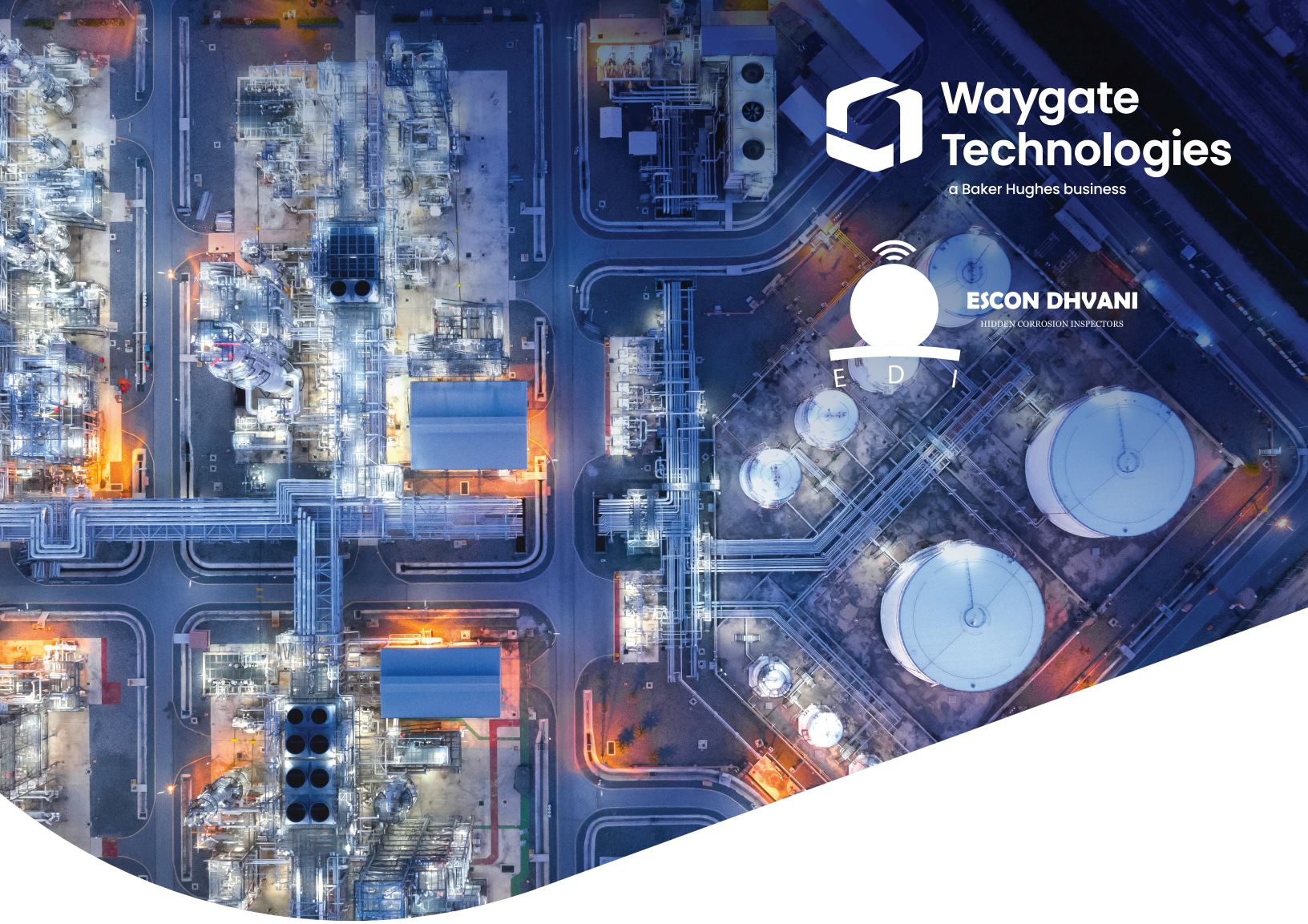

Safeguarding Pipelines With Higher Order Mode Cluster Scanning

TECHNOLOGY BRIEF

Undetected corrosion is the number one cause of pipeline failure

Aging infrastructure requires inspection

Nearly 2.2 million miles of pipeline – enough to reach the moon more than nine times – stretch across points around the globe, many connecting to processing plants working far beyond the life envisioned in their original designs. Ninety percent of America's 135 petroleum refineries are older than 35. Statistics like this are not confined to the petroleum industry. Aging infrastructure is found in natural gas, chemical processing, and water treatment.

