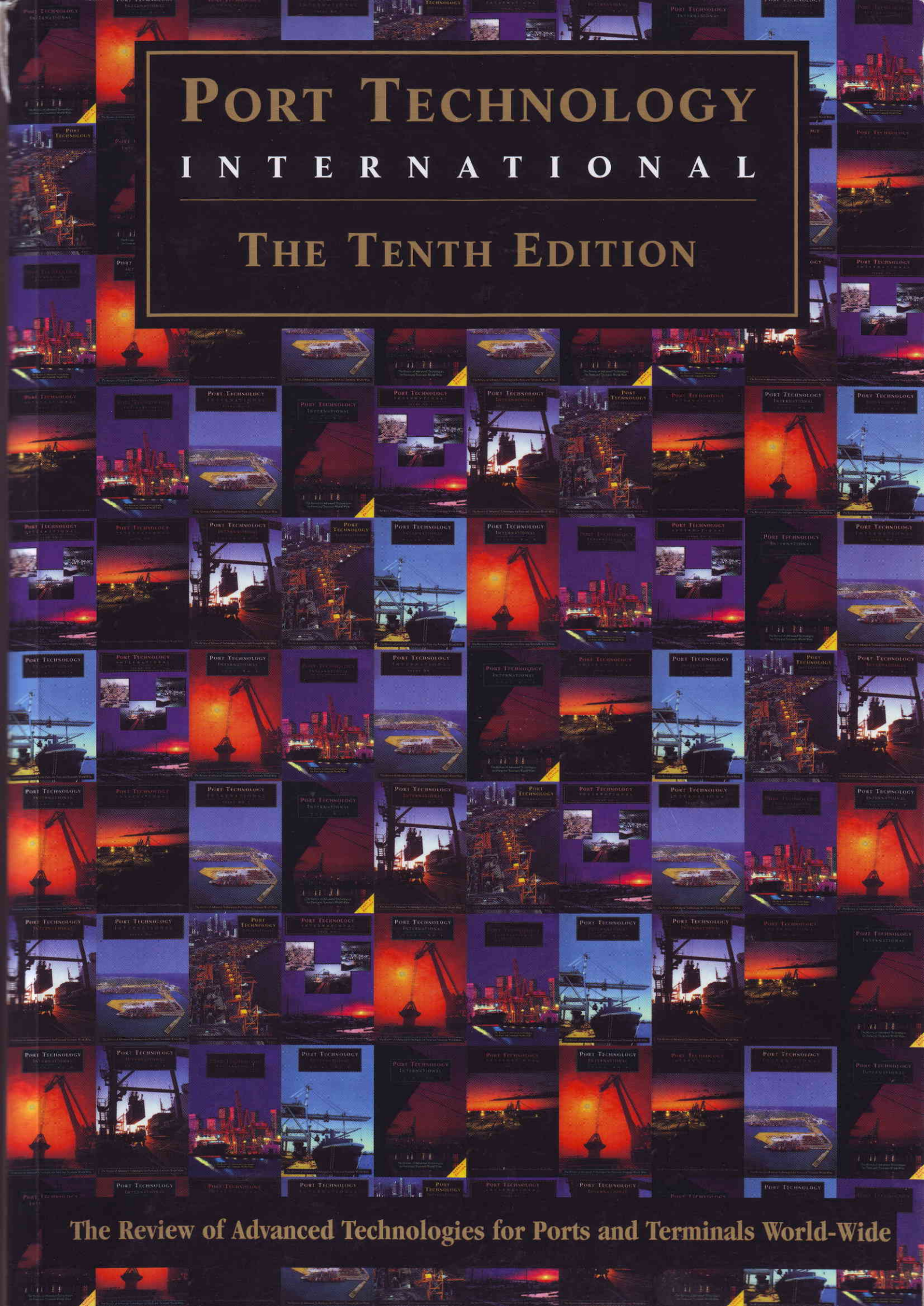
PORT TECHNOLOGY
INTERNATIONAL
THE TENTH EDITION
The Review of Advanced Technologies for Ports and Terminals World-Wide

Contents

Sirrah Sensors Increase Crane Productivity

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Abstract

The continuous increase in container traffic also requires more accurate and more efficient container cranes. Performance can be improved in different ways but the most important factor is to avoid waste of time by decreasing the transfer time of the container from the vessel to the quay.

