

SIBRE: TRANSFORMING PORT OPERATIONS WITH INNOVATIVE TECHNOLOGY



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In today's era of Industry 4.0, SIBRE stands at the forefront of designing, manufacturing, and distributing industrial brake systems and transmission components. With a focus on safety, reliability, and sustainability, SIBRE has embraced cutting-edge technologies such as inertial sensors, cloud computing, 5G, computer vision, Radio Frequency Identification (RFID), Industrial Internet of Things (IIoT), and recently AI. This article explores the positive impact of SIBRE's SLP system, along with its accompanying technologies, revolutionizing the port sector.

ENHANCING INDUSTRIAL EFFICIENCY AND SAFETY WITH IMU SENSORS IN THE MARITIME SECTOR:

In recent years, the integration of Inertial Measurement Units (IMUs) into various industrial applications has heralded a significant transformation in safety, productivity, and efficiency. This transformation is especially prominent in the maritime sector, where IMUs, coupled with advanced technologies like machine learning, are revolutionizing the way operations are conducted. The marriage of IMU sensors and machine learning offers numerous advantages that not only enhance operational processes but also extend the lifespan of critical machinery components.

IMU sensors are instrumental in providing real-time data on an object's orientation, acceleration, and angular velocity. This data is invaluable in industrial settings, particularly in the maritime sector, where safety and efficiency are paramount. By harnessing the

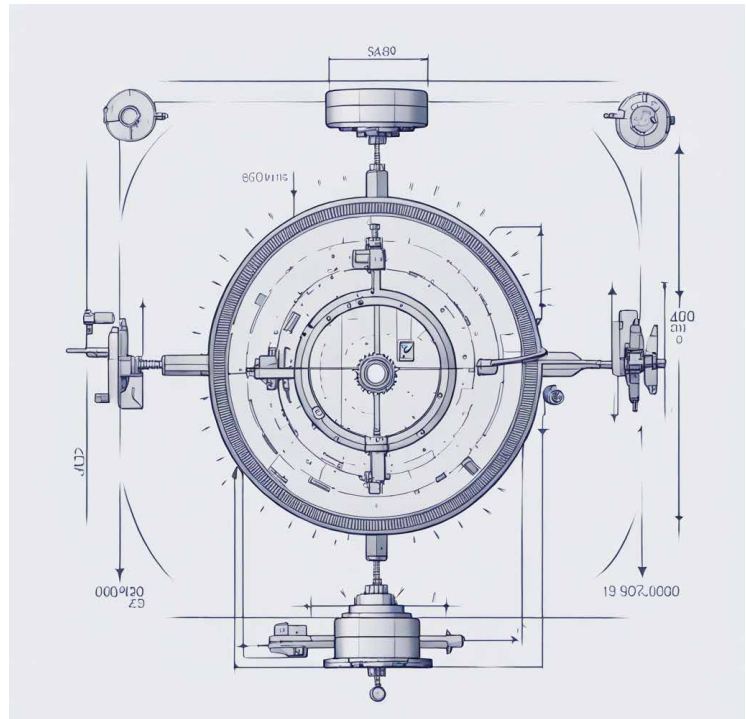


FIGURE 1.
Creation by AI using
stable diffusion XL

power of IMU sensors, companies can reap a multitude of benefits.

First and foremost, IMU sensors contribute to a substantial increase in safety. By continuously monitoring the movements and vibrations of machinery and equipment, these sensors can quickly detect irregularities or unexpected deviations from the norm. This early warning system significantly reduces the risk of accidents and potential injuries to personnel, making industrial operations safer for everyone involved.

Furthermore, the implementation of IMUs in conjunction with machine learning algorithms has proven to be a game-changer in predictive maintenance. Rather

than relying on fixed maintenance schedules, which can be costly and time-consuming, industries can now predict when machinery components will require attention. This leads to a substantial reduction in machine downtime and maintenance costs, resulting in enhanced productivity and operational efficiency.

The maritime sector, including ports and shipping terminals, has experienced a remarkable transformation in the past decade. With the incorporation of IMU sensors and machine learning, the sector has witnessed a 22 per cent growth in emergency applications over the last five years, as reported by the "High-End Inertial Systems

Market and Technology Report 2017" by Yole Développement (November 2017). This growth demonstrates the increasing importance of IMU sensors in safeguarding operations in high-risk environments.

