Massachusetts
Materials
Technologies LLC

HSD Tester

Nondestructive Material Verification

Nondestructive Material Verification

Material verification is an essential practice for all industries to obtain critical material property data to ensure safety, meet all government regulations, maintain proper records, and expand the lifetime of existing assets.

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.

Innovative Technology Transforming the Industry

Portable

Designed to test on pipes ranging from 4 to 60 inches in diameter. Field personnel are equipped to complete any job, including in-ditch testing of oil and gas pipelines. Testing of fittings, tanks, and flat plates is also available.

Nondestructive

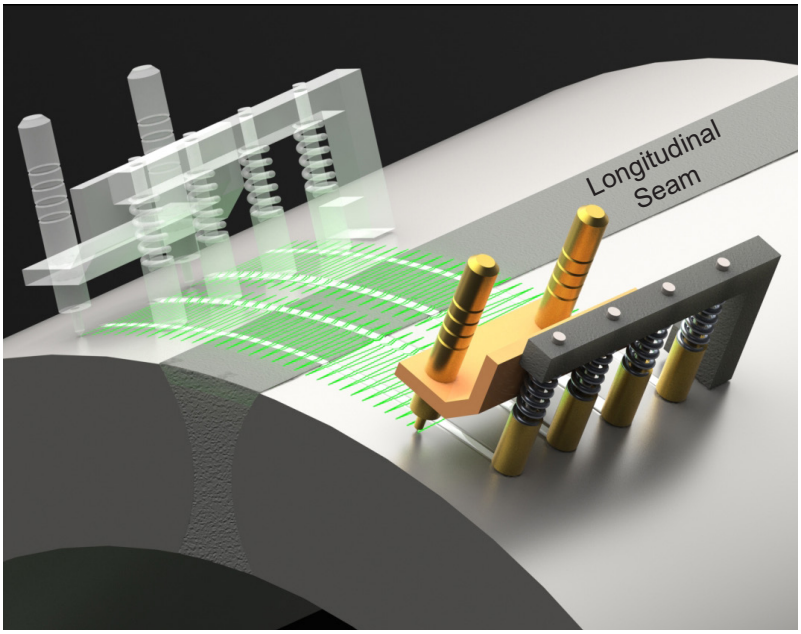
NDT

The HSD Tester leaves multiple grooves on the pipe surface with a depth of less than 0.002 inches (50 µm). The groove geometry is shallow and spherical, so there is a limited stress concentration around the deformed area. Grooves can be buffed from the surface after testing if long-term fatigue performance is a concern.

Accuracy

%

The performance and capabilities of the HSD Tester have been demonstrated through testing on more than 50 integrity digs and an internal database of 124 steel pipe joints. Testing has been performed on pipes of varying vintage and fabrication, including seamless, electric resistance welded (ERW), double submerged arc welded (DSAW), and flash welded construction. Comparing the accuracy of tensile strength prediction of the HSD Tester with laboratory tensile testing for 124 pipe samples, the yield strength is within +10% to -15% with over 90% confidence, and the ultimate tensile strength is within +10% and -10% with over 95% confidence.



During a test, four styluses generate grooves on the pipe surface that are measured through contact profilometry.

Material Grade Determination

The HSD Tester implements a process called frictional sliding, where multiple styluses deform the pipe surface to generate shallow grooves and measure the material response.

Hardness

A profiling tool measures the width and depth of each groove. This geometry, in addition to the force applied to each stylus, is used to calculate the hardness that indicates a material's resistance to permanent deformation.

Representative Stress & Strain

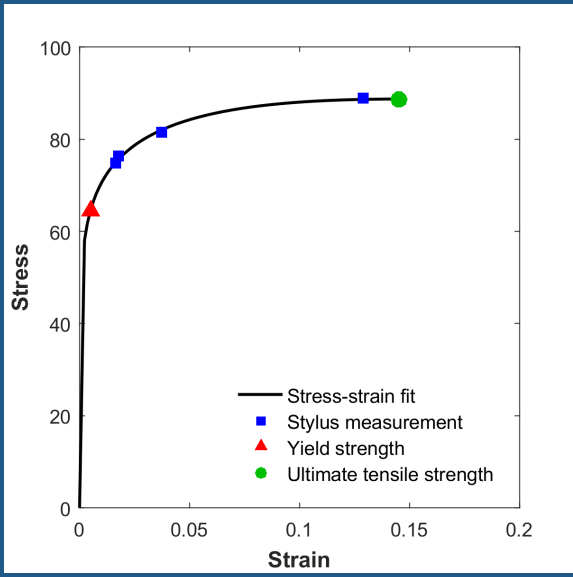
The material response for each stylus is used to calculate the representative stress and strain, relating the frictional sliding measurement to an equivalent tensile value.

