



LINALOG[®] Hard Spot Inspection Report

Release Ab	26 Aug 2004	Initial Release by Tuboscope Pipeline Services
Version 1	23 Sep 2019	Re-analysis of Hard Spot data
Version 2	11 Dec 2019	Incorporated GW #s per customer's request

Duke Energy Corporation
62.18 mi. x 30" Line 15
Owingsville to Wheelersburg
Run Date: 03 July 2004
Job #: 6584.01
Run 2

2 Scope and Results of 2004 Inspection

Duke Energy (now Enbridge) contracted Tuboscope Pipeline Services to perform a Hard Spot survey for a 62.18 mile section of the 30" Line 15 pipeline, from Owingsville to Wheelersburg. Tuboscope is a predecessor of the business owned by NDT Global LLC, and is no longer in business. The primary objective of this inspection survey was to collect and analyze hard spot data for localized hardening indications within this pipeline segment.

3 Operational Details

3.1 Pipeline & Medium Information

Pipeline Name	Owingsville to Wheelersburg, Line 15
Launch – Trap	Owingsville - Wheelersburg
Length of Inspected Pipeline Section	62.18 miles
Pipeline Diameter	30"
Wall Thickness Range	0.375"
Weld Type(s)	DSAW
Pipe Grade(s)	X52
Minimum Bend Radius	3D
Usual Medium	Natural gas
Medium Used for Inspection	Dry gas
Average Flow Velocity during Inspection	5.91 mph

3.2 Inspection Run Details

The survey launched July 3 at 7:37 a.m. and trapped July 3 at 6:08 p.m. was accepted as the Log of Record. Dry gas propelled the Linalog survey tool for approximately 10 hours 31 minutes at an average speed of 5.91 miles per hour. No problems were reported during this run.

3.3 Data Quality

The run was successful and data was complete.

Tuboscope

Pipeline Services

Linalog HR PLUS with Hardspot
& Pressure Ratio
Pipeline Survey Report

For

DUKE ENERGY GAS TRANSMISSION

Modified

30" Egypt Line 15 Pipeline

Egypt Station, MS to Barton Station, AL

Surveyed April 26, 2005

Job Number 10008.01

Run 1

**30" Egypt Line 15 Pipeline
Egypt Station, MS to Barton Station, AL
Job Number 6668.01
Modified**

This is the second issue of the report on this pipeline. The original report was issued June 8, 2005. This report is being reissued due to receipt of more current information on the previous caliper survey.

This section of Duke Energy Gas Transmission's line was surveyed by Tuboscope Pipeline Services in April of 2005. The 71.26 mile section, located in Mississippi and Alabama, is reported to be constructed primarily of Grade X-52, EFW manufactured, .375 inch nominal wall pipe. Sections of .358, .385, .387, .404, .429, .462, .469, .485, .500, .508, .562, .577, .600, .625 and .656 inch nominal wall pipe were also reported.

Inspection Tool Run

The survey launched April 26 at 7:20 a.m. and trapped April 26 at 9:14 p.m. was accepted as the Log of Record. Natural Gas propelled the Linalog survey tool for approximately 13 hours and 54 minutes at an average speed of 5.13 miles per hour. MFL Sensor number 110 was intermittent throughout the survey. No other problems were reported and no additional runs were authorized.

Verification Dig Sites

No verification digs were performed while Pipeline Services personnel were on location.

Survey History With Tuboscope

This is a repeat inspection of this line by Tuboscope Pipeline Services Inc. The prior inspection was completed in April of 2001 under Job Number 6264.05. Refer to Special Report Notations for comments regarding changes in interpretation procedures and comparisons of data to previous surveys.

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LINALOG[®] Hard Spot
Inspection Report

Release Aa	23 Jun 2005	Initial Release by Tuboscope Pipeline Services
Version 1	25 Nov 2019	Re-analysis of Hard Spot data

Duke Energy Gas Transmission
63.52 mi. x 30" Line 15
Mt. Pleasant – Gladeville
Run Date: 29 Apr 2005
Job #: 10008.02
Run 1

2 Scope and Results of 2005 Inspection

Duke Energy Gas Transmission (now Enbridge) contracted Tuboscope Pipeline Services to perform a Hard Spot survey for 63.52 mile section of the 30" Line 15 pipeline, from Mt. Pleasant to Gladeville. Tuboscope is a predecessor of the business owned by NDT Global LLC., and is no longer in business. The primary objective of this inspection survey was to collect and analyze hard spot data for localized hardening indications within this pipeline segment.

