

scope

Intelligent inspections are here.

Implementing AI Platform for Stringing Line Inspection for
Wagner-Smith Equipment Co.



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The Challenge

With one of the most expansive rental fleets across the continental United States, the inspection of stringing lines is a daily, ongoing effort at Wagner-Smith Equipment Co. Even with standardized procedures in place, manual visual inspections of these lines are extremely labor intensive and require technicians to maintain constant focus on the line while it being paid out and back in.

Traditional visual inspection methods typically only examine one side of the line while it is in motion at high speeds. Consequently, relying on an operator's split-second decision regarding the line's continued safe use has always been fraught with risk. Moreover, maintaining lines to a specific safety factor was challenging, as accurately determining their health necessitates breaking the line to assess residual strength.

Identifying and resolving stringing line defects is of paramount importance to Wagner-Smith Equipment. The Scope system, capable of 95% accuracy in detecting line irregularities and predicting residual break strength (RBS) within a +/-5% range of the actual RBS, emerged as an ideal solution. However, precise identification and evaluation of damaged sections on a line represent only a portion of the challenge. Operators must be able to effortlessly access and utilize this information to devise an effective repair strategy. For the appropriate upkeep of a miles-long line, it is essential to accurately pinpoint the location of damage and notify operators as those specific segments approach.

Gaining more precision around inspections and transparency into the line's quality was vital, particularly for mission-critical assets that directly affect operational safety, like stringing lines.

Primary Challenges

1. Accurately correlate a degree of abrasion to a predicted residual break strength
2. Accurately identify line anomalies including cut strands, pulled strands, burns, debris and splices
3. Accurately measure distance traveled and monitor line health across that distance
4. Enable operators to efficiently build a repair plan after a scan
5. Enable fleet managers to easily review line scans and any defects that may be present
6. Enable automated reporting and notifications based on scan data

The Solution

At the core of Scope's system is the Insight Engine, a deep learning neural network that has been rigorously trained to identify defects in rope with exceptional accuracy. Through extensive residual break strength testing and training, the Insight Engine is capable of detecting anomalies with 95% accuracy, and can even predict Residual Break Strength within +/-5% of a line's actual RBS. As more data is acquired through inspection scans, the machine learning platform continuously improves its performance.