Engineering Stress-Strain Curve

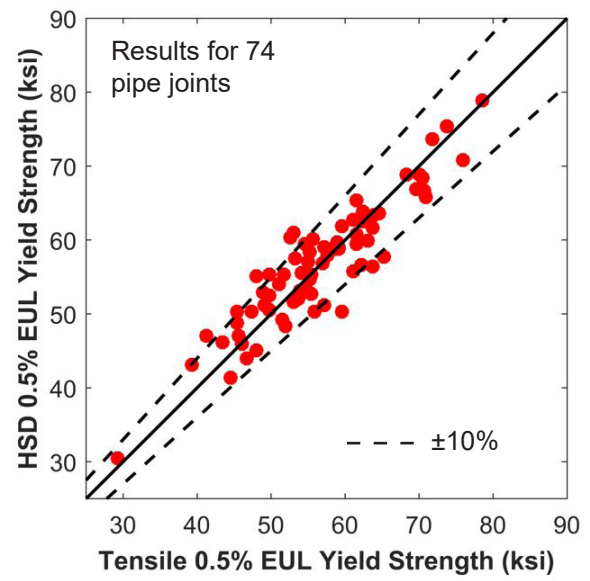
A complete stress-strain curve is fit to individual stylus measurement, allowing for determination of the tensile strength properties. This includes:

- 0.2% offset yield strength
- 0.5% elongation under load (EUL) yield strength
- Ultimate tensile strength (UTS)
- Strain hardening exponent (n)
- Power law strength coefficient (K)

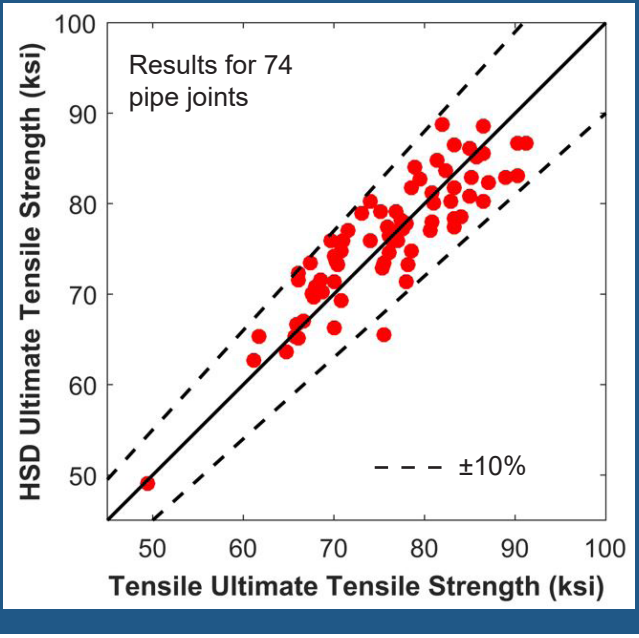
Measured Material Response



Yield Strength Performance



Ultimate Tensile Strength Performance

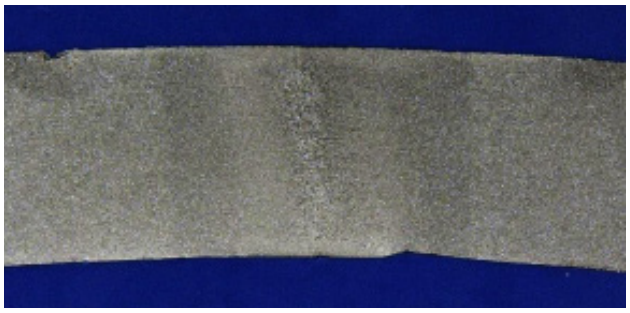


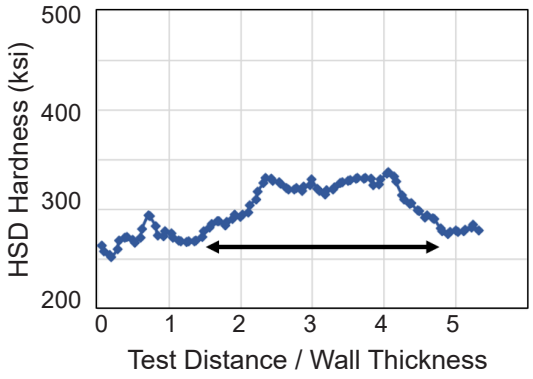
Welded Seam Identification

The HSD Tester scans over a longitudinal welded seam and identifies the fabrication process. The seam type is determined through the analysis of the hardness variation across the weld. The number of local increases in hardness associated with the presence of heat-affected-zones, magnitude of local hardness increases, and the overall size of the affected area, all provide data that can be used to classify the weld 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).

