

# ILI SMART PIGS



## Bottom Line:

In-line inspection (ILI) “smart pigs” travel through pipelines helping pipeline operators detect issues and perform preventative maintenance before an incident can occur. Since 1999, corrosion caused pipeline incidents are down 76% with the help of ILI smart pigs.

## Frequently Asked Questions

### How do ILI smart pigs help pipeline operators inspect pipelines?

ILI smart pigs travel through a pipeline scanning and measuring a pipe's walls looking for signs of dents, corrosion or cracking. Like diagnostic imaging at a doctor's office, smart pigs can use magnetic resonance or ultrasonic waves to identify potential problems. The resulting data is then analyzed to diagnose issues and schedule maintenance.

### What are the different types of ILI smart pigs?

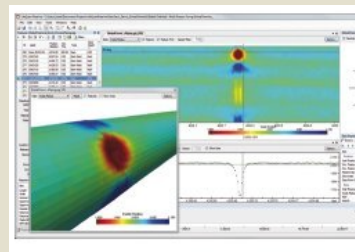
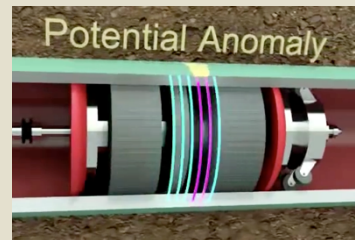
ILI smart pigs, also called tools by pipeline operators, are grouped into three main categories according to the potential problem they are designed to find:

**Dents** - Dent smart pigs, also called deformation or geometry tools, use flexible calipers to measure a pipe's shape. Dent tools will also find buckles, wrinkles or other types of bending strain that may indicate pressure on or movement of the pipe

**Corrosion** – Corrosion smart pigs primarily use magnetic fields that detect metal loss in pipe, which can indicate general corrosion, pitting, pinholes or wall thinning from erosion (internal wearing away of the pipe). Technical names for corrosion tool types include MFL (magnetic flux leakage) and TFI (transverse field inspection) tools.

**Crack** – Crack tools use ultrasonic waves, or specialized magnetic or analytical approaches, to find potential cracks in the pipe wall, connecting welds or associated with dents. Technical names for crack tools include UT (ultrasonic testing) and TFI (transverse field inspection) tools.

Pipeline operators use ILI smart pigs to inspect their pipelines by traveling through the pipelines and scanning the pipe walls.

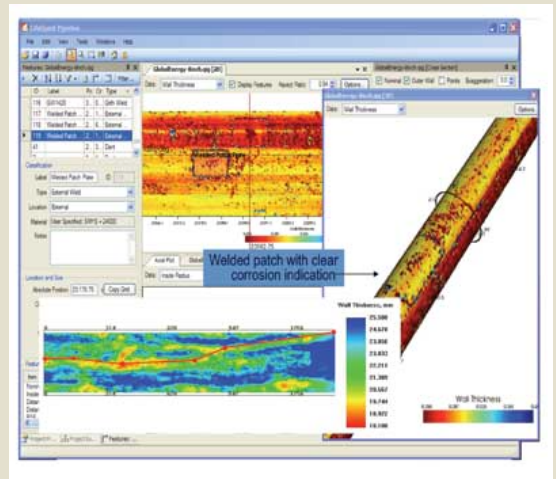


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## How is information from ILI smart pig inspections put to use?

ILI smart pigs produce large amounts of raw data which must be analyzed to separate natural features of the pipe metal from potential problems. That raw data can be displayed graphically or in 3D to help operators determine the severity of a potential problem. Pipeline operators will use analytical models to predict the growth rate of a corrosion area or crack so they can schedule maintenance before the issue threatens the pipe's integrity.



## What is the success rate of ILI smart pigs?

Smart pigs focusing on metal loss have helped pipeline operators reduce corrosion caused pipeline incidents by 76% since 1999. Crack tools can detect cracks as small as 1 mm deep and 25 mm long with a 90% probability of detection. While no technology is foolproof, the ability of ILI smart pigs to detect minute defects long before they are a threat to the pipeline can give it an advantage over other inspection techniques without similar capabilities, such as hydrostatic pressure testing (using water at high pressures inside a pipe to test pipe integrity at that point in time).

## What efforts are underway to confirm and improve ILI smart pig capabilities?

**Research & Development** – The liquids pipeline industry, along with natural gas pipeline operators, pipeline operators from Europe, Asia and the Middle East and vendors of pipeline inspection technology join together through the Pipeline Research Consortium International (PRCI) to fund over \$20 million of research and development into pipeline knowledge and technologies. Pipeline inspection technology research, either through ILI smart pigs or hand-held diagnostic tools used for further testing of pipe, are a prime focus of the research. A recently completed PRCI project confirmed the capabilities of ILI smart pigs to find cracking in pipelines by comparing the results of 50,000 data points from ILI smart pig results and on-site maintenance excavations.

**Industry-Wide Recommended Practices** – The liquids pipeline industry is putting the finishing touches on API RP 1176, a new industry-wide recommended practice for assessing and managing pipeline cracking. The recommended practice provides pipeline operators state-of-the-art guidance on interpreting ILI smart pig results data to detect potential cracking in pipelines, including hard to find hairline cracks hidden in weld seams.

**Industry-Wide Guidance** – The liquids pipeline industry is developing guidance for integrating threat data to better evaluate pipeline performance and maintenance needs. Many issues will not cause a pipeline incident on their own, but together can add up to a problem requiring attention. Better integrating ILI smart pig results with other threats to pipelines will help prevent future incidents.