Corrosion develops beneath supports. Failures to identify and correct the problems lead to failures in above-ground lines. Rigid supports designed to hold the weight of both the pipe and its components are common inside plants. Flexible or resilient supports allow pipes to move in response to the cycle of expansion and contraction stresses while still supporting the line.

No matter the type, supports must be regularly inspected for corrosion. If supports falter, leaks follow, leading to significant losses and making it difficult, if not impossible, to keep the line online while repairing it.

For an example of the effects, one need only recall the news making refinery explosions of the not-to-distant past. One blast, in particular, prompted the shutdown of a refinery. An investigation found pipe corrosion, at least in part, lead to the incident. A month later, reports confirmed that the corrosion was caused by unseen condensation moisture that collected between the bottom of a 10-inch pipe and a loose steel sleeve on which it rested.

Inspection and remediation can prevent such outcomes, but that solution is not so simple as it might seem. Lines can form a thick, tightly wound web of pipe that is difficult to access and maintain. Safety implications abound. The process requires skill, care, and the best in technology. It can be costly, especially if it prompts a shutdown in production. But the costs of support corrosion undetected and unchecked are higher still.

Factors of deterioration

Corrosion eats away beneath the surface at supports, working its way into every point of weakness, causing vulnerabilities.

All the factors work in its favor. Moisture, minerals, and load stresses reach circumferentially and axially along the length of the line. Pads & clamps between the pipes and their supports aim to minimize the effects, but crevices form in supports, and corrosion works its way there. Moisture settles, collects, and accumulates in crevices and, unseen begins the process of pipe deterioration at the supports.

Leaks from other equipment can carry contaminants. Chlorides, for example, can accelerate deterioration. Galvanic corrosion, or bimetallic corrosion, poses another hazard, as one metal corrodes another through an electrolyte. Explained differently, when the two metals are immersed in a conductive solution and electronically connected, corrosion is the result. Use of the wrong or flawed coating materials also can cause corrosion. Then there are the ordinary troubles of the extraordinary conditions that might affect pipes, which are subjected to extreme operating temperatures and expansion and contraction against their supports.

Further, finding the corrosion these factors cause is not as simple as merely looking. Deterioration can be obscured on pipe surfaces beneath or near supports, allowing corrosion to grow without notice.

It’s time for a better approach to detecting corrosion under pipe supports

Traditional approaches

Seeing might equate to believing, but it is what is not seen in pipelines and supports that later could wreak havoc. Associating the visible appearance of corrosion with the actual level of it at the support is unreliable, particularly if the pipe has not been lifted away from the support to reveal what appears there on the surface.

Traditional non-destructive testing techniques provide possible but flawed solutions. Examples include X-rays, magnetic particles, and ultrasonic testing. Some companies employ more than one of these techniques. These efforts are costly, time-consuming, and risk loss of containment.

Still, testing approaches like ultrasonic non-destructive testing (NDT) plays a major role in the inspection of pipe supports. But to perform a conventional ultrasonic inspection at this inaccessible region, the pipes need to be lifted out of their supports. This is undesirable due to the risk of further stressing an already weakened pipe. Compounding the damage could involve a complete shutdown. Additionally, this approach is not particularly accurate in quantifying the wall loss, depending on the nature and extent of corrosion.

Visual inspection is another common method to detect CUPS, but pipe support corrosion is a hidden threat. The correlation between visible corrosion and actual corrosion is unreliable and difficult. Access to the location of interest is often not possible. Thus it is not always feasible to perform a visual inspection. Again, pipe lifting or removal of the support is necessary to get access to these locations.

Traditional approaches provide an artificial assurance and allow the corrosive process to continue unabated. A better answer is required to ensure real confidence in the integrity of the line.

The solution

Essential to an inspection that uncovers the threats at the most critical portions of the line is technology that can be counted upon to detect corrosion under pipe supports.