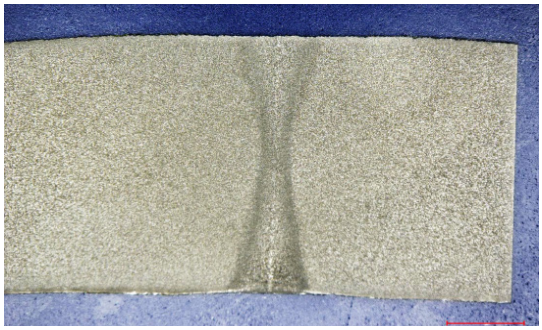
Seam Cross Section	HSD Measured Response

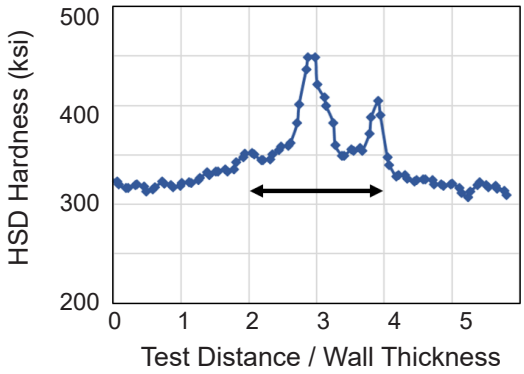
Low Frequency Electric-Resistance Welds (LF-ERW)



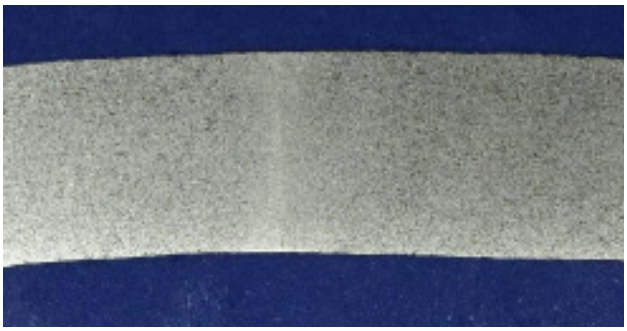


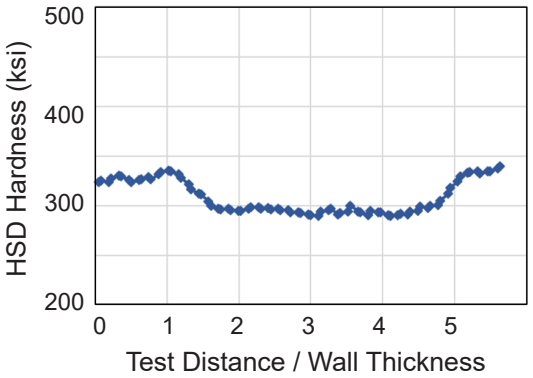
High Frequency Electric-Resistance Welds (HF-ERW)





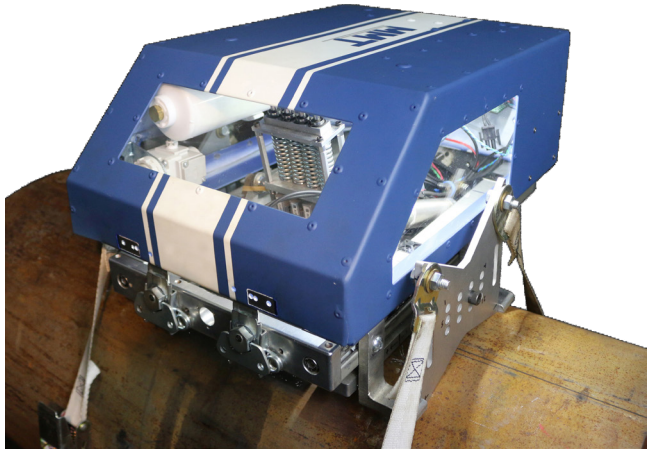
Normailized Seam (Post-Weld-Heat-Treatment)





Valuable Data for Pipeline Integrity Management

The HSD Tester presents the opportunity for complete material records at an affordable cost. The information the HSD Tester can provide is needed to ensure safe operation of pipelines and meet all government regulations. Major costs associated with service interruption, pipeline replacement, hydrostatic pressure testing, and catastrophic failure can be avoided by implementing this cost-effective solution. No alternative method exists for longitudinal seam determination.



