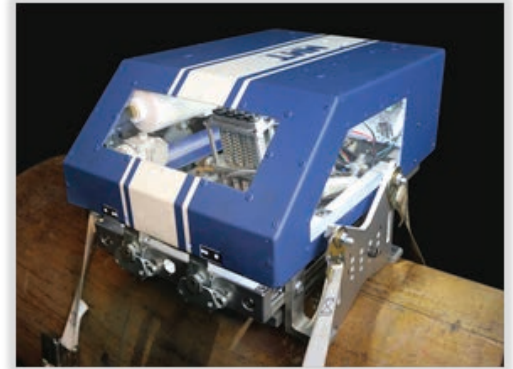


HSD TESTER NONDESTRUCTIVE | PORTABLE | METAL STRENGTH VERIFICATION

The Hardness, Strength, and Ductility (HSD) Tester is a portable, nondestructive testing (NDT) instrument for metals that accurately and reliably measures the yield strength and identifies the longitudinal welded seam type of pipelines without service interruptions or expensive cutouts.

The HSD Tester will support the need to extend the life of old pipelines and to perform quality control of new assets. Accurate and reliable data about the actual steel strength of specific pipe sections will help prioritize system maintenance efforts and perform enhanced risk assessment to continue pipeline integrity management.



ON-SITE NDT USING THE HSD TESTER

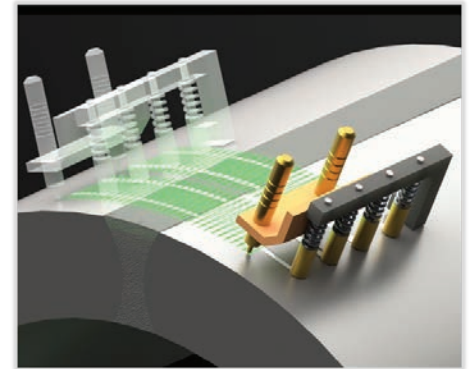


TESTING SERVICE

- Hardness, Strength, and Ductility (HSD)
- Spark Optical Emission Spectrometry (OES)
- Metallographic analysis surface replicas

KEY FEATURES

- Preliminary yield strength and ultimate tensile strength immediately available.
- Accuracy of $\pm 10\%$ on yield and ultimate tensile strength when compared to tensile testing.
- Test range of 25-100 ksi yield strength.
- Compatible on 4 – 48" diameter pipe.

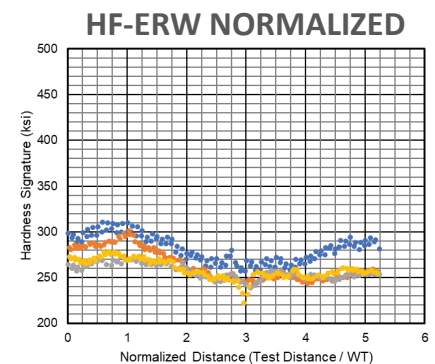
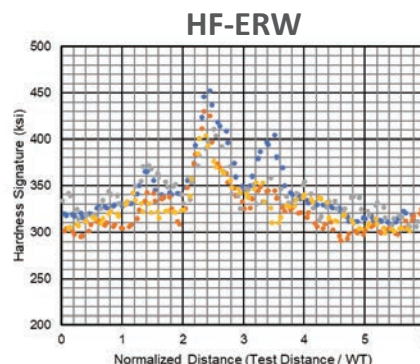
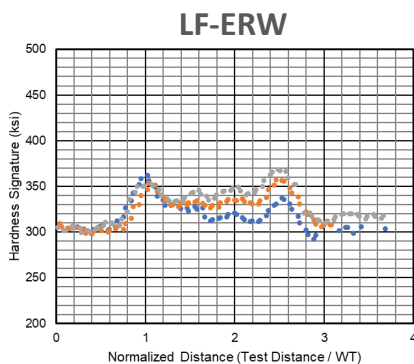


HSD FUNDAMENTALS

Four styluses make shallow grooves on the surface and continuously measure the material response.

WELDED SEAM IDENTIFICATION

The HSD Tester scans over a welded seam and identifies the fabrication process, such as Low Frequency or High Frequency Electric-Resistance Welds (LF-ERW or HF-ERW), Double Submerged Arc Welds (DSAW), flash welds, and the presence of post-weld-heat-treatment (PWHT). Each type of weld has a characteristic hardness signature such as those in the examples below.



DATA FOR PIPELINE LIFE EXTENSION AND SAFETY

PROVIDING CRITICAL DATA

Challenge - Data is Needed to Ensure Safe Operation

Pipe Performance Depends On

Geometry

(\$600+ Million/year spent on inspection)

LARGE volume of data available



Material Properties

(\$10 Million/year spent on inspection)

SMALL volume of data available

Yield Strength Toughness

- Currently, materials records are incomplete
- Material properties vary along the pipeline
- Need to identify and inspect “weak links”

NEW COST-EFFECTIVE TECHNOLOGIES

Challenge

Pipeline integrity management is expensive

- Cost of service interruption
- Cost of pipeline replacement
- Cost of catastrophic failure
- Cost of non compliance

Solution

Cost-effective pipe strength testing

- Practical: No service interruption, nondestructive, least expensive
- Opportunities: Testing where the pipeline is already excavated

Advantage - Embracing these solutions across the industry will improve

- Cost reduction by life extension: Prioritize \$4+ Billion/year spent on pipeline integrity
- Service continuity: All testing performed without interrupting service.
- Safety: Reduce the risk of major failures and incidents.

COMPLEMENTARY TO IN-LINE INSPECTIONS



Pipeline Survey

In-Line Inspection (ILI)

Identify “weak links” and group similar pipes.



Accurate Strength Testing

HSD Nondestructive Testing (NDT)

Perform nondestructive testing on representative pipes.

ILI and NDT combine to produce accurate and reliable datasets on asset assessment for efficient use of pipeline integrity budgets.

CONTACT

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