3 Operational Details

3.1 Pipeline & Medium Information

Pipeline Name	Line 15
Launch – Trap	Mt. Pleasant - Gladeville
Length of Inspected Pipeline Section	63.52 miles
Pipeline Diameter	30"
Nominal Pipe Wall	0.375"
Wall Thickness Range	0.385", 0.387", 0.404", 0.406", 0.429", 0.431", 0.438", 0.441", 0.462", 0.464", 0.469", 0.500", 0.508", 0.562", 0.577", 0.625", 0.656", 0.688"
Weld Type(s)	EPW
Pipe Grades)	X52
Minimum Bend Radius	3D
Usual Medium	Natural gas
Medium Used for Inspection	Natural gas
Average Flow Velocity during Inspection	5.45 mph

3.2 Inspection Run Details

The survey launched on 29 Apr at 6:51 am and trapped 29 Apr at 6:35 pm and was accepted as the Log of Record. Natural gas propelled the survey tool for approximately 11 hours and 44 minutes at an average speed of 5.45 mph. Hard spot sensor number 4 became inoperable at the launch and remained inoperable throughout the survey. No other problems were reported and no additional runs were authorized.

3.3 Data Quality

The run was successful and data was complete.

Tuboscope

Pipeline Services

Linalog HR PLUS with Hardspot
Pressure Ratio
Pipeline Survey Report

For

DUKE ENERGY GAS TRANSMISSION

24" Line 11
Huntsville to Lufkin
Surveyed July 20, 2005
Job Number 10015.01
Run 2

**24" Line 15
Huntsville to Lufkin
Job Number 10015.01**

This section of Duke Energy Gas Transmission's line was surveyed by Tuboscope Pipeline Services in July of 2005. The 61.09 mile section, located in Texas, is reported to be constructed primarily of Grade X-52, ERW manufactured, .312 inch nominal wall pipe. Sections of .500, .544, .594, .388, and .372 inch nominal wall pipe were also reported.

Inspection Tool Run

The survey launched July 20 at 8:26 a.m. and trapped July 20 at 7:40 p.m. was accepted as the Log of Record. Natural gas propelled the Linalog survey tool for approximately 11 hours and 14 minutes at an average speed of 5.4 miles per hour. Hardspot Channels 25, 26, and 27 became intermittent at the launch. Some AGM locations (1, 3, 9, 13, and 23) could not be matched with the station numbers. The tool's speed was occasionally outside its primary range of effectiveness (.5 to 7 miles per hour). Refer to Special Report Notations for comments regarding tool velocity. No other problems were reported and no additional runs were authorized.

Verification Dig Sites

No verification digs were performed while Tuboscope Pipeline Services personnel were on location.

Survey History With Tuboscope

This is a repeat inspection of this line by Tuboscope Pipeline Services Inc. The prior inspection was completed in April of 1993 under Job Number 2873.01. Data comparison is done from the prior survey; however, please note that previous grades are only transferred if the survey was performed within the last five years. Refer to Special Report Notations for comments regarding changes in interpretation procedures and comparisons of data to previous surveys.



PHMSA Form 8860, Rev. 10/2007. For more information on this form, visit <http://www.phmsa.dot.gov>.

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Linalog HR Plus with Hard Spots & DEF Inspection Report

Pipeline: 30" Texas Eastern -Whee_Athe_15 - Wheelersburg
Compressor Station to Athens Compressor Station

Customer: Spectra Energy Transmissions

Run Date: July 9, 2008

Run ID: 10611.01



LINALOG[®] HR Plus & Def
with Hard Spot & INS/GPS
Inspection Report

Release Aa	30 Sep 2011	Initial Release
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Spectra Energy

79.7 mi. x 30" KOSC-EGYP_15

Kosciusko - Egypt

Run Date (HR Plus & Def): 11 July 2011

Job # (HR Plus & Def): 70157.01

Run Date (Hard Spot): 15 July 2011

Job # (Hard Spot): 70158.01

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Report Date: 30 Sep 2011, Rel: Aa



Executive Summary

Spectra Energy contracted NDT Systems & Services to perform an HR Plus & Def with Hard Spot & INS/GPS survey for a 79.7 mile section of the 30" KOSC-EGYP_15 pipeline, from Kosciusko to Egypt. The primary objectives of this survey were to collect and analyze magnetic flux leakage data for anomalies, deformation data for mechanical deviations, inertial data for pipeline mapping, and hard spot data for localized hardening indications.