Technical Specifications

Weight	28.6 lbs / 12.95 kg
Dimension	19 in x 9 in x 13.5 in (L x H x D) 48.26 cm x 22.86 cm x 34.29 cm
Power	120V
Test Duration	10 minutes
Test Distance	1.33 inches / 3.38 cm
Computer Unit	Microsoft Windows

Highlights and Applications

Low Cost

- No service interruptions
- No expensive cutouts

Portable

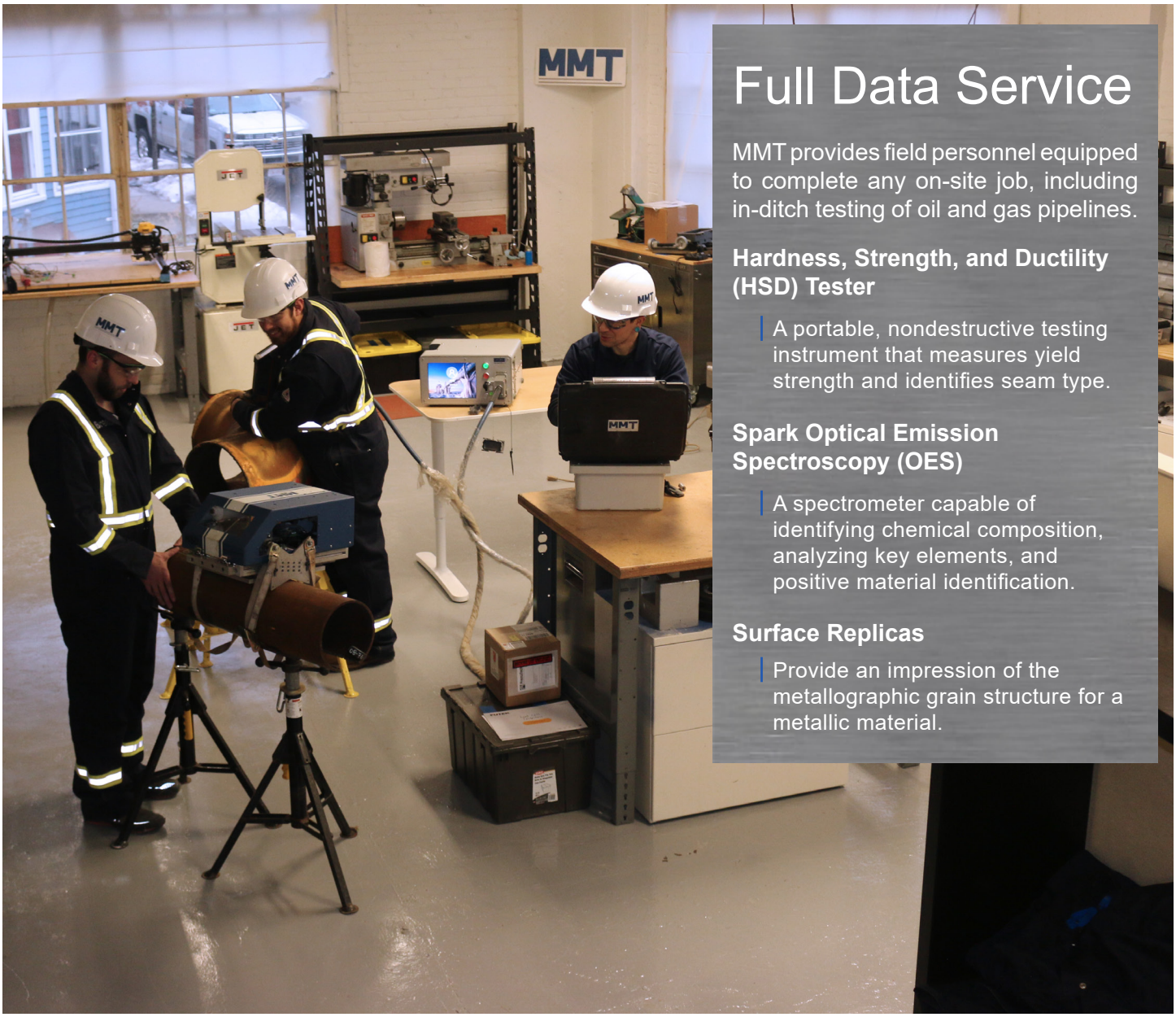
- Ready to use in-ditch
- Capable to test on pipes, fittings, and plates

New Asset Verification

- Confirm manufactured material properties

Old Asset Verification

- Complete missing material testing records (MTR)



Full Data Service

MMT provides field personnel equipped to complete any on-site job, including in-ditch testing of oil and gas pipelines.

Hardness, Strength, and Ductility (HSD) Tester

> A portable, nondestructive testing instrument that measures yield strength and identifies seam type.

Spark Optical Emission Spectroscopy (OES)

> A spectrometer capable of identifying chemical composition, analyzing key elements, and positive material identification.

Surface Replicas

> Provide an impression of the metallographic grain structure for a metallic material.

MMT

Contact Information

For more information or to request a quote for our services, contact us at

sales@bymmt.com

(617) 502 - 5636

www.bymmt.com

167 Prospect Street, Unit 4
Waltham, MA 02453