One important source of saving time is to reduce the time taken for positioning the head block and the spreader top over the container by eliminating any remaining oscillation of this spreader. A good way to reach this objective is the use of intelligent and easy to use sensors for controlling the different movements of the container at the end of the cables: this is called sway, skew and height control. The measurement information given by these sensors can be used by a special software in the computer system (PLC) which is controlling the crane in order to regulate the sway and the twist movement of the hoist.

Consequently crane manufacturers do not need to spend time in crane design and installing sophisticated systems which will need high skilled people specialised in electronics.

The intelligent and integrated sensors from Arck Electronique fully attain this objective: SIRRAH is a stand alone sensor, easy to integrate and requiring no adjustment. It is independent of the type of crane; the only factor to be considered is to choose the right product in the range related to the type of crane, whether ship-to-shore or transfer crane.

SWAY CONTROL

Sway regulation can save time in a very efficient way. It prevents the load swinging at the end of the cables when trying to place it on the trailer chassis or load it on the vessel. Crane drivers are used to reducing the sway by adjusting the trolley speed at the right moment.

A crane driver with long experience and continuous attention to the load can stop the sway as well as any automated crane, thus saving time at any container transfer. Unfortunately, visual fatigue is inevitable after working for a few hours and, associated with a lapse of concentration, it can lead to unnecessary movement and increase of container transfer time.

