KUENZ FREE RIDER
THE NEXT LEVEL OF RTG

When conceptualizing the next generation of RTG crane, we at Kuenz were clear that we could not succeed if we weren't willing to break the mold. We didn't want to do a simple cut-and-paste job from previous iterations, so the primary objective was to meet the requirements of the future container handling business for more efficiency and speed, as well as enhanced ergonomics.

THE FREE RIDER

We see the FREE RIDER as the missing link between the existing RTG and common ASC's. The FREE RIDER thereby facilitates the conversion of RTG brownfield terminals into automated operations. A new milestone in this industry.

The main idea behind the existing RTG operation was to use the RTG just for the side loading or unloading of containers for horizontal transport. In this case, the conventional RTG is used mainly in trolley movement and no long travel container transport in the stack was needed. Based on such RTG characteristics we can see that there is a low operating speed, a weak gantry structure, and excess movement during operation. Therefore, automating has been a challenge.

We foresee that the future challenges for automated RTG's will be in the optimization of the product, as well as the fast and safe integration within existing terminals. To fulfill these future requirements, the FREE RIDER redesign results in the below innovations:

1. IMPROVED GANTRY STRUCTURE

The mechanical concept has been optimized to an ideal cost-performance ratio as described above. The new design reduces gantry weight, allows for a reduction in the dynamic force on wheels, crane way and structure with a drastic reduction of energy consumption and maintenance service. Following years of work on automated equipment, Kuenz has a focus on what the next steps are.

The revision of the crane gantry structure features an increased stiffness and reduced gantry structure weight, due to an innovative, patented aerodynamic design. It's manufactured as a stiff and robust single girder with an aerodynamically shaped main girder and A-shaped posts. Four traveling gears, each consisting of four rubber tyres, are equipped with a steering gear, which allows for different travelway directions. The stiff aerodynamic gantry structure, together with the robust rope tower of the new hoist system SPIDER allow for significantly higher travel speed, even with a fully loaded container up to 130 m/min.

2. SPIDER HOIST SYSTEM

The new, patented hoist system 'SPIDER' is currently the most innovative and advanced hoisting gear concept on the market. The rope tower is a key function of the Kuenz FREE RIDER and consists of eight rope drums. A special 8x2 rope reeling system creates a rigid rope tower with a mechanical ant-sway in all directions. Additionally, the hoist system is able to perform micro-motion movements in x, y and skew direction, and as well, trim and list functions. This ensures optimum, precise, and safe container handling. Auxiliary ropes are not required for the fine positioning. Furthermore, no additional anti-sway or micro-motion is necessary for a smooth operation. The integrated Micro-Motion allows +/- 5° of all movements and a horizontal shift of 300 mm in all directions.

With the new system, we reach the highest number of moves per rope in the industry and if the rope needs to be replaced it will be very quickly. The final calibration of the ropes will be done automatically by the system.

The combination of a stiff gantry structure, stiff gantry travel units and the high stiffness of the Spider hoist system makes the FREE RIDER to an overall stiff machine. The key features are high travelling speeds, travelling with a loaded container and that the system is ready for full automation. Of course, it is possible to automate every equipment. It just depends on how much sensors and equipment you put on the crane. However, just a stiff structure allows you to keep the automation system simple and reliable with less maintenance.

BENEFITS

The main features of the Kuenz FREE RIDER translate into a number of benefits for terminal operators:

- Higher productivity
The stiff aerodynamic gantry structure and the robust rope tower of the Kuenz SPIDER hoist system allow for a significantly higher travel speed, even with a fully loaded container. The maximum speed of the Kuenz FREE RIDER is 160 m/min without load and 130 m/min with maximum load. Because of the higher speed, the productivity of the FREE RIDER is 20% above common RTG's on the market. In addition, the Kuenz SPIDER and Kuenz ONE HAND systems guarantee a much faster positioning. As a result, when compared to traditional RTG’s, a lower number of FREE RIDERS are needed to handle the same amount of containers in a terminal.

- Total Cost of Ownership
A lower number of cranes resulting in a lower number of operators and reduced maintenance costs. In addition, the aerodynamic gantry structure of the FREE RIDER significantly reduces power consumption. We estimate the reduction of operational expenditures at approximately 20% to 30% over the lifetime of the cranes.

- Intuitive control of cranes – skills of operators
Because the Kuenz ONE HAND system is so intuitive, it does not require the same
training efforts as traditional control systems. This will make operation safer and reduce the cost of training.

- Ready for automation
Apart from the above-mentioned benefits, the Kuenn FREERIDER is also opening completely new possibilities for automation. This makes the Kuenn FREERIDER a future-proof investment, even if you will still work with operators on the RTG’s

**CONVENTIONAL RTG OPERATION**
There are additional benefits in the daily operation. Today you have a lot of waiting time during the day for the horizontal transport. That makes the system unproductive. With the FREERIDER you can make this time productive. You are now allowed to do the housekeeping between the moves, transport breaks or automated during the night with the FREERIDER, similar to an ASC. On the other side you will save a lot of money because you can reduce additional equipment as reach stacker, straddles, tractors etc. for the housekeeping. Summarizing the FREERIDER combines two jobs. The horizontal container loading and the housekeeping.

**WHEELED AUTOMATION**
The industry is faced today with the problem that it has to invest all lot of money and automation equipment to solve the problems from the weak gantry structure of the RTG’s to get a semi-automated crane with the same old problems in safety. Because of the high degree of automation equipment, they have less reliability of the systems and high maintenance costs.

Based on that the Kuenn FREERIDER was specifically designed to meet high-level automation requirements. Because of the high gantry speeds, it is possible to operate the Kuenn FREERIDER like an Automated Stacking Crane. This is what we refer to as “Wheeled Automation”.

The concept of “Wheeled Automation” consists of:
- Transfer zones at each end of the block
- 1 or 2 RTG’s per block which are powered by a mono spiral cable drum or bus bar system
- RTG’s equipped with a small generator set to switch blocks.
- Standard laser and camera systems combined with remote operating stations known from typical ASC terminals.
- Standard infrastructure as used for manual RTG’s.

“Wheeled Automation” can be implemented step-by-step in a terminal operation.

The concept of “Wheeled Automation” is the most modern RTG automation concept available in the market providing for lowest operating costs combined with maximum safety for people inside the terminal.

Compared to a sophisticated modification to an automated ASC terminal the automated FREERIDER concept changes your operation in an easy way by converting your RTG Brownfield to an end loaded block. Modification works occur systematically without effecting your daily terminal operation. Existing RTG tracks can be reused; further, no significant civil works are required, except of electricratification, enclosure and building of the transfer zone. Stacking capacity will stay the same as ever.

**ABOUT THE AUTHOR**
Walter Schoenecker is the Head of the product development FREERIDER at Kuenn. He is in charge of the FREERIDER product management and sales. Before he was responsible for sales and project management of hydro mechanical equipment for power plants at Kuenn. He studied Civil Engineering and Economics at the Graz University of Technology, Austria and employed at Kuenn for more than 10 years.

**ABOUT THE ORGANIZATION**
Kuenn was founded in 1932 by Hans Kuenn 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. Kuenn is one of the oldest and most prestigious mechanical engineering companies in Austria.
Kuenz offers innovative and efficient container handling solutions for your intermodal terminal or stacking yard. Kuenz’s rail mounted gantry cranes, automated stacking cranes and tailor-made spreaders are designed for highest reliability, performance and safety.