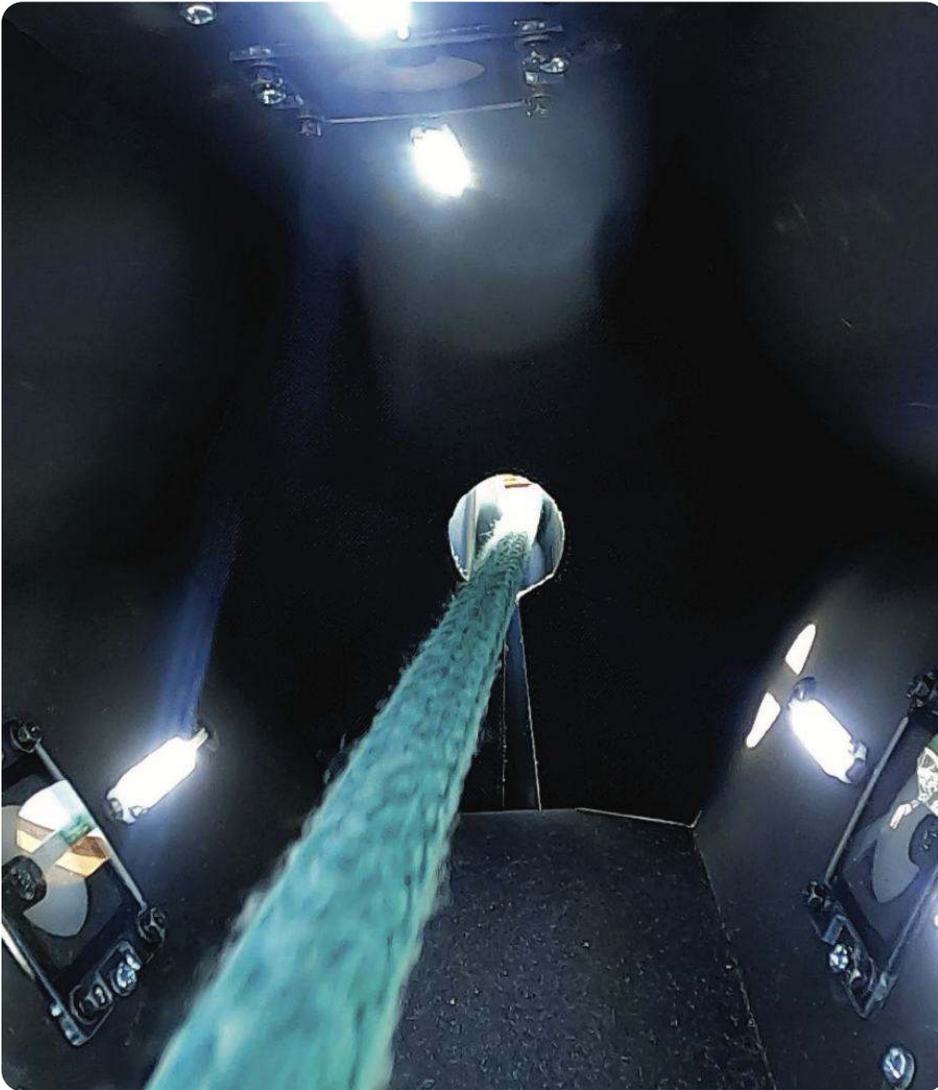
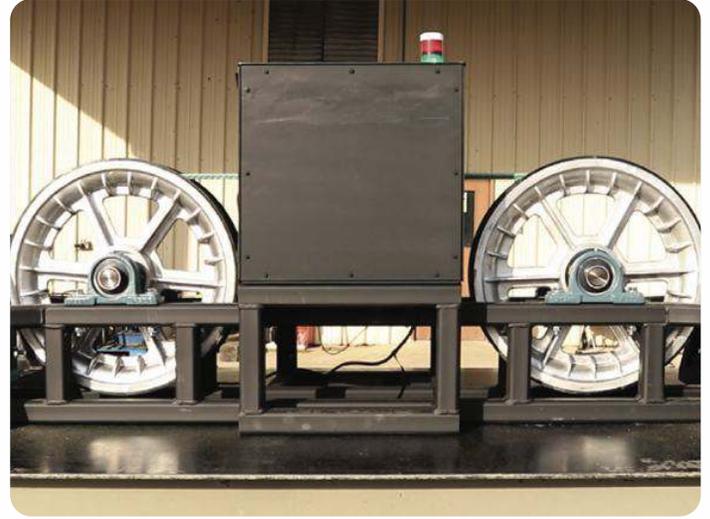
The Scope hardware is designed as a standalone inspection unit, specifically for placement between two stringing units as line is spooled from one machine to the other. The unit comes with a mounting table for operators to easily access tools and splice rope. Multiple cameras surround the rope subject, capturing 360° views of the line inside the device.

The Scope system continuously captures images of the line during scans, which are then analyzed by the Insight Engine. The engine synthesizes this information into a user-friendly graph, displaying the health of each individual line segment in real-time on a tablet. This allows operators to receive immediate feedback on the scanned line segments, facilitating quick and informed decision-making. The intuitive interface was designed to help operators track their pull speed and position on the line, making it simple to pinpoint the location of any damage.

With every scan, the Scope system generates valuable data points that are securely stored online. This enables operators to review the line and formulate a repair plan if needed, while fleet managers can immediately access the scans and relevant images. The system delivers real-time reporting and notifications, removing the need for manual inspection report creation, streamlining the inspection process for everyone involved.



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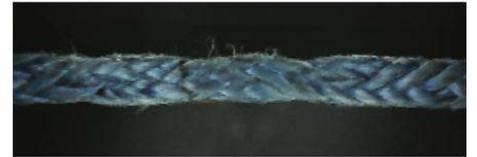
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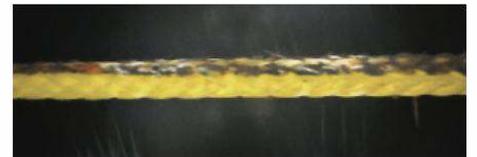
Cut Strands



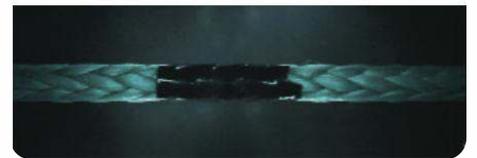
Splices



Discoloration



Debris



The advanced technology in the Scope platform automatically captures and uploads image data of any detected damage or line anomaly, making it readily accessible online for review by both operators and fleet managers.