Higher Order Mode Cluster, or HOMC, Corrosion Under Pipe-support Scanners, or CUPS, meet this need. The devices are critical to an overall piping integrity management strategy. The right technology will not only assess the external condition of pipes but also deterioration in interior mechanisms. This could be done as an in-service inspection without emptying the pipe. HOMC guided waves are unaffected by the point of incidence of the probe. Accurate Wall loss estimation is possible, and complete inspection coverage is achieved with suitable scanning procedures.

The benefits of CUPS include:

High-quality data: HOMC guided wave technology can be applied to axial or circumferential inspections. The system inspects beneath pipe supports to detect both localized and larger general corrosion. Operators get high-resolution A, and B scans providing clear, cross-section profile images of pipe corrosion.

High-dimensioning accuracy: Short-range ultrasonic, guided wave technology relying on HOMC delivers reams of high-quality, consistently accurate data, and vivid visualization that other technologies simply cannot match. The system detects corrosion at an unrivaled level of precision, providing decision-makers with a level of strong, detailed information they can’t get anywhere else.

Wide application: Non-dispersive, operating at high frequency and resulting in minimal displacement on pipe surfaces, HOMC can reach sections of pipe inaccessible with conventional guided wave techniques using single modes. This means the technology can work in a wide range of pipe diameters, varying support types, and in the tight spaces

Less downtime means more productivity

that ordinarily make effective inspections while keeping operations online difficult to the point of impossible.

Faster inspections: The CUPS system is designed and tested to ensure higher speeds of inspections. Operators manually manipulate scanners while the software adjusts to the operators' speed and variance to ensure that data are consistent and reliable. This allows operators to set their pace and inspect more pipes at a faster rate.

Non-invasive: Inspections can be performed on pipes under supports without the need to disrupt production and product flow.

In each critical aspect, the CUPS system using HOMC guided-wave technology stands apart.

Use Case – Traditional Methods Meant Shut Down

A 35-year-old plant faced a steadily compounding problem.

Its inspection workload had become unsustainable, resulting in a growing backlog of maintenance and repair projects. Management demanded stronger intelligence on the lines' future reliability and integrity. Extending the life of the plant would require a proactive approach and swift action. That necessitated a full inspection with problems fixed upon discovery.

But getting a full inspection posed another problem: Traditional methods would require shutting down parts of the plant on a rotating basis, turning the effort into an exceedingly costly enterprise.

Enter HOMC. Using the technology, the plant was inspected and remained online throughout. Only when areas required remediation were those portions of the plant taken temporarily offline.

A fast, efficient, non-invasive inspection using HOMC technology resulted in deterioration being discovered before it became more severe and allowed for the continued operation of the plant and, ultimately, an extension of the facility's operation.

Pipeline and plant operators seeking to remain at the forefront of problems, identifying corrosion and remediating it early, and aiming to retain the productivity and life of their sites need technology they can count on to perform with minimal disruption and deliver the highest levels of efficacy and accuracy.

A proven winner has emerged. HOMC guided-wave CUPS technology delivers unmatched results so that users can pursue unmatched success.

About Us

Waygate Technologies, a Baker Hughes business, is a global leader in non-destructive testing and examination solutions. As a derivative of GE Inspection Technologies, the company holds over 125 years of experience in ensuring quality, safety, and productivity in industrial settings.

Today, the company helps its customers by applying state-of-the-art data and analytics for best-in-class insights on their products and processes. Through a partnership with Escon Dhvani, located in Southeast Asia (Singapore HQ), the company markets a pipe scanning service leveraging Escon's Corrosion Under Pipe-support Scanner (CUPS) technology. CUPS is differentiated by the same patented short-range ultrasonic guided wave technology, which is the core of the company's Tank Annular Plate Scanning (TAPS) technology. CUPS facilitates and improves inspection of corrosion under pipeline supports using Higher Order Mode Cluster (HOMC) guided waves. The technology is the first of its kind to provide highly accurate, visualized data in detecting any size corrosion at pipe supports in both axial and circumferential applications.

Through CUPS, customers benefit from smart, more accurate, and less intrusive inspection programs when assessing the condition of above-ground pipeline supports using a market-leading advanced inspection services company.

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