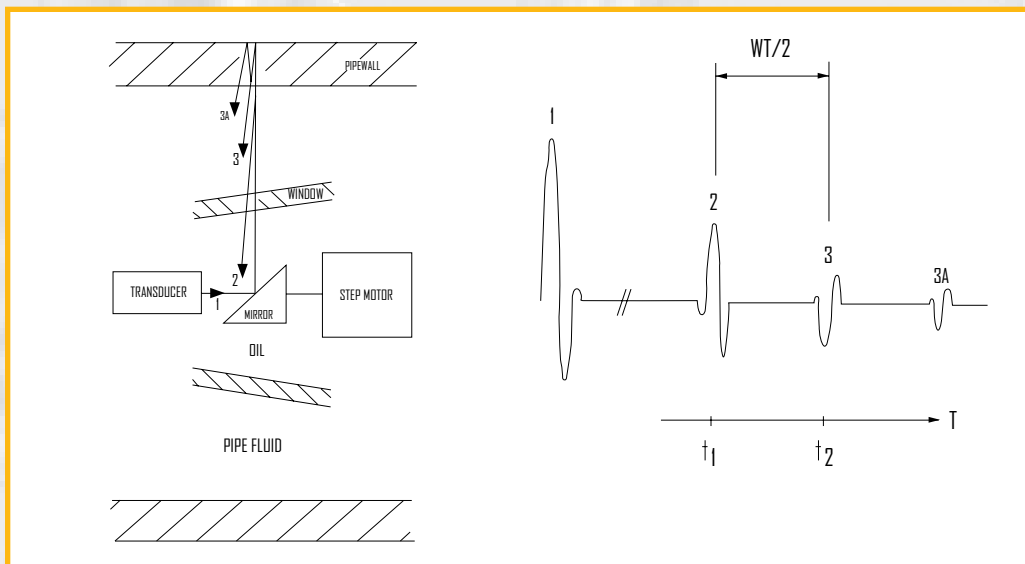


pipeline inspection services

the piglet system

In order to inspect the “unpiggable” pipelines, A.Hak Industrial Services designed an intelligent and versatile tool called the Piglet. The Piglet can negotiate an unlimited number of bends, travel in two directions, and inspect multiple diameters in one inspection run. The Piglet uses a patented ultrasonic technique that allows the tool to measure the complete circumference and scan 100% of the pipe wall to ensure an accurate reading with no data averaging. The Piglet system releases and lays down a tiny 1mm fibre optic filament as it traverses through the pipe. A. Hak connects this filament to the data processor outside the pipe where an inspection engineer will be able to monitor live, real time results on the condition of the pipe.

Below is a visual of the patented Ultrasonic Measuring Principle



piglet operational aspects

The Piglet is sent through the pipeline in a similar way to conventional pigs, requiring a fluid in the pipeline for propulsion, and a differential pressure over the Piglet System. A. Hak has built a complete range of temporary launchers and receivers that can be attached to any pipeline configuration. A.Hak will provide complete pumping and monitoring as part of the package.

Diameter	Max Inspection Speed	Bend Radius	UT Coverage
4" - 6"	.82 ft/s	1D	= 200%
8" - 10"	.82 ft/s	1D	>100%
14"	.73 ft/s	1.5D	>100%
16"	.55 ft/s	1.5D	>100%
24"	.45 ft/s	1.5D	>100%
32"	.36 ft/s	1.5D	>100%
36" - 48"	.27 ft/s	1.5D	>100%