This promotes open and effective communication regarding the health of the line, allowing operators to quickly develop standardized protocols for addressing and repairing identified issues, leading to consistent and streamlined processes across the organization.



The Solution

For Steve Aston, Vice President of Operations at Wagner-Smith Equipment, proper equipment maintenance is directly linked to the company's commitment to providing the most reliable stringing solutions for safer operations. Both the pulling machine and stringing lines are treated as mission-critical assets, affecting front-line operators and a wide range of stakeholders in the utility industry and the broader community.

The benefits of implementing Scope were evident from the early development stages through the final handoff to operators. Outcomes included:

On the first day, the team automatically detected unknown issues, obtained a comprehensive data record, and received instant, accurate rope analysis.

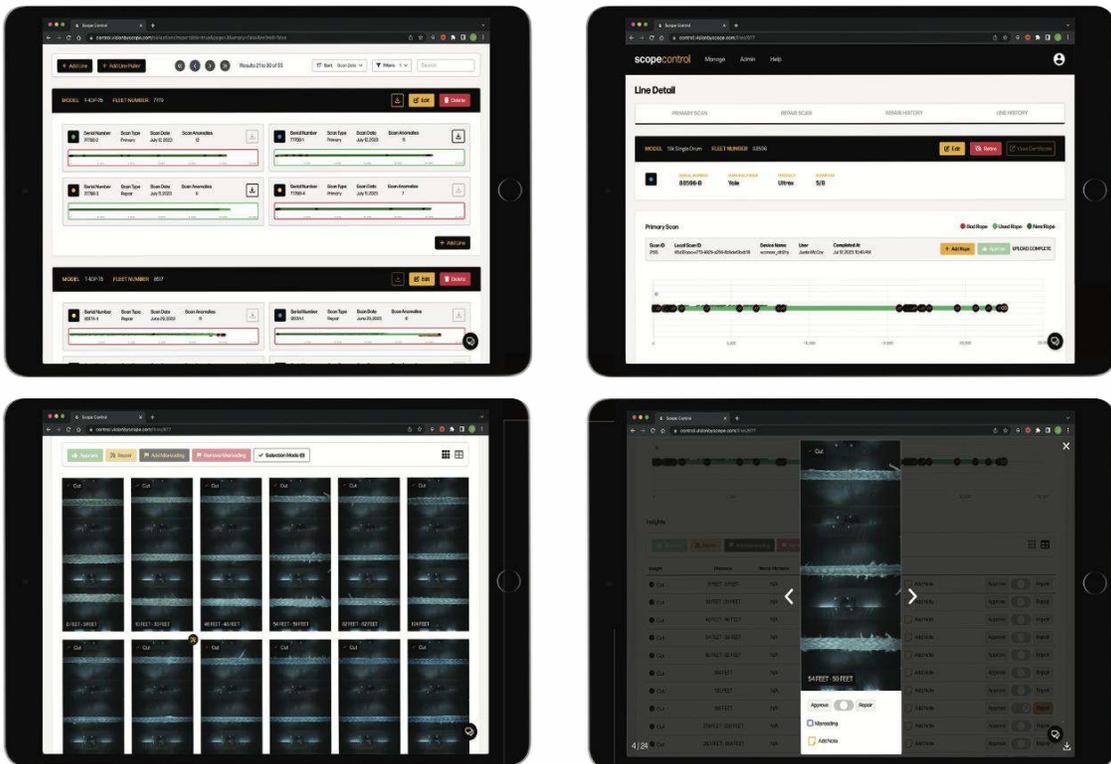
Over 75 unknown issues of different types were discovered on the lines in the first week.

Traceability improved across the entire fleet, enabling programmatic tracking of line health on a line-by-line basis.

The integration of Scope automated inspection is a key component in reinforcing Wagner-Smith's commitment to delivering the most secure mission-critical stringing equipment in the industry. The limitations and risks associated with sole reliance on manual visual inspection for monitoring the health of individual lines are significantly mitigated with the implementation of this system.

Additionally, the utilization of Scope for failure analysis, coupled with the provision of serialized information, has empowered Wagner-Smith with the capability to undertake an efficient review of defects. This has resulted in the formation of meticulous repair strategies and the achievement of comprehensive traceability.

