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Ship Side Operational Efficiency

Why Make it Complicated or Expensive?

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With ever increasing vessel sizes and pressure to shorten turnaround times, productivity of moves over the quay is concerning terminal operators and driving a growing need to make ship-side operations more productive. However, this can seem a daunting task requiring expensive and complex improvements to a number of interconnected processes. We will explore an area where typically there are easy to achieve improvements – the interchange between the quay crane and the prime mover, and review how, by using industry proven technology with innovative approaches to positioning systems, it is possible to achieve significant crane cycle improvements with a modest outlay.

Introduction

One of the largest areas of improvement any terminal operator can make is the efficient utilisation of equipment and labour assets, and this is no more self-evident than in the ship to shore operation. With ever increasing vessel sizes, productivity in moves over the quay is of greater concern for terminal operators, which is driving a growing need to make ship-side operations more effective.

Clearly, improving ship-side operational effectiveness can be quite a wide subject as there are many links in the overall ship-side process chain that could receive attention with a view to improvement. However, various studies and reported statistics have concluded there is significant potential for improving quay crane performance by reducing the time it takes in container positioning at the changeover point between the crane and prime mover or truck. The concept behind improving this is simple – to position the trailer correctly before the quay crane spreader arrives so that the crane does not have to wait while the truck driver shuffles the trailer into the correct position.

Our goal in solving this issue was to provide a straightforward way to deliver the highest impact to efficiency, that it should be easy to implement and be very low in cost. For this reason we looked at introducing a Trailer Positioning System with what we believe is the lowest Total Cost of Ownership in this industry.

The Business Case for a Low Cost Trailer Positioning System

Some studies conclude that as much as half a crane's cycle time is spent - or wasted - on load positioning. When it comes to positioning the spreader over the truck chassis, we prefer to take a more conservative view and have concluded that by shaving a mere 6 seconds off each ship load movement cycle, taking a typical quay crane workload of 35 gross moves per hour (GMPH), the average GMPH will move from 35 to over 37, resulting in a productivity improvement of almost 6%. This improvement is the result of reducing the transfer time between the trailer and crane, by eliminating shuffling.

The return on Investment (ROI) this represents will depend upon the running costs of the crane and its utilisation, and this will of course vary from terminal to terminal. However, depending on the value of these two factors, the 6% increase in productivity represents an ROI of between just 3 weeks and 5 months, for a low-cost positioning system.

The Challenges for a Low Cost Trailer Positioning System

Our challenge was to make this system provide full functionality and yet have a really low total cost of ownership. To achieve this there were some key attributes of the system that were necessary:

1. The system should require a very low capital spend to ensure a fast ROI. The challenge here was to use industry proven technology but in new, innovative ways.
2. It should be easy to install (i.e. require no specialist engineering skills) whilst being non-invasive to the crane superstructure and of course it should require no equipment on any of the trucks. Once installed, the set up should be kept simple by not requiring any manual operation or settings; the system must be ready for use as soon as it is installed and switched on.

3. Once the system is operational it must remain consistently accurate and carry a low maintenance overhead, with the maintenance department being able to maintain the system without any special tools or knowhow.

Additionally there were a set of operational challenges to ensure that as well as being low cost, this system would be a complete solution, and these were as follows:

1. The system should support ship load (full trailers) and discharge (empty trailers) and should do this for both single and multiple trailer loads behind the truck.
2. The system should cater for all common container sizes: 20', 40', 45' and twin lift 20'.
4. As there are a number of lanes under the quay crane, the system should be able to work in any lane and must recognise trailers approaching from either direction.
5. The system should be intuitive for truck drivers and require no special training.

System operation

As previously mentioned, a goal of this system is that it should be completely automatic from switch-on and therefore have no special operational considerations. From the perspective of the truck driver, it should be intuitive to use and apart from some initial guidance, no special training is necessary. This is especially important when a terminal uses drivers from a pool operating in the port, where there may not be the familiarity of permanently assigned staff.

A controller is installed on the quay crane to manage an array of sensors. There are two sets of sensors, the first is required to detect 20', twin-lift 20', 40' or 45' containers (see Figure 1) and the second set detects empty trailers using reflectors mounted underneath the trailer bed. The controller also has an LED indicator mounted at each end of the sill beam (see Figures 2 & 3) and uses this to indicate to the driver he is in the vicinity of the stop position (amber directional indicator) and that he should stop (a red indicator).

Figure 1 Prime Mover Stopped in the Correct location

The system will work in any lane under the quay crane and the truck may approach from either direction. However, it is normal safe practice to allocate a specific lane to a crane and then ensure trucks approach from the same direction (doors to the rear) as this effectively creates a one way system under all the cranes with just a few exceptions.

Instructions are provided to the truck driver via the LED matrix. As a truck approaches, the system will detect whether the trailer is loaded. For a loaded trailer, the system will determine the profile of the load (single/twin 20', 40' or 45') and provide the

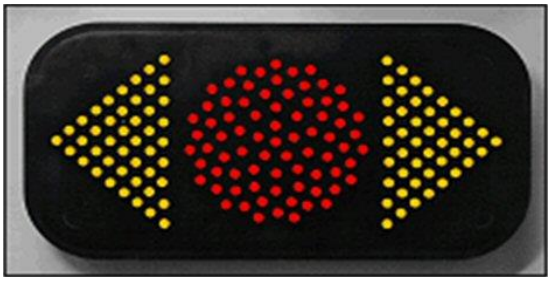

Figure 2 LED Matrix Showing Stop, Forward and Reverse

indications to suite the load detected on the chassis. As the driver approaches the stop position an amber indicator is used to indicate he should slow down and continue forward, and as he reaches the stop position the indicator will change to red. If however he overshoots then he will see another orange indicator showing that he should back-up to the stop position. For an empty trailer, the system will show the same indications for the front or rear trailer positions for a 20' single container, or a centred location for 20' twinlift, 40' or 45' containers.

Summary

Increasing container ship sizes and the pressures to turnaround ships in less time has the potential to create a bottleneck at the berth. Ship side operational efficiency is therefore a key concern for most terminal operators. The TPS is built to be an easy decision for the terminal to provide a solution to delivering a significant improvement to the quay crane cycle time. The system can be considered a stand-alone solution or it will also form part of an overall strategy to help enable other improvements, such as the implementation of semi-automated quay cranes that require the trailer to be pre-positioned to maximise the effect of the automation.

We are also introducing a version for RTG's which will operate under the same principles and has the advantage that where twin lifts are required the spreader gap settings will become the same between the Quay Crane and the RTG.

Allan Jones

Allan Jones is the Head of Business Development for International Terminal Solutions. In this role he is leading the business development strategy for the company and helping expand an already successful base of customers in the maritime and logistics industries. Allan has extensive sales and marketing experience in the Information Technology industry, backed up by technical and consulting roles from the first 10 years of his career. After helping list Simware, a Canadian software company on the on the NASDAQ he became their Vice President Worldwide Operations. He has also subsequently held the position of Vice President, eSolutions for Netmanage and Strategic Business Director, Logistics for the Jade Software Corporation, where he created an international base of maritime customers.

About ITS

ITS is a privately owned company situated at the Loughborough Technology Centre in the UK. Working with the best known container terminals worldwide, ITS has an impressive list of completed projects and satisfied clients. ITS supplies G-POS, a GPS system for tracking containers and handling equipment; E-SMART an equipment status visualisation, safety and KPI tool, and other optimisation, identification, positioning and security systems.

With a depth of experience in integrating RFID and GPS technologies into business applications, ITS can help customers explore and implement innovative new ways to use this technology to gain competitive advantage.