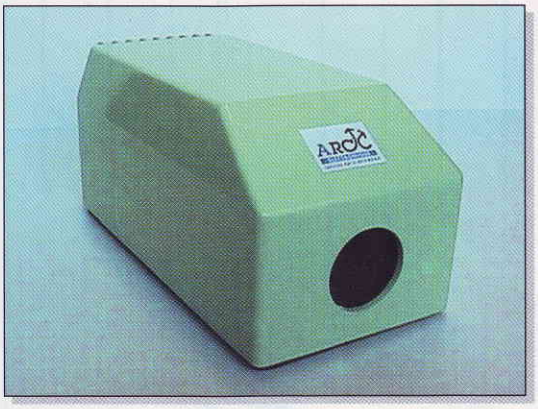

Figure 1
The Sirrah sensor

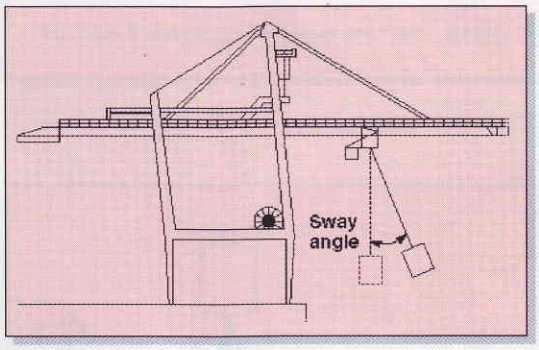

Figure 2 (left)
Sway angle

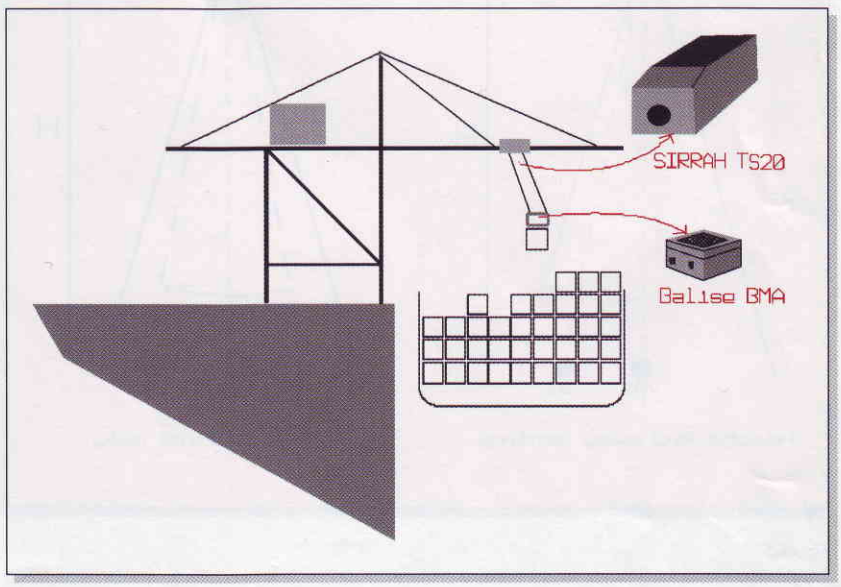

Figure 3 (below)
Sensor positions

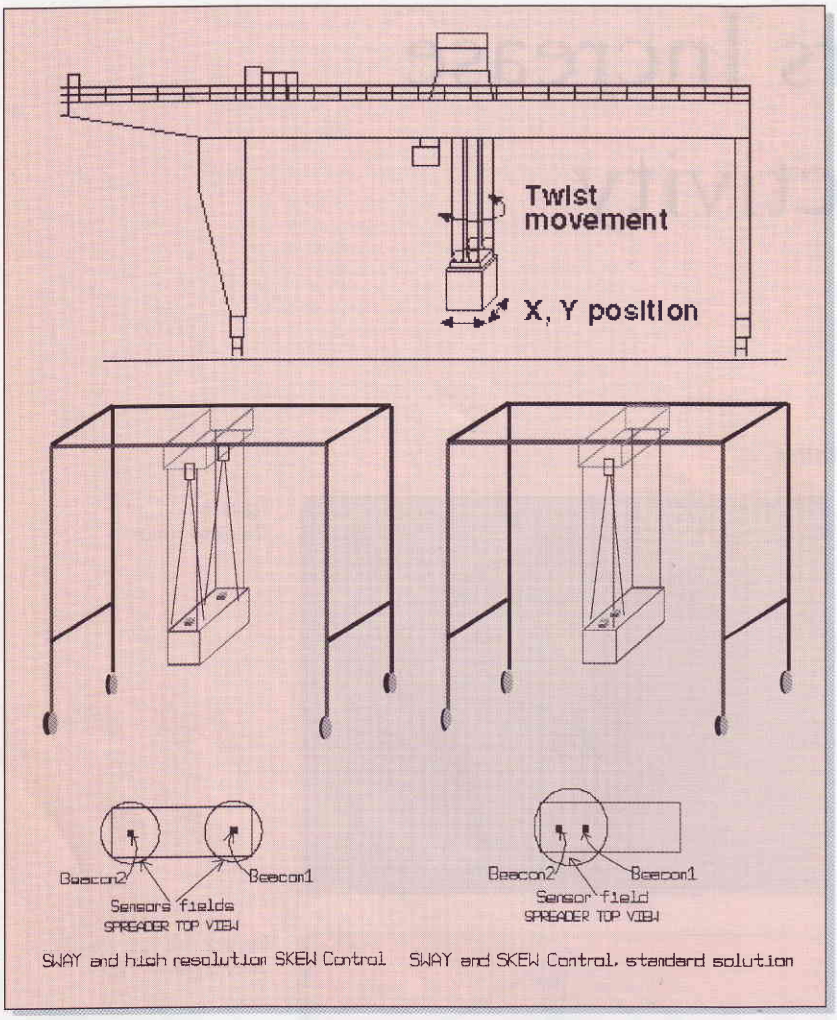

Figure 4
Skew control

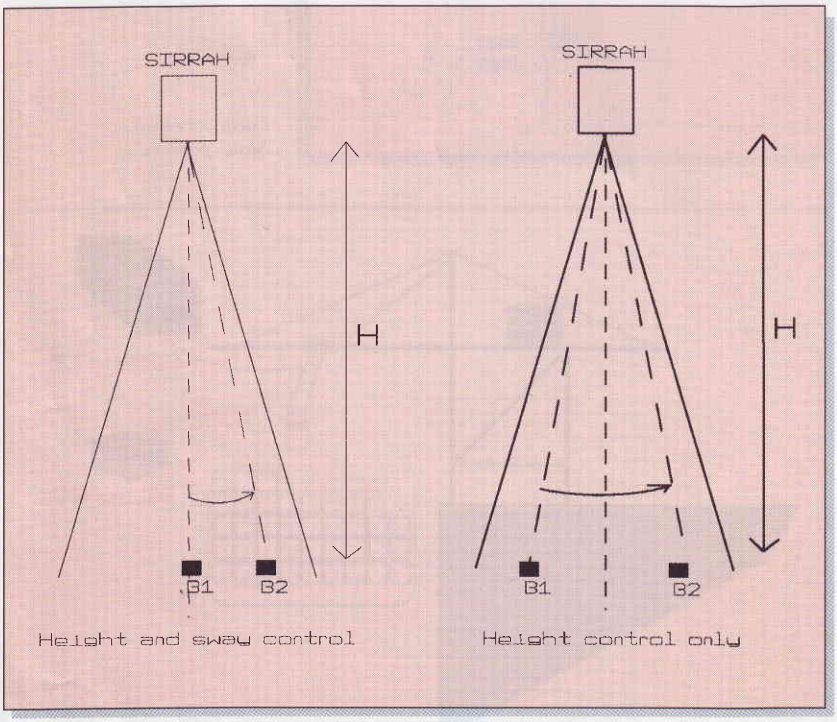

Figure 5
Height measurement

In contrast, an automated sway regulation will do the job 24 hours per day with the same accuracy, independently of the crane driver's skill. Relieved of this tiring job, the crane driver can work with less fatigue and, above all, can concentrate his attention on other tasks, such as logistics and security.

Sway control can function at a higher speed during the trolley movement than the driver can do alone. Secondly, it can be combined with an exact adjustment of the head block height in order to prevent the container damaging the crane's legs or the container stacks.

This last adjustment cannot be done by the crane driver because he is not able to evaluate with accuracy the height of the head block. This optimised trajectory leads to the shortest movement and consequently to a shorter transfer time.

SKEW CONTROL

Some cranes are fitted with an improved hoisting system which offers the possibility of adjusting the orientation of the load around the vertical axis. It is done by moving the crane's wheel positions individually by means of hydraulic power.

Operation is dramatically improved by having an automated skew regulation on the crane, because it will allow a quick response for container unloading and also assure an accurate alignment of the container, especially useful when stacking containers very high with an RTG crane. This allows a very precise alignment of each container in the stack in relation to the others previously stacked and avoids a twisted and unsafe stack.

Skew measurement is provided by adding a second beacon to the sway sensor infrared beacon which works with only one. The position measurement of these two points makes this skew evaluation possible.