With a fleet spanning in the US, Scope's online platform improved communication and visibility across Wagner-Smith locations and among Fleet Managers. Clear, centralized, and accessible data, at all times, facilitated more productive discussions between Wagner-Smith and Utility Contractors concerning stringing lines on rental equipment. Following an intensive beta trial at the Burlleson, TX Headquarters, the company successfully deployed Scope systems throughout the country. Currently operating five Scope systems positioned in strategic locations, Wagner-Smith is able to offer efficient and accurate inspection services to its customers anywhere they are.



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The first Scope Inspection System was completed in November 2022 and delivered to Burleson, Texas. Four more systems were sent to locations in Georgia, Arizona, Ohio and Oregon, taking just two days for setup and training at each location.

Innovating for a Safer Future

Scope's AI cloud-based app immediately revealed previously undetected line defects from its initial image collection. The AI identified anomalies not visible to inspectors during puller operation, confirming its effectiveness in automated defect detection and residual break strength prediction.

Maintaining a factor of safety

Manual visual inspection alone made it challenging for companies like Wagner-Smith to maintain their stringing lines to a specific safety factor. In the past, their only option was to conduct break tests on select line segments as an indication of the strength of the unbroken line. However, with the introduction of Scope's automated inspection technology, Wagner-Smith can now consistently operate above a required safety factor for the residual strength of the line. This marks a historic milestone in the industry, as Wagner-Smith becomes the first OEM to offer such a high level of reassurance to its customers.

The system calculates a threshold for strength per-line, taking into consideration the chosen safety factor, the pull strength of the equipment, and the residual break strength of the specific line. This threshold determines the system's classification of rope as good, used, or bad, ensuring that the line can be retired or repaired as soon as it dips below the set strength.

Verifiable Line History

Through the Scope online platform, Wagner-Smith Equipment's fleet managers can review the results of automated defect detection daily with inspection teams across the nation. The prompt reporting and hands-on implementation assistance allowed them to swiftly determine if anomalies required corrective action, driving for zero escapes where Scope monitoring was in place. Additionally, Scope systems provide Wagner-Smith Equipment with a digital record of inspected lines, complete with visual proof of the results, creating a verifiable line history that demonstrates their commitment to responsibly maintaining safe line life.

Efficient Repair Planning

Collaborating with the Wagner-Smith Equipment team, Scope integrated a repair planning process into the platform, allowing users to review and select anomalies requiring repair. The system then alerts operators when they are approaching the selected repair locations during the next line scan. An automatic log of anomalies and repairs is generated and made available for download in the web app. Every scan culminates in an inspection certificate displaying the health of the line along with any approved anomalies. These have become part of the standard inspection materials passed down to customers of Wagner-Smith Equipment.

Looking Ahead

Wagner-Smith Equipment and Scope envision an enormous potential for the industry to boost operational safety by leveraging deep learning to enhance inspections. With Scope systems already deployed nationwide, a wealth of inspection data is being used to refine and train networks to accurately identify and predict potential issues. The possibilities for innovation in safer operations are boundless, including the ability to detect different types of splices and more nuanced degrees of damage, as well as leveraging tension data and line health to alert operators before critical thresholds are reached.

Working with visionary companies like Wagner-Smith Equipment is critical in the development of innovative new technologies that can benefit an entire industry. With over 1 million feet of stringing lines inspected in the first months of using Scope systems, they are leading the charge towards safer operations in the utility industry.

About Wagner - Smith

Established in 1917, Wagner-Smith Equipment has been synonymous with line-stringing equipment for as long as the industry has existed. As a trailblazer for generations, the company has excelled in designing, producing, renting, and servicing overhead and underground line-stringing equipment.

Wagner-Smith Equipment plays a crucial role in operations where equipment failure is unacceptable, and a downed line can have disastrous consequences. Besides offering equipment services, Wagner-Smith Equipment also manages the synthetic lines used on stringing machines. Headquartered in Burleson, Texas, Wagner-Smith Equipment extends its reach across the entirety of the continental U.S., forging enduring relationships with numerous utility contractors. As their footprint stretches across state lines, they continue to underscore the importance of meticulous equipment maintenance, thereby ensuring their commitment to quality and service remains undiminished in the face of growth.

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