The Fixed Cabin concept

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Given their long term experience in crane drive systems and crane automation solutions, ABB is now taking the next step in quay crane automation – remote control. Remote control improves the working environment for drivers and provides the opportunity for increased productivity.

The developmental stages of the remote driven quay crane were done in succession. One of the major items undertaken was testing a fixed cabin concept.

Fixed Cabin

Instead of a driver’s cabin attached to the trolley, ABB implemented the Fixed Cabin concept. With this concept, the driver’s cabin can be mounted anywhere on the crane structure. To aid the driver, cameras are installed on various points on the crane, and automation features such as Electronic Load Control (ELC) and Ship Profiling System (SPS) are implemented.

Taking the driver off the trolley improves the working environment from a number of aspects. Traditionally, drivers sit in a bent over position to monitor the load. As they are subject to a high amount of physical force during heavy acceleration and deceleration, the strain on back, neck and shoulders can be substantial. With the new, upright position that this concept provides, there is no more jerking trolley, relieving not only the muscles but also preventing dizziness.

The moderate sound level in the fixed cabin decreases the risk of impaired hearing and is less tiring, making it easier for the driver to concentrate on his task.

In a traditional quay crane, the driver’s cabin is installed behind the trolley. This means that over the ship, the driver has a limited visibility over the cells. With the new ABB Fixed Cabin concept, controllable cameras can give the driver a better view than in a traditional crane. ‘Seeing the front side of the spreader really makes it easier to operate in the ship cell’ was one of the first comments made by operators after initial trials. Not only does this facilitate quick operation but it also improves the safety for people on board the ship.

Possibility of increased production

The fixed cabin concept opens up the option to operate the trolley with shorter ramp times and at higher speed. Until now, the limiting factor has often been what the driver can take. No driver’s cabin reduces the weight on the trolley which in turn leads to reduced motor and drive sizes, thus reducing energy consumption and running costs.

With ABB’s automation solutions, an optimum travel path to and from the ship are used. Through proven technology, the crane control system performs automatic cycles including landings over the quay. The driver supervises the operation and performs all landings on the ship.
Remote STS

Once ABB proved the concept of the Fixed Cabin, the remote operation was a natural follower. For Automated RMG cranes, remote operation has been a fact for a long time and with today’s quay cranes with full automation over the quay, there are many similarities between the two.

When manual intervention is needed, the remote operator controls the crane from an operator’s desk. The operator’s desk is a control table with master switches and push buttons where remote operators drive the crane with monitors providing feedback. The difference between the desk for an RMG and an STS crane is small, and they can very well be operated from the same desk, which ensures production flexibility and redundancy. For the operator, remote control means a comfortable and safe environment. When a crane needs assistance from an operator, the crane requests a desk connection. The request is handled by the control system, which distributes the cranes among the active control desks. When the crane has been assigned to a specific desk, the camera images and data from that crane are displayed on the monitors, and the controls are ready for the operator to handle.

Safety

The safety issues are of course taken care of; as always this is a key factor in all ABB deliveries. The communication between the remote operator’s desk and the crane is redundant and fulfills all requirements of safety category three, providing safety for man and machine.

Automation and remote operation

During operation, the Terminal Operating System sends work orders to the crane and the operation is handled automatically, except for the small part of the cycle over the ship. The crane trolley is halted over the requested ship cell with the spreader on a safety distance above target height. There is no remaining pendulum on the load and the skew is adjusted to zero. Aided by cameras, the driver can control the spreader and load. The automation lets the driver relax for a longer part of each travel cycle, thus giving him the opportunity to focus solely on the really important sections of a move where it is possible to save time, such as when operating over the vessel.

The repetitiveness of the automatic cycles ensures efficient and consistent production for hours. A skilled driver may be as fast as or even faster than automation during a single cycle, but as the human operator gets tired or unfocused, mistakes are easily made. These mistakes can cost a lot of time and lead to disturbances in the production.

During the entire development process, the Crane Simulator, an ABB Crane System product used for Driver training, has been used to simulate operation. The remote operation has been tested in a number of different scenarios to verify correct behavior and sufficient information for the driver to control the crane. Using the ABB Simulator gives direct feedback from the operators and ensures optimum functionality.

Tests performed on the crane, as well as in the simulator, prove that automation decreases the difference between skilled and less experienced drivers, thus making operation less vulnerable.

However, all drivers perform better as they get used to working in close cooperation with the system.

Not only do ABB’s automation features increase production, but their consistent and predictive operation also facilitates berth planning, making sure that the whole yard process is smooth and without disturbances. Automatic crane control, in cooperation with remote operation, may be the key to future production – safe, driver-friendly and highly efficient.

ABB Crane Systems’ main mission is the efficient and optimised handling of containers, bulk materials and steel products in ports, power plants and steel mills. The productivity and quality of the installations are improved in a cost-effective way by applying total solutions based on knowledge of the customer’s processes.

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