However, there is still immense potential in the port and naval sectors, where the growth rate remains at 5 per cent. This is primarily due to the complexity of maritime operations and the need for specialized solutions. Nevertheless, the market in this segment is valued at an astonishing €900 million (\$965 million), indicating a substantial opportunity for further expansion.

One notable success story in the maritime sector is the company SIBRE, which has been utilizing IMU sensors for over six years in Ship-to-Shore (STS) cranes. SIBRE's application of IMU sensors has been instrumental in preventing equipment snags and detecting impacts during crane operations, providing insights into crane efficiency like never before.

SIBRE's innovation has introduced a new Key Performance Indicator (KPI) known as "crane motion intensity". This metric has revolutionized preventative and predictive maintenance for cranes, offering a cross-functional approach that benefits both maintenance teams and operations. The integration of IMU sensors and machine learning has added significant value to the Terminal Operating System (TOS), enabling more informed decision-making and optimizing operational processes.

It is beyond question that the incorporation of IMU sensors and



machine learning in the maritime sector will lead to a profound transformation, as this article will elucidate. These technologies enhance safety, productivity, and operational efficiency, while also extending the life of machinery components. The growth in emergency applications, as well as the success of pioneers like SIBRE, underscores the immense potential for further advancements in this field. With ongoing innovation and adoption, the maritime industry is poised for a safer, more efficient, and highly competitive future.

THE POWER OF SLP

SLP, short for Snag Load Protection, is an anti-snag system for STS container cranes. It utilizes an inertial sensor installed at the source of entanglement, the head block, to detect potential snags before they occur. By providing early detection, the SLP system

FIGURE 2. SIBRE SLP. First pre-snag system by IMU technology

allows for timely intervention, preventing or minimizing incidents that could lead to damage. Unlike reactive systems dependent on chain reactions caused by snags, SLP is a proactive and preventive solution. To draw a comparison, it's similar to how proximity sensors in automobiles prevent collisions, as opposed to airbags that react after impact. SLP's distinguishing feature is its use of an inertial sensor (IMU), which enables rapid response, precision, and reliability by leveraging advanced algorithms trained on thousands of hours of crane operations and real collisions. Notably, this technology has been utilized by Apple in their latest Apple Watch for accident detection, showcasing its effectiveness.

SLP offers several key features that enhance crane operations and safety. It provides preventive protection against snags during both hoisting and lowering

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FIGURE 3.
SIBRE Guardian.
Impact detection by
IMU technology

operations, integrating seamlessly with SIBRE's ultra-fast braking systems for swift reactions. Particularly, SLP is capable of detecting snags during the lowering operation, a unique capability enabled by the IMU-based detection mechanism, which is not influenced by cable tension. Additionally, SLP offers quick reset functionality, as it only requires the press of a button for local or remote resetting. This eliminates the need for time-consuming mechanical resets, leading to shorter downtime and increased operational efficiency.

The benefits of SLP are relevant. It significantly improves safety, productivity, and efficiency in crane operations, reducing downtime and extending the lifespan of crane components. Studies have shown that SLP can increase the service life of hoisting cables by approximately 30 per cent. Moreover, SLP ensures a rapid return on investment, with reported payback periods ranging from 1 to 2 years. Last but not least, its robust design and high-quality components contribute to a low Total Cost of Ownership (TCO).

IMPRESSIVE REFERENCES AND EXPANSION

SLP has been delivered on four continents, to help major container terminal operators such as APMT, TIL, PSA, DPW and GPA. It seamlessly integrates with cranes from leading manufacturers such as ZPMC, KONECRANES, PACECO and LIEBHERR. Recent projects include installations on new ZPMC cranes for Terminals in Barcelona, Oman, and Croatia, as well as 13 new Konecranes at the GPA terminal in Savannah, US. With six years of operational experience, SLP has been deployed on various crane types, communicating seamlessly with PLCs from different manufacturers and supporting different reeling cable types and head block configurations.