The criteria for pressure-based reporting used interaction of 1" x 6t, the code Modified B31G 0.85dl, pressure ratio of FPR, MAOP of 1000 psi, and information from the pipe segments list. There are **NO** anomalies that have an FPR ≤ 1.1 .

Analysis of the data shows that 515 joints contain possible metal loss features. Of these, 463 are in the <30% range, 39 are in the 30-39% range, 7 are in the 40-49% range, 3 are in the 50-59% range, and 3 are in the >60% range.

In this section of pipeline, there are 3 indications of dents, **NO** indications of ovalities, and 18 indications of expansions that meet the minimum reporting criteria. In addition, there is 1 indication of a dent occurring on a girth weld that measures below the minimum reporting criteria.

There are 34 indications of hard spots that measure 200 – 300 Brinell and 1 indication of a hard spot that measures 301 – 400 Brinell.

The results listed here and in the Pipeline Register are NDT Systems & Services' best evaluations of the condition of a pipeline at the time of the survey. Evaluations are based on information provided by Spectra Energy, and data obtained from similar surveys.

For clarification of any aspect of a survey, please contact our office. NDT Systems & Services welcomes the opportunity to provide continued service to Spectra Energy.



**LINALOG[®] HR Plus &
Hard Spot with INS/GPS
Inspection Report**

Release Aa	26 Jul 2011	Initial Release
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Spectra Energy
75.5 mi. x 30" TOMP-DANV Line 15
Tompkinsville – Danville
Run Date: 05 Apr 2011
Job #: 70130.01
Run 1

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Reprint Date: 26 Jul 2011, Rel. Aa



Executive Summary

Spectra Energy contracted NDT Systems & Services to perform an HR Plus & Hard Spot with INS/GPS survey for a 75.5 mile section of the 30" TOMP-DANV Line 15 pipeline, from Tompkinsville to Danville. The primary objectives of this survey were to collect and analyze magnetic flux leakage data for anomalies, hard spot data for localized hardening indications, and inertial data for pipeline mapping.

The criteria for pressure-based reporting used interaction of 1" by 6t, the code Modified B31G 0.85dl, pressure ratio of FPR, MAOP of 1000 psi, and information from the pipe segments list. There are **NO** anomalies that have an FPR > 1.0.

Analysis of the data shows that 1295 joints contain possible metal loss features. Of these, 1190 are in the < 30% range, 87 are in the 30-39% range, 15 are in the 40-49% range, 2 are in the 50-59% range, and 1 is in the >60% range.

There are 14 indications of hard spots that measure 200 – 300 Brinell and 2 indications of hard spots that measure 301 – 400 Brinell.

The results listed here and in the Pipeline Register are NDT Systems & Services' best evaluations of the condition of a pipeline at the time of the survey. Evaluations are based on information provided by Spectra Energy, and data obtained from similar surveys.

For clarification of any aspect of a survey, please contact our office. NDT Systems & Services welcomes the opportunity to provide continued service to Spectra Energy.



LINALOG[®] HR Plus & Def
with Hard Spot & INS/GPS
Inspection Report

Release Aa	16 Aug 2012	Initial Release
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Spectra Energy
48.8 mi. x 30" Line 15
Berne – Holbrook
Run Date: 05 June 2012
Job #: 70320.01
Run 1

1 Scope of Inspection

Spectra Energy contracted NDT Systems & Services to perform an HR Plus & Def & with Hard Spot & INS/GPS survey for a 48.8 mile section of the 30" Line 15 pipeline, from Berne to Holbrook. The primary objectives of this survey were:

- To collect and analyze magnetic flux leakage data for anomalies.
- To collect and analyze deformation data for mechanical deviations.
- To collect and analyze inertial data for pipeline mapping.
- To collect and analyze hard spot data for localized hardening indications.

2 Operational Details

2.1 Pipeline & Medium Information

Pipeline Name	Line 15
Launch – Trap	Berne – Holbrook
Length of Inspected Pipeline Section	48.8 miles
Pipeline Diameter	30"
Wall Thickness Range	0.375", 0.358", 0.385", 0.386", 0.387", 0.404", 0.425", 0.462", 0.464", 0.469", 0.485", 0.500", 0.508", 0.525", 0.625", 0.656"
Weld Type(s)	DSAW, FW, SPRL
Pipe Grade(s)	X52, X46, X60, X65, X70
Usual Medium	Natural Gas
Medium Used for Inspection	Natural Gas
Average Flow Velocity during Inspection	5.34 mph

2.2 Inspection Run Details

An inspection run was performed on 05 Jun 2012. The Linalog Max tool was launched at 12:38 p.m. and trapped at 8:50 p.m. Natural gas propelled the tool for 8 hours and 12 minutes at an average speed of 5.34 mph. It was reported by the field crew that the tool was in good condition. There was no debris reported.

2.3 Data Quality

During the inspection run, Hard Spot sensors #37-42 failed at ~127300 ft. The data were downloaded from the recorder flash drive to a hard drive, converted with the LinaView software suite, and inspected by NDT personnel in the field. Internal diagnostics on the tool and visual inspection confirmed that the data quality was acceptable for full circumferential analysis. This survey (Job # 70320.01) was accepted as the Log of Record.



Inline Inspection Draft Final Report

B15-630Aa

Line ID: L111_PERU-11

Run Date: August 26, 2015

Report Date: December 7, 2015

Utility Station:

in

Pipeline Station:

Texas Eastern Transmission, LP



High Res MFL Combo

General Run Information

Pipeline Name	LILL_PERU-12	
Job #	B15-630Aa	
	Launcher	Receiver
Station	Lilly Station	Perulack Station
Location(city, county, state)	Lilly, PA	Perulack, PA
Date / Time	09/28/2015 8:13 AM	

Sensors	MFL	Res.	Cal.	IDOD	INS
Total	166	166	84	84	323y / 3Acc
Rec	166	166	84	84	323y / 3Acc
Bad	31, 32	1, 2, 5 7, 8			0 / 0

Product	Natural Gas			
MAOP (psig)	1050.0			
Pipe Diameter	24.000 inches			
Length	55.99 miles			
Hours				
Criteria(s) Used	Modified B31G			
Interaction Rules	Axial Spacing	1.0 inch	Circumferential Spacing	6.0T

Inspection Quality & Findings

Deformations w/ Metal Loss	30
Deformation Indications	392
Dent < 2% O.D.	371
Dent < 3% O.D.	21
Dent < 5% O.D.	0

Depth %	ML Indications clusters	Internal		External
		< 20%	20% - 39%	40% - 69%
< 20%	4963	400	4554	3704
20% - 39%	837	45	789	81
40% - 69%	51	0	51	0
> 70%	0	0	0	0

Manufacturing Indications	135	Metal In-Close Proximity	447	AGMs	54	Bends	798
M.I Defects	73	Irregular Welds	5	Casings	47	Factory Bends (< 3D)	0
Rough Long Seam	0	Debris Indications	1	Repair Sleeves	0	Field Bends (> 12D)	798
Heat Affect Zones	37			Patches			
				Composite Wrap			

Hard Spot Indications

A separate algorithm is assigned to the detection of 'Hard Spot', this algorithm compares the field of Residual and MFL, as well as, the draw or flattening of the caliber at the produced point of Hard Spot; no indication of Hard Spot is found on this line section.

Stress Crack Corrosion

SCC is not acquired by axial aligned MFL survey tools; now has been logged by this survey.

Lamination

Review of this project has found one location of potential lamination. A typical line having lamination has very positive indicators of short rounded caliber indication, in conjunction with specific signatures on both the Residual and the MFL fields.

- During the complete analysis of this pipeline, one location of potential lamination is present at Enduro Station 707+00.89 – an area of 12 inches long and 14 inches wide is suspected.
 - o This location is listed as a Manufacturing Indication with the following comment: "This mill related area is showing small rounded caliber indication (reductions), the MFL is showing a loss of metal reading; this would be typical of a mid-wall lamination".

Hard Spot Indications

A separate algorithm is assigned to the detection of 'Hard Spot', this algorithm compares the field of Residual and MFL to a draw or flattening of the caliber at the produced point of Hard Spot; no indication of Hard Spot is found on this line section.

Metal in Close Proximity Indications

There are indeed a large number of close metal calls seen in both this survey and the previous data; however, many of the close metal calls previously made are pipe texture, added metal, and not metal in close proximity. These are being reviewed and either trimmed from the report or changed to the appropriate classification.

Burst Pressure Issues: *calculated with interaction rules of [Axial – 1.0 inch] [Circumferential – 6.0T].
Please refer to the Enduro Pipeline Listing and/or the Metal Loss Listing for calculated Burst Pressure information.*

Pipe Construction and Wall Change Issues

The data supplied appears to be a consolidation of at least two different reports from ILI vendors or from in-house compiled records, specifically – there are a great many differences in alignment with the pipe construction type and the wall changes.

- The importance of this is that your heavy wall pipe (for the most part) is DS&W construction, while the general nominal line pipe is (as provided) ELP construction.
 - o The alignment difference between the data runs from around 40 feet to a couple of hundred feet at times.
 - o Weld signature is very obvious where the DS&W pipe is used and has been added (where it was not supplied) and aligned to the correct location.

Inspection Details

General Run & Line Information

The tool was run in a Natural Gas environment at an average speed of 5.99 miles per hour for a length of 300,339 feet.

- At no time did the tool incur over-speed.

The line at the time of the survey appeared clean with a smooth interior wall surface, the survey tool being received with minimal debris in the brushes; some solid material was attached to the sensors and collected in the brush unit. The odometer wheels were working freely and proper data was recorded throughout the survey.

Tool and Data Condition

The tool was received on time and in good condition. All data sets worked correctly, with only a minimum amount of sensor issues (see sensor count above); no mechanical damage was found.

- The data quality from this survey is very good.

As provided by Texas Eastern Transmission, LP

- The MAOP/MOP is 1050.0 psi for the pipeline.
- You have requested the reports be prepared using Modified B31G calculations.
- The interaction rules used are: [Axial – 1.0 inch] [Circumferential – 8.0T].
- The year of construction ranges from the 1950's through the 1980's.
- Pipe Grades X42, X46, X52, X60, X65, and X70 are used for this pipeline.

Pipe Construction

The pipe construction used is EFW and DSAW as relayed in the above mentioned email; some seamless pipe is found and previous logging has ELF identified in the records. Records are unclear as to which construction of pipe has been used; in these cases, Enduro had defaulted to Seam Weld (SW) and so noted.

- DSAW weld seam is quite recognizable and suggestion comments have been made where DSAW is expected.

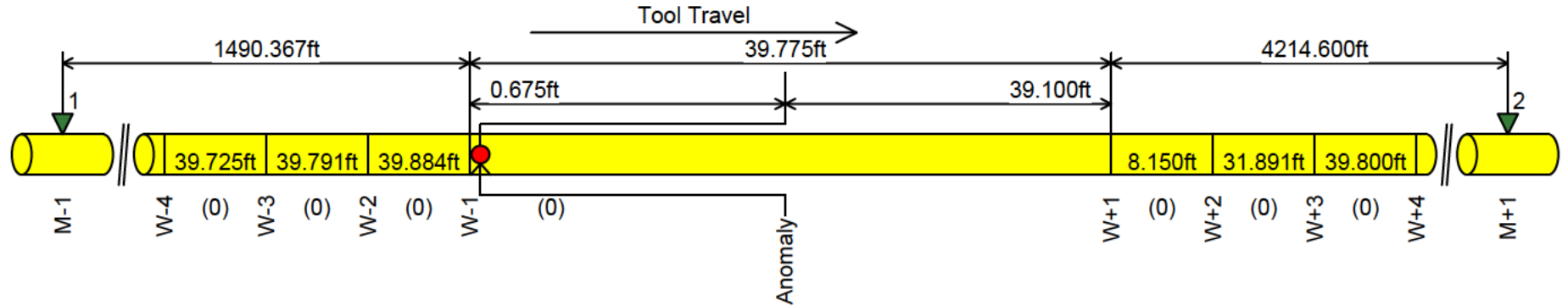
Repairs to the line section

- There are many locations that appear to be repaired, seen by the presence of "Marker Band Area" on both sides of the repair locations:
 - No documentation has been found to establish the use of "Composite Wrap"
- There were no metal sleeves found on the line.
- If available, please review your repair records to verify and provide feedback for future line analysis considerations.

Client : Duke Energy
 Job # : 10186.01
 Run Date : 5/31/2006

Line Name : AGT 26" M/L
 Section Name : Lambertville to Stony Point
 Pipe Diameter : 26"

Dig Information Sheet



Anomaly : NCA
 Top/Left : 2:20/314288.617ft
 Distance : 314288.617ft
 Length : 0.00"
 Clock : 02:20
 Speed : 5.5mph