HEIGHT MEASUREMENT

To decrease the transfer time, it is necessary to go at full speed straight to the estimated final position. Nowadays the distance between hoist and ground or between hoist and container in the stack is calculated by using the information given by the incremental encoder on the cable's roller. But this information is subject to errors; the ropes can be stretched by the load and counting errors are always possible in the PLC. This makes it necessary to decrease the speed slightly before arriving at the estimated final position.

An alternative is to use an external sensor which measures the absolute value of the height between trolley and hoist. Using this, it is possible to go down at full speed and to stop the hoist at the last moment, reducing the time required but staying in a safe situation.

The same sensor used for sway and skew control is able to evaluate the height by using special integrated software.

FUTURE IMPROVEMENT

There is only one remaining problem in the complete cycle of container transfer; that is the final adjustment of the spreader top to the container before picking up. There is always a remaining oscillation of the spreader, and the spreader is blocking the direct view of the container from the crane driver.

We are preparing the design of a very strong set of small sensors to be integrated inside the spreader and able to give to the PLC accurate instructions on where to move the head block in order to pick up the container.

When evaluated, this last function will solve the problem of wasted time in the container transfer cycle and will make a crane operational 100% of its time in use.

ABOUT THE AUTHOR

Marc Brouant is the managing director of Arck Electronique, a company specialising in infrared technology. He graduated as an Electronics Engineer and Doctor of Science, and is the inventor of SIRRAH sensors and also the owner of corresponding registered patents.

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