![TMEIC logo - We drive industry]

Prevent toppled containers in rubber tire gantry crane operations

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"For yard cranes, 82% of the cost of insurance claims is caused by stack collisions" says Laurence Jones, Director of Global Risk for specialty maritime and transport industry insurer TT Club. The problem is simply a spreader or a container under the spreader colliding with the stack. The resulting damage and/or injuries caused by such accidents amounted to "339 claims costing US$42m over the last 7 years." According to Mr. Jones, "If you haven't [had such an accident] you either have *stack profiling* or you are lucky."

Stack topples are indeed a problem during container yard operations, causing damage to equipment and in some cases injury to humans. Additionally, the productivity of the yard is affected, and the resulting operational disruption is felt throughout the terminal.
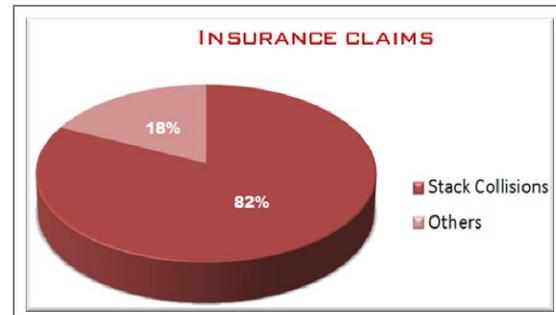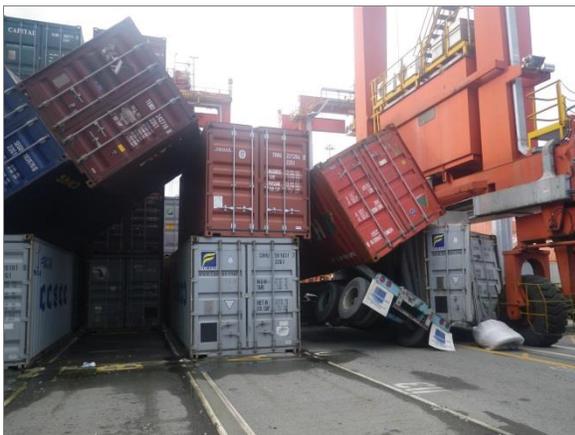

Figure 1. Collisions – major share of insurance claims

The Maxview Smart Move™ system is an innovative solution for this problem. This system acts as an extra set of eyes for the machine operator. Developed by TMEIC, the Maxview Smart Move system protects the crane spreader as well as the container load and stacks, thereby preventing the major source of costly accidents associated with Rubber Tire Gantry Cranes (RTGs).

Helping eyes

Terminal operators and equipment suppliers have explored various sensor vision technologies over the years. An effective and proven technology is LIDAR, or *laser radar*. This optical remote sensing technology measures properties of reflected infrared laser light to dynamically determine position of containers and spreader (loaded or unloaded).

The Maxview Smart Move system utilizes an industrial-grade laser scanner and sophisticated Maxview® system software

modules to anticipate the movements of the spreader in flight as compared to the stack profile so as to prevent contact between the two.

The sensor is a Class 1 (eye-safe) laser, with an environmental rating of IP67, built to withstand and operate in the harshest outdoor weather conditions..

Avoiding collision

As the crane trolley passes over the container stack, the Maxview Smart Move™ system records a profile of the containers below, as well as other obstacles that may be present. The system also tracks spreader position relative to the stack profile.

These measurements, along with the trolley and hoist master switch control inputs from the operator determines the safe operating envelope for the spreader, as depicted by the blue dashed box in Figure 2.
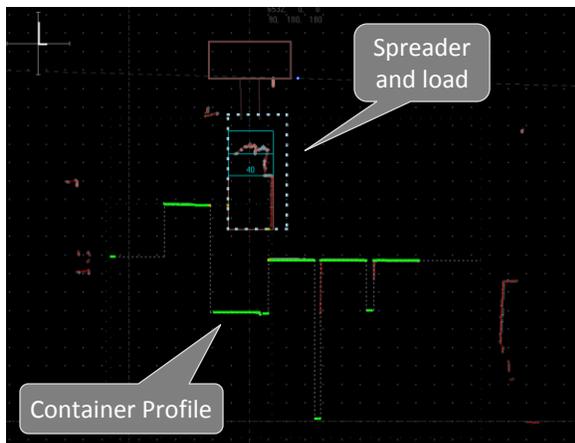

Figure 2. Maxview Smart Move™ measurements

It is important to note that the operator has complete control over his or her actions up to the moment that the system determines a collision to be imminent. Only then will the system moderate the motions of the load to avoid impact, as the operator adjusts to take advantage of the assist.

The system is designed to be active in the background at all times but without intervention until collision avoidance requires it. One can liken this to the reverse motion sensors available on many modern automobiles: operation is only restricted when a collision is imminent.

The operator is thus able to move with more confidence in every motion, as he knows the system will prevent him from causing a box collision based accident.

Operational Results

DP World Vancouver became highly interested in a technical solution to containers toppling when their records revealed that the total cost of toppled boxes in their yard surpassed half a million dollars in the last five years – not a rare figure among the most active terminals around the world. So the terminal decided to try the Maxview Smart Move™ system in two of their 19 RTG cranes.

