

SIBRE – SNAG LOAD PROTECTION AND GUARDIAN

combines Snag Load Protection and its add-on Guardian, to deliver the world's first preventive protection system against snag-load events

the challenge

Port terminals operate in some of the most demanding and risk-intensive environments in the industrial sector, where Ship-to-Shore (STS) cranes routinely handle heavy loads under strict time pressures. One of the most critical safety challenges is the occurrence of snag-load events - situations where a container becomes unintentionally caught during hoisting or lowering. These events generate extreme dynamic forces within milliseconds, causing structural damage, sudden crane stoppages, wire-rope failures, and severe risks to personnel both on deck and beneath the crane. Traditional detection technologies - based on load cells or hydraulic pressure - are reactive, detecting anomalies only after harmful tension has already propagated through the hoisting system.



snagged load



impact with vessel cell guides

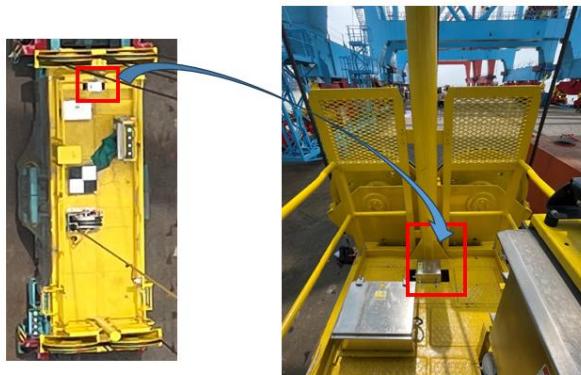
the innovation

SIBRE innovation combines Snag Load Protection (SLP) and its add-on Guardian, establishing a groundbreaking safety ecosystem for Ship-to-Shore cranes. Together, these technologies deliver the world's first preventive protection system against snag-load events - one of the most damaging and high-risk incidents in port operations.

SLP leverages a high-precision Inertial Measurement Unit (IMU) installed directly on the headblock, capturing real-time acceleration and angular speed data at the source of potential entanglement. Advanced machine-learning algorithms, trained on thousands of hours of crane operations and real collision scenarios, interpret this data to detect hazardous motion patterns before dangerous tension occurs.

SLP • IMU sensor

On the headblock



When a risk is identified, before snags occurs, SLP automatically ultra-fast brake activation within milliseconds, preventing structural damage, wire-rope failures, and risks to personnel. This proactive approach represents a fundamental shift from traditional reactive technologies.

The Guardian add-on elevates this innovation further by providing continuous IIoT-based monitoring of crane behaviour. It introduces a new KPI—Motion Intensity—which quantifies the softness or abruptness of crane movements, enabling predictive maintenance, operator performance analysis, and improved operational efficiency. Guardian also detects 360° impacts and automatically synchronizes video footage, offering immediate situational awareness and data-driven decision-making.

Together, SLP and its add-on Guardian create a comprehensive, intelligent safety layer that enhances crane resilience, significantly reduces incidents, supports automation, and

improves productivity while extending the lifespan of critical components. This holistic approach positions the system as a leading innovation shaping the future of safe and efficient port operations.

SLP · SLP MH service fast brakes



MH SERVICE BRAKES
USB5-V with T-SF-SLP



SLP · Control Panel

Inside e-room



how it was implemented

It has been successfully deployed on more than 50 STS cranes at leading container operators worldwide, including APMT, TIL, DP World, PSA, SSA Marine, and Evergreen, as well as on cranes from OEMs such as ZPMC, Konecranes, Liebherr, Kocks, Paceco, and Mitsubishi.

The system has been integrated across various crane architectures, interfacing seamlessly with crane PLCs from OEMs such as Siemens, ABB, TMEIC and Toshiba. It supports both fibre optic and copper-based reeling cable technologies and is compatible with all crane configurations, including single-hoist, dual-hoist tandem, and single-hoist tandem setups.



SLP during test

result

Initially, the system underwent a two-year data capture phase, collecting inertial movement data from the headblock to develop robust algorithms for the early detection of snag-load events and impacts. Subsequently, the first unit (as POC), it was subjected to rigorous testing by the end user, ensuring not only accurate detection of true positives and true negatives but also minimizing to nearly 0% the false positives and false negatives.

Its deployment across multiple operators and OEMs further validates its effectiveness and reliability. Positive results are also reflected in the inclusion of the system in the specifications for new cranes by several operators.

The system has demonstrated the ability to prevent approximately 90% of snag-load incidents, while significantly mitigating the impact of the remaining cases on both vessels and cranes, as well as reducing operational downtime.

Additionally, by preventing or minimizing the stress caused by snag-load events, the system has been shown to extend the service life of crane components, increasing lifting cable longevity by over 30%.

Finally, operators have calculated a return on investment of less than two years, with some reporting immediate cost savings due to the avoidance of expenses associated with just one snag-load incident.

conclusion

SLP and its add-on Guardian represent a transformative advancement in crane safety, operational efficiency, and predictive maintenance. Their combined capability to detect and prevent snag-load events before harmful tension occurs sets a new industry benchmark, shifting port operations from reactive protection to true anticipation and prevention.

The system has already demonstrated exceptional robustness and scalability. It has been successfully deployed on more than 50 STS cranes across major global operators—including APMT, TIL, DP World, PSA, SSA Marine, and Evergreen—and integrated into cranes from leading OEMs such as ZPMC, Konecranes, Liebherr, Kocks, Paceco, and Mitsubishi.

Following a two-year data capture phase and rigorous end-user validation, SLP achieved near-zero false positives and false negatives. Field results confirm its ability to prevent approximately 90% of snag-load incidents and significantly mitigate the remaining cases—reducing vessel and crane damage, minimizing downtime, and extending component life, including a 30% increase in wire-rope longevity.

In summary, SLP and Guardian deliver a proven, scalable, and future-ready safety innovation that materially enhances crane resilience, operator protection, and terminal productivity—setting a new global standard for safe and intelligent port operations.

LINK: <https://www.sibre.de/en/slp-snag-load-protection/>



SIBRE team with end user team during commissioning



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