

SMART MOVES

KALMAR'S SMARTPATH AND SMARTRAIL AUTOMATION SYSTEMS FOR THE OPTIMISATION OF CONTAINER HANDLING EFFICIENCY RELY ON A ROBUST ONBOARD COMPUTER WITH A VERSATILE SET OF INTERFACES

Productivity in ports and terminals can be greatly improved through equipping the container handling machines with a container position verification system that is integrated with the terminal's Yard Management System. In response to this need, Kalmar Industries has developed the Smartpath system, in close co-operation with control system specialist CC Systems. The onboard system core runs on the CC Pilot XS onboard computer, keeping track of the exact location of each container and machine in near real-time, thereby helping reducing unproductive and unplanned container moves.

Containers, container handling machines and the Yard Management System (YMS) all build a net of information flow, where Smartpath plays a key role. The YMS maintains a database of every container, acting as a back-office system for the harbour operations. Smartpath communicates the actual container location to the YMS, ensuring that the specific container is located where it is supposed to be on the yard. Every movement of a container on the yard is communicated to the YMS, including also unplanned moves, such as shuffling the containers in a stack.

All movement requests are based on commands that the YMS sends to the machines in the yard. Here, the Smartpath concept helps to assign specific tasks to the machine closest to the container to be moved, minimising time spent and energy consumed for each work task. The yard map and the named storage locations are stored in the Smartpath system of each machine. Changes to the yard layout are easily propagated to the machines.

Communication between machine and back-office is handled via a wireless link. The communication link on the machine is also used for ensuring



As a global supplier of cargo handling equipment, Kalmar Industries is pushing the boundaries of efficiency in container ports (Photo: Kalmar)

accurate positioning data. This is accomplished through a differential GPS solution; in essence this means that the positioning data in the GPS receiver is corrected by a differential GPS signal from the terminal's stationary radio transmitters.

The Smartpath concept also provides an external interface that enables remote retrieval of its status. That information can be used by the YMS and maintenance systems.

Robust onboard computing

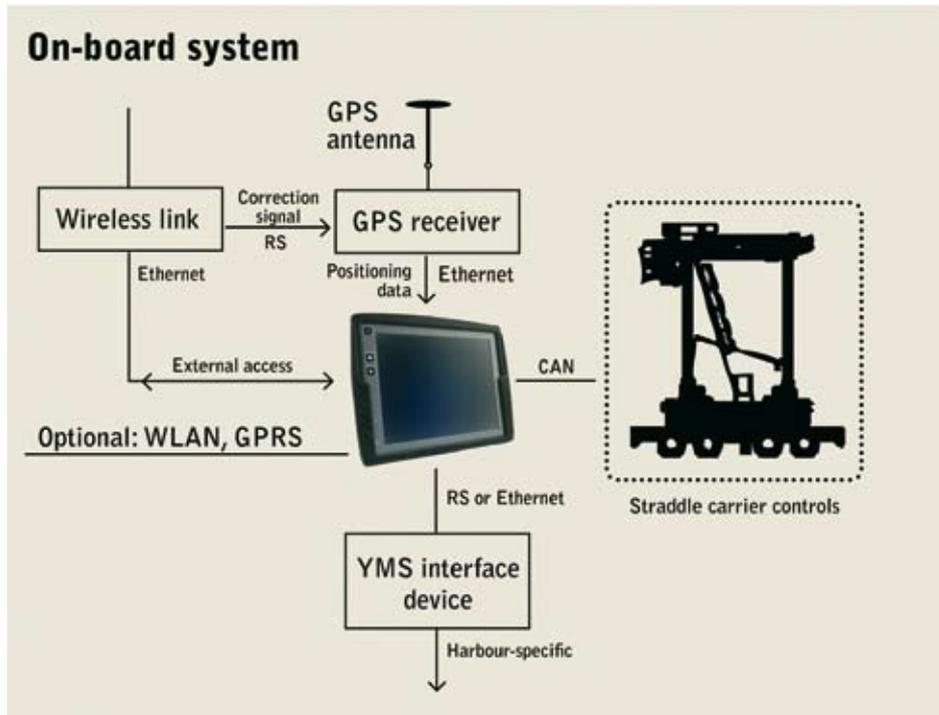
The heart of the Smartpath concept, the onboard system, runs on a CC Pilot XS onboard computer. With its versatile set of interfaces, the created system architecture can reduce the number of components within. Yet, the system scalability remains high, enabling future growth in quantity and quality of information handled. Furthermore,

Smartpath is machine- and manufacturer-independent, enabling Kalmar Industries to provide the same solution to different types of machines for container movement, and also to third-party machines when necessary. This has already been realised in the Smartrail concept, which has pretty much the same hardware and software architecture as Smartpath, while providing additional functionality for machines moving along virtual rails.

In the graphical user interface (GUI), the driver is presented with the movement tasks given by the YMS along with the current position of the machine on the yard layout. The view is constantly updated as the machine moves in the yard. As the driver executes the movement requests, Smartpath automatically confirms all movements performed back to the Yard Management System.



The Smartpath system architecture enables the exact location and movement of individual containers to be optimally controlled



Front and rear views of CC Pilot XS

The CC Pilot XS has an XScale 533 MHz CPU and a graphical SVGA display of 6.5in or 10.4in with touch screen. CC Pilot XS has a proven track record in a large number of applications in demanding industrial conditions. It is used in a variety of roles such as controller, HMI, video screen and as host for auxiliary systems such as diagnostics and remote access. The computer is available also without the display, as a powerful black-box computing module for applications where no GUI is needed.

The operational efficiency of a terminal has a clear effect on the service experienced by the next link in the logistics chain. Smartpath has proven that it reduces container move times, the need for shuffling, and time spent on unplanned actions such as searching for lost containers. It helps keep the focus on planned and controlled work.

All this has numerous positive side-effects including, but not

limited to, improved safety in the workplace, and even – over time – lower insurance fees. In addition, the field data that is pushed to the YMS is very accurate, which in turn increases the value of back-office operations. The bottom line is increased productivity in container terminals – through smart moves.

Advanced machine controls

There is a clear trend in the industrial vehicle business towards advanced onboard systems. These systems often incorporate a powerful onboard computer that can run the value-adding software applications and provide the operator with an easy-to-use Human Machine Interface.

Smartpath is another example of such a system, made possible through CC Systems' products and strong engineering support capability. The company has a long track record of supporting companies such as Metso Minerals, John Deere Forestry, Atlas Copco and Bombardier Transportation with control system solutions that improve machine efficiency and reliability. **ivT**

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