In the short time in operation, the Maxview® system is already showing benefits, even beyond expectations. For example, normal yard stacking practice in most RTG operations is to lower the edges of the stacks on both sides to reduce the potential box topple. This is taken one step lower on the truck lane side of the stack, as injury potential is higher on this side.

With the Maxview Smart Move system in place preventing box topples from occurring, the stacks can be raised by at least one box on both sides, reducing the 'rounding' of the stack (Figure 3).

For terminal operators with limited ability to expand stacking capacity, this is an increase of between 5% and 10% without any capital investment.
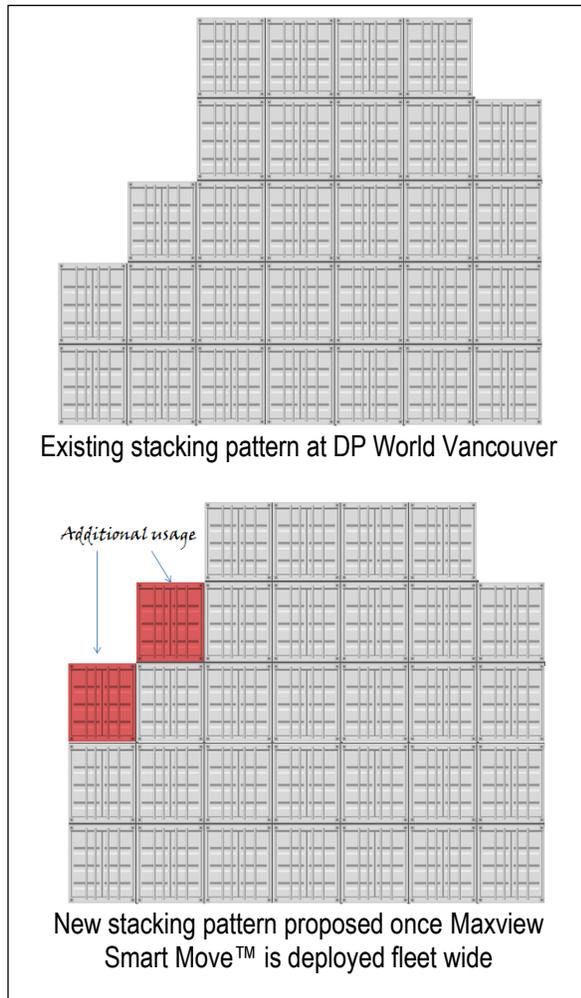
Existing stacking pattern at DP World Vancouver

Additional usage

New stacking pattern proposed once Maxview Smart Move™ is deployed fleet wide

Figure 3. Yard capacity utilization can be improved

At the end of the rope

Average hoist rope life for an RTG is 6,300 hoisting hours, which is almost 2.5 years in operation. Annually almost half of the RTG cranes require a hoist rope change, at an average cost of $16,000 per set, not including downtime for the machine.

About 17% of rope changes are considered premature due to the rope snagging on adjacent box edges, causing excess wear and tear. This occurs in slack rope conditions when a spreader is being lowered and the rope bellies out too far after landing.

Personnel at DP World Vancouver have noticed that the Maxview Smart Move system prevents excess slack rope in spreader landings, as the system also manages a soft landing in each operation. The operator is never caught off guard by a box landing hard and paying out excess rope. This translates into potential savings for the terminal of up to $25,000 annually.

Protecting Customer Property

As noted earlier, around 80% of the insurance costs in a container yard are associated with stack collisions. The Maxview Smart Move system prevents stack collisions, thus reducing cargo and equipment damage, and insurance costs while creating a safer working environment for equipment operators.

Injuries associated with stack collisions are also costly in both human and financial terms. By preventing collisions, the Maxview Smart Move system reduces the risk of related injuries and damage to terminal assets.

Conclusion

Container terminals worldwide are expected to work with high productivity levels and at a lower cost per TEU. In this environment accidents happen. With the advent of container stack profiling and collision prevention systems such as the Maxview Smart Move™ system, it is now possible to operate RTG or RMG cranes with improved safety and profits (*safe productivity*) for the terminal operator.
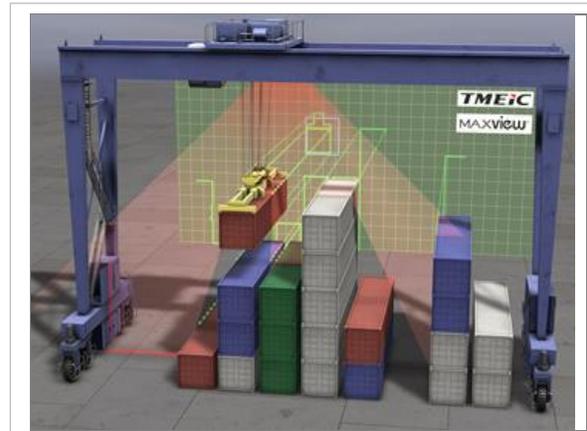

Figure 4. Maxview Smart Move™ in action

ABOUT THE AUTHORS

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ABOUT THE COMPANY

TMEIC is a global joint venture between industry leaders Toshiba and Mitsubishi Electric, formed to focus their combined product and application expertise on the industrial drive systems business. With a large staff of industry leading application experts, TMEIC has a long history of successful crane automation system installations at nearly every port around the world. As the global leader in Crane Automation solutions, from simple drive upgrades to fully automated cranes, TMEIC is committed to "Delivering Customer Success, every Project, Every Time".

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