**A. Hak Industrial
Services US, LLC**

11665 Fuqua St, Suite D405

Houston, TX 77034-4661

Phone: (281) 484-2000

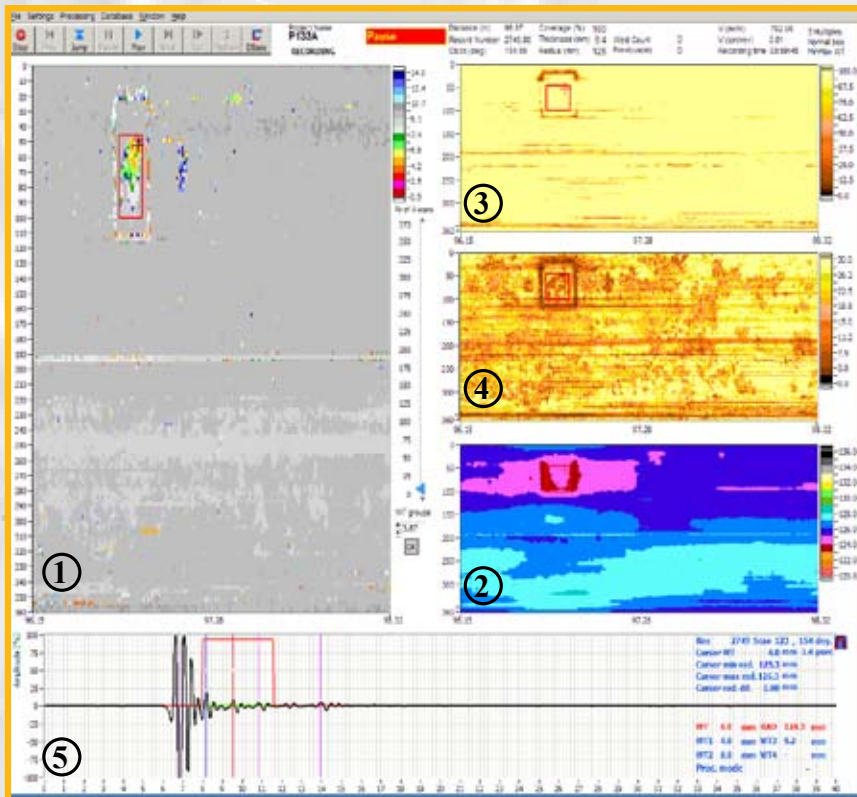
Fax: (281) 484-2002

www.a-hak-is.com

data analysis and reporting

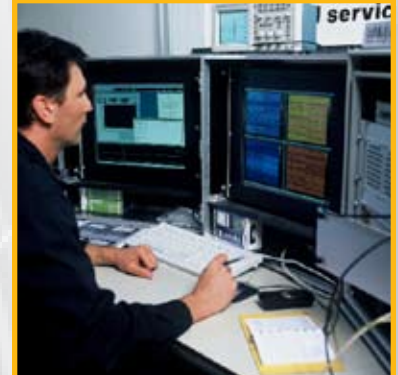
The Piglet System uses an advanced data acquisition system to store and process all the data, which results in the most accurate and detailed ultrasonic analysis available in the industry. Detailed analysis utilizes various tools to optimize the reliability of the information extracted from the data, such as A-, B-, and C-scans, as well as radial cross-section views. A.Hak verifies the data recorded during the inspection in multiple independent stages for completeness and quality. All analysis and reporting functionality complies with the *Pipeline Operator Forum 2005 (POF)* guidelines.

The visualization below shows corrosion under a patch with 4mm remaining wall thickness out of 9.3mm normal wall thickness.



1. Wall thickness (t)
2. Distance from center of pipe to inner wall (IR)
3. Signal amplitude of the inner wall reflection
4. Signal amplitude of the outer wall reflection
5. Ultrasonic signal, or a-scan

A. Hak is capable of differentiating between internal and external corrosion and deformation anomalies, including dents, gouges and grooves. A. Hak can quantify geometric information by accurately sizing anomalies, including length, width and depth. The tool can detect metal loss to a minimum remaining wall thickness of 2 mm. It is A-Hak's standard practice to assess anomalies by using B31.G analysis and it is possible to determine corrosion growth of the defects using the previous inspection results, or following a future inspection.



**A. Hak Industrial
Services US, LLC**

11665 Fuqua St, Suite D405

Houston, TX 77034-4661

Phone: (281) 484-2000

Fax: (281) 484-2002

www.a-hak-is.com