

Bringing crane operations down to earth

Remotely controlled STS cranes increase efficiency, improve working environments and boost productivity

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The remote controlled Ship to Shore (STS) cranes are making a major breakthrough in container terminals. Recently two terminal operators decided to adopt remote control of STS cranes with the help of ABB Crane Systems' technology.

The first step towards remotely controlling cranes was the introduction of remotely controlled stacking cranes. Since then, the technology has been further developed to enable the remote control of STS cranes as well. Thanks to the close cooperation between ABB Crane Systems and Manzanillo International Terminal (MIT) in Panama, the technology can now be used on a wider scale. In Panama, the first remotely controlled STS crane is already in commercial operation.

The introduction of remotely controlled STS cranes in container terminals is not only expected to bring remarkable improvements in productivity, but also provide the crane operators with a more comfortable, ergonomic working environment thus allowing them to improve their performance.

Development of the technology

ABB has developed a comprehensive range of automation features to enhance the safety and performance of STS cranes and currently, nearly 400 remotely controlled stacking cranes equipped with ABB

technology are in operation. Based upon this experience, it was clear that the ability to control STS cranes remotely could yield significant improvements in vessel turnaround times and increases in the productivity of terminal operations.

To demonstrate the feasibility of remote controlled STS crane operations, and their ability to achieve consistent, long term improvements in productivity, it was necessary to maintain the confidence of the terminal operator and of the operating, maintenance and supervisory personnel, therefore, a pilot project was undertaken. This demonstrated not only that it is possible to control the crane from a Remote Control Station (RCS) located more than 600 meters from the crane, but also that the associated improvements were highly appreciated by crane operators. The RCS is similar to those used and proved effective on ABB's Automatic Stacking Cranes (ASC).

Factors influencing the performance of STS cranes

In common with many systems, the performance of an STS crane is dependent upon minimum cycle times achieved consistently over long periods. The achievement of low cycle times requires



advanced automated control systems with features that are designed to attain minimum times at all stages of the cycle. ABB Crane Systems has the most comprehensive range of control features including Automatic Container Landing and Vehicle Guidance systems.

In general, there are limitations on acceleration/retardation rates imposed due to the presence of operators on board the crane. Issues such as avoiding the likelihood of motion sickness and of course, health and safety considerations for the operator need to be accounted for. However, with the crane driver relocated to a comfortable office environment it becomes possible to increase speeds and shorten ramp times.

The limitations on rates for cranes with operators on board also affects the principal movements of the crane when loaded and unloaded during return journeys and extends the planned cycle times. Cycle times must provide for corrective movements for sway control, skew control and corrections for vehicle alignment. These corrections are highly automated with ABB remote control systems and with no operator on board, more aggressive corrections can be made, further reducing cycle times.

Ergonomics and operator performance

Maintenance of low cycle times is also dependent on operator performance. Performance varies between individuals and it also varies significantly over the duration of a shift. For operators on board STS cranes, fatigue is appreciable. When controlling an STS crane from a cabin the operator must lean forward and look down between his feet whilst subjected to continuous, rapid movements. This is hard on the neck and the back; it causes fatigue and can lead to high rates of absenteeism.

This has to be compared with the remote option of the operator sitting in an ergonomically designed chair and desk fitted with joysticks and buttons, while looking at monitors showing images from cameras and control information. In this situation fatigue is greatly reduced and overall performance improves accordingly. Additionally, often camera outlooks are more helpful than views available from the cabin, especially when considering modern STS cranes with lifting heights of well over 50 meters. It may be said that this ergonomic option is essential for increased productivity on the quay.

The higher levels of automation plus more consistent performance of the operators not only reduces cycle times but makes performance more consistent and predictable. Thus even higher levels of actual performance are achieved.

Production and planning

The operator is sitting in a control room alongside other operators of STS and ASC units. This is good for morale but also has more tangible benefits. Each crane can be controlled from any desk so that it is possible for an operator to be relieved for short breaks without interrupting operations. This provides considerable scope for more flexibility among the operators on duty.

Since the crane remote control room can be located in or near the central terminal control room, there is also scope for improvement in communication. This also provides the opportunity for closer integration into the Terminal Operating System (TOS). Thus, if a crane delivers to a lashing platform or to an unmanned vehicle, the landing part of the cycle can be fully automated.

On new cranes built for remote control no cabin is supplied. Thus there is a reduction in the live load and savings can be made in the capital costs of the trolley as well as the cabin itself; also power consumption is reduced.

Larger vessels, higher cranes, further challenges

There is a constant trend towards larger vessels and therefore



FIGURE 1: No more uncomfortable working positions for crane drivers. The introduction of remote control in STS cranes allows the crane drivers to move to an ergonomic office environment.

higher cranes with longer outreach.

This adds to pressure on the STS crane operators. The average path length of each cycle will increase and the visibility from the cabin will be less favourable.

This move towards higher cranes further increases the demands made on terminals and the significance of overall performance. The more favourable views available from cameras and the reduced cycle times permitted by remote control will make a significant contribution to the higher levels of productivity necessary to meet this challenge.

Remote control yields significant positive results in all of these aspects of performance.

Conclusion

The features and benefits of remote control of STS cranes have been firmly established and will have significant effects upon the performance and reliability of terminal operations over the next decade.

ABB Crane Systems believes that when terminal operators appreciate the aggregate benefits of remote control, there will be a surge of interest similar to the situation when they introduced remote control of stacking cranes.

ABOUT THE AUTHOR



Fredrik Johanson has a Bachelor of Science degree in Energy Engineering from Mälardalen University in Västerås, Sweden and an MBA in Project Management from Linköping University of Technology in Linköping, Sweden. Fredrik joined ABB in 1984 as a Systems Design Engineer and has long and versatile experience on electrification and automation of cranes.

ABOUT THE COMPANY

ABB Crane Systems offers electrical and automation solutions for controlling the motions of container cranes, ship unloaders and industrial cranes, for new installations, upgrades and modernization of existing crane systems. Combined with ABB's long and vast experience on crane system projects throughout the world over decades these solutions and industry leading innovations enable terminal operators and industrial plants to increase both productivity and energy efficiency of their operations.

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