How to reduce spreader damage

DP World Canada in Vancouver, BC, is having success reducing crane damage with Maxview Smart Landing from TM GE

There is a wide variety of "semi-automation" tools for quay crane control on the market, but many terminals do not see value in these so-called driver assisting tools. Experience with anti-sway systems, in particular, has often been that drivers do not like them and switch them off.

Drivers are most likely to resist semi-automated control where it causes the crane to behave in an unpredictable or "unproductive" way. A system that slows the trolley down while software calculates the position of an obstacle, for example, and then accelerates again when no danger is confirmed is often not welcomed.

A smarter way

Earlier this year TM GE Automation Systems launched a ship profile and hoist control system called Maxview Smart Landing (MSL). It combines automation with manual control to address a key cause of spreader related crane down-time by preventing high speed, high impact spreader landings.

MSL is part of the Maxview family of TM GE's crane guidance systems that uses time-of-flight laser radar to measure and profile loads and landing targets with a degree of accuracy necessary to operate a crane automatically. A key difference between Maxview and other ship profile systems is that Maxview uses the same scanner to detect the container profile and the suspended load.

Other systems use an open loop system for load management, with one system to profile the containers and another to calculate the position of the load relative to the trolley. The position of the load relative to the profile is calculated by cross referencing.

TM GE takes position information from one sensor to get the position of the spreader in two degrees of freedom relative to the trolley while profiling the stack at the same time. This allows the software to compare directly the positions without having to calibrate between two sets of sensors and avoids any delay in the crane's response to the driver's command from the joystick.

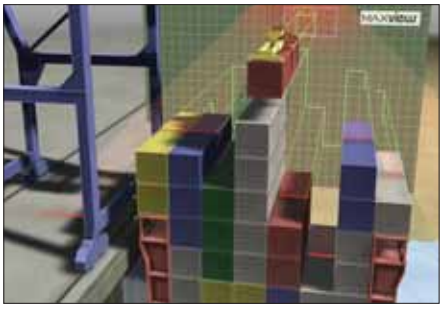
Maxview was developed for automated stacking and material handling cranes, but until recently it could not be applied in the same form to a quay crane because the range of the laser sensors was insufficient. Germany-based Sick now offers the LD-LRS series, which incorporates a lens to extend the range of the sensor to over 80m, sufficient to measure and profile from the crane trolley to the bottom of the vessel, and improve its ability to "see" dark objects.

The laser scanners continually measure and update the profile of the containers and the vessel while tracking the position of the spreader as it moves. Using the data the Maxview software creates a "slowdown envelope" around the spreader and interfaces with the crane drive to limit the hoist or trolley speed when a container or the bottom of the ship is detected within that envelope.

Gentle touch

MSL has options for regulating crane trolley and hoist lowering speeds to prevent collisions and automatically adjusting the load speed to a pre-set value as the spreader approaches a landing point. This can have a significant effect on crane productivity when a driver is lowering a container deep into a vessel.

Instead of relying on his "feel" for the bottom of the ship or the position of the container underneath the load the driver can lower the spreader at "full stick" and MSL will reduce the speed and "inch" the load down to a soft landing automatically. Importantly the crane driver still feels in control and the transition between manual "command" and automated "control" is seamless.



Avoid a hard landing - two views of Maxview Smart Landing

DP World Canada installed the first MSL system on a new ZPMC crane this year. Crane superintendent Andy Green said spreader damage from high speed landings where drivers misjudge cell depth had been an ongoing problem and TM GE, which supplied the drives for all the new cranes at the terminal, had an attractive solution.

DPW was able to persuade crane drivers to accept the system and it is "on" by default. Drivers can switch it off, but Green says they are doing this only on rare occasions when they are stowing in vessels without cell guides. For trolley position, however, MSL is "off" by default and the drivers must turn it on. Typically they do so only when they are working behind a deck stack of four or more containers.

Green says MLS has been very beneficial in reducing spreader damage and related downtime. DPW has not seen a significant increase in crane moves per hour, but crane efficiency has improved because of a reduction in crane downtime against the vessel. The MLS display is available to drivers on the CMS monitor but, as is typical in the port environment, most drivers do not use it.

In fact, said Green, "most drivers do not know the system is operating; this is a good thing and indicates to us that the system is not affecting the drivers' ability to operate." Data collected to date show that the number of spreader landings where the hoist lowering speed exceeds that set in the MSL has fallen by 96.6% since the system was installed.

Remove "off" option?

After an incident earlier this year DPW may remove the option for the drivers to switch MSL off. A routine post-operation inspection found a crane with a severely damaged spreader cable. A review of the Maxview CMS playback showed that MSL had been turned off and the driver landed the spreader in the cell at full speed.

As well as being useful for reviewing driver performance, this information allows DP World Canada to differentiate between operational damages and maintenance costs for budgetary purposes.

With the cost of a MSL system around US$75,000 per crane (depending on the retrofit requirements), the ROI equation is simple. "The addition of the Smart Landing system to our other cranes is a priority," added Green. Washington United Terminals (Hyundai MM) in Tacoma, US will also install MSL on two new ZPMC cranes.

Road to automation?

While ASCs are now common, combining automation and quay cranes remains much more difficult. There are many load control, skew control, stack profiling, straddle/chassis alignment and automatic spreader landing systems on the market that, taken together, can completely automate the quay crane cycle.

Highly experienced drive control and automation specialists such as ABB argue that quayside gantry crane automation is not far off, but operators may take some convincing. The quayside environment is highly dynamic. Cranes work in close proximity to people and the "exceptions" that would necessarily trigger an automated system to shut the crane down are varied and frequent.

Some leading operators take an "all or nothing" approach to semi-automation, the rationale being that unless a system can completely eliminate a driver it is an unwanted cost. Privately, however, some acknowledge that the push towards greater quay crane automation is likely to come from health and safety in initiatives relating to workplace safety.

It has long been known that the posture required to control a crane presents significant ergonomic challenges. Systems such as MSL could be the key to getting crane drivers accustomed to working with automation in a way that would ease the transition to full remote controlled operation from, say, a cab safely positioned on a waterside crane leg, out of the danger zone suspended from the moving trolley 100-150ft above the ship's deck.

But the remote cab may struggle for driver acceptance. This seems to be the case, for example, with an ABB test cab on the leg of one crane in operation with Hutchison in Panama.

The remote operation works, but apparently drivers do not like it. From TM GE's perspective, its system offers something that prevents hard landings without drivers even knowing it's on. ❑