INTRODUCING GUARDIAN FOR ENHANCED INSIGHTS

Building on the success of SLP, SIBRE has introduced GUARDIAN, a cutting-edge IIoT SaaS cloud platform that enhances operational insights. GUARDIAN leverages IMU data to generate real-time, effortless monitoring of a new KPI called Motion Intensity. This platform incorporates advanced impact detection during crane operations,

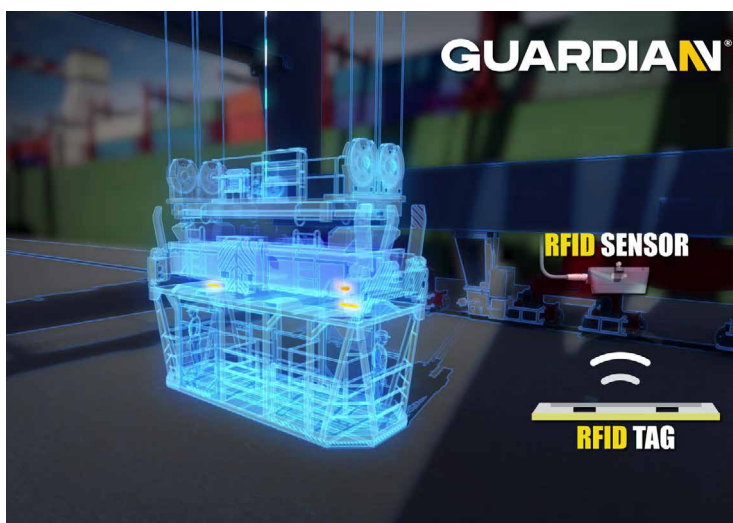


FIGURE 4.
SIBRE Reader.
Handling equipment
identification by RFID
technology

“SIBRE’S APPLICATION OF IMU SENSORS HAS BEEN INSTRUMENTAL IN PREVENTING EQUIPMENT SNAGS AND DETECTING IMPACTS DURING CRANE OPERATIONS, PROVIDING INSIGHTS INTO CRANE EFFICIENCY LIKE NEVER BEFORE.”



FIGURE 5.
SIBRE Cognitive.
Hatch cover detection
by AI

complemented by dashboards and video systems for in-depth analysis. GUARDIAN also provides notifications via e-mail, Telegram, and SMS, empowering operators to proactively manage their crane operations, identify root causes, and take appropriate corrective action. Furthermore, data generated by GUARDIAN can be shared with end clients, facilitating deeper analysis and automation of operations.

EXPANDING CAPABILITIES WITH COGNITIVE AND READER

In addition to SLP and GUARDIAN, SIBRE has introduced two complementary products: Cognitive and Reader. Cognitive leverages computer vision technology, powered by AI, to detect hatch covers. Whereas Reader utilizes RFID technology for enhanced tracking and identification of equipment used by spreaders in STS operations. In addition

to increasing the crane's safety, these products offer practical data-driven insights, enabling preventive maintenance, improved operational efficiency, optimized terminal movements through TOS integration, and increased automation.

CONCLUSION

SIBRE's SLP, alongside GUARDIAN, Cognitive, and Reader, empowers STS cranes with unprecedented perception capabilities. By enhancing safety, productivity, and efficiency, these technologies drive digitalization and automation, and contribute to reducing the carbon footprint of terminals. The real-world success of SLP is validated by its extensive installations across renowned terminals worldwide. Taking advantage of SIBRE's advanced solutions today will allow joining to the wave of digital transformation revolutionizing the port industry.

ABOUT THE AUTHOR:

Jose García works as CTO for SIBRE Brakes Spain – a company of SIBRE Holding GmbH + Co. KG. He's a seasoned engineer with more than 23 years of experience in the IT and Industrial Sector. He manages projects and products related to Industry 4.0 in automation, IoT, AI, Big data and machine learning

ABOUT THE COMPANY:

SIBRE is a worldwide operating, medium-sized company of traditions with over 60 years of company history. From the very first the company engages in the development and production of brake systems for the industry. Right from the start value was set on technical innovation, the most modern manufacturing technology and high customer use. Production procedures are continuously supervised by a quality management system.

The aim of the product development is an optimum combination of a top-quality product, the easiest use and market-driven price both for plant engineers and plant operators.