, it is critical for avoiding weld cracks as a result of fatigue.

In response to this, Kuenz started to use double girder cranes with superstructures; the design fits perfectly for a very dynamic crane and fulfils the requirements of a barge terminal. The cranes have grown a lot over the last few years, with cantilever lengths increasing up to 36 metres, and spans rising to more than 55 metres. The speeds and acceleration values have also grown over the last few years; most of the cranes have acceleration values of 0.3 metres per second (m/s^2) and go as fast as 150 metres a minute (m/min). In addition, operating wind speeds have also increased from about 72 kilometres per hour (km/h) to more than 90 km/h in this period. The

stiffness of the cranes is phenomenal as well, allowing trains to be loaded and unloaded efficiently in a short amount of time.

THE CHALLENGE

The requirements of the barge terminal have changed quite a lot over the years, with design standards being updated and the wind surface coefficients increased. This created a real headache for the Kuenz engineers. Therefore, Kuenz decided to build the next generation of barge cranes. The challenge for Kuenz was threefold: fulfill the requirements of barge terminals, deliver a price competitive machine, and leave some room for even higher, more demanding requirements from the customer.



FINDING A SOLUTION

Several hours were spent in trying to find solutions for this problem. The main concern was the considerable wind surface. Because of the double girder design with a superstructure, the wind surface was almost 30% higher compared with a traditional single lattice girder. The high wind surface was one of the driving factors for dimensioning the motors, brakes, frequency converters and other components. So, with the bottleneck acknowledged, it was now time to find a solution. Many remedies had been tried, but there was nothing which felt like a groundbreaking idea until one of the engineers remembered a design which he used in one of his former projects, a radial gate for the water power industry. All the steel structures which water has to flow over are round and not rectangular, as water flows much better and smoother over this type of surface.

This was the groundbreaking idea. The main girder has to change from being rectangular to round – as this reduces the wind surface - and instead of two girders we decided to only use one. The new Kuenz Aerodynamic Girder was born. The girder consists of two I-Beams, one on each side of the girder, and one bottom chord and upper chord which are bended and connected to the two I-Beams. The bended plates have a great stability and therefore no stiffeners inside the girder are needed.

A bolt-on rail on top of the I-Beams, which sits on a neoprene layer, is used for the trolley rail. The girder is also equipped with a superstructure, allowing us to build cranes with wide spans of 60 metres and more, and long cantilevers of 40 metres or more. The needed stiffness in a horizontal and vertical direction is provided by the I-Beams on the girders and the A frame structure of the legs. The stiffness enables highly efficient, overlapped movements of the trolley, hoist and gantry, allowing 35 moves per hour or more to be achieved with this type of crane.

Besides the excellent stiffness of the cranes, the wind surface was also reduced tremendously. The aerodynamic crane has approximately 50% of the double girder crane's wind surface, meaning the installed power and energy consumption from the crane is about 30% less. We were also able to reduce the weight of the crane, which increases the lifetime of the wheel and causes less wear to the rail. All in all, it was the development we were hoping



for; by changing one piece of the crane, we were able to create several major benefits compared to existing barge crane designs.

OUTLOOK

The first of these cranes were installed in 2016 and have been running for more than 3 years to the fullest satisfaction from customers. Several barge terminals in Europe have been equipped with the new technology, while two other units were sold to a customer in the United States. The latest barge crane also featured a hinged cantilever, which can be lifted and lowered like an STS crane. The new crane

is now in the commissioning phase and will be handed over to the customer within the next few weeks. With this design, we at Kuenz were able to not only meet the need from the customer right now, but also to prepare the industry for its future needs. Higher wind speeds and higher acceleration values, combined with more moves per hour and less power consumption, can all be accommodated with this new design.

REVIEW KUENZ'S SOLUTIONS IN THE AIS PORTAL

ABOUT THE AUTHOR

David Moosbrugger is Managing Director of Kuenz. David is in charge of Sales and Engineering at Kuenz. Before becoming Managing Director of Kuenz, Moosbrugger worked several years in engineering, project management and sales. He also lived several years in the US, working for Kuenz America.

ABOUT THE ORGANIZATION

Kuenz was founded in 1932 by Hans Kuenz who succeeded in creating a significant and successful mechanical engineering

company in a very short period of time. The company started out manufacturing tower construction cranes. The focus later shifted towards manufacturing container cranes, followed by hydro power equipment. Kuenz is one of the oldest and most prestigious mechanical engineering companies in Austria.

ENQUIRIES

Kuenz GmbH, Gerbestr. 15,
6971 Hard, Austria
Tel: +43 5574 6883 0
Email: sales@kuenz.com