

## Summary

At bulk terminals transshipment of cargo takes place between ship and terminal. For the transshipment ship loaders and unloaders are used. The loader and unloader are usually driven by operators. Due to healthy regulations, economical costs and scarcity of well-qualified operators, automated loading and unloading is becoming more interesting. Automation in the container handling industry is nowadays common technology, in bulk handling industry it is not. The question is: will automation be a common technology for the bulk handling industry in future?

The general driver for automation is replacing the human. Replacing the human results in less dependency on labour and improves the safety on the terminal. Automation can lead to an increase of production and a decrease in cost.

Ship unloaders can be divided into discontinuous and continuous unloaders. Discontinuous unloaders use a grab to tranship portions of material from the ship to the port side. The discontinuous unloaders have a unloading cycle which causes a discontinuous output flow of bulk material. Continuous unloaders do not have a cycle time and have a continuous output of bulk material. Each type of ship unloader has his own advantages and disadvantages. All ship loaders have the same principle: The bulk material is transported by a conveyor and is dumped into the ship's hold.

An automation systems for a discontinuous unloader is realized by ABB. It uses sensors to scan the ship and material. It can detect the position of the hatch and the profile of the material. The system determines the grab position for the next cycle and plans shipment paths automatically and effectively to ensure an automatic loading operation. An automated system for continuous unloaders is built by ThyssenKrupp Fördertechnik. The system has a teaching and playback method. Manual operation is needed to teach movements. After teaching the system can automatically unload by repeating the movements. With both systems the starting and finishing of the unloading process requires manual operation from the crane cabin. This is a reason why the current automated systems for bulk aren't made with the idea of cost reduction by reducing the number of personal drastically. The cost reduction comes from the performance improvement and by shorting the berthing time of ship.

Neither the discontinuous unloader nor the continuous unloader can be regarded as an all-purpose machine and so there is a market for both automated systems.

A special case in the automation of bulk handling is the Luojing Ore terminal in Shanghai. It is the world's first fully automated bulk cargo terminal and was built in 2007.

There is definitely a future for automation in the bulk handling industry. The described automated systems already show a improvement in performance, even though the systems do not have the perfect solution yet. Automation is still a new technology in the bulk industry and many companies are making development in automated bulk handling. A fully automated bulk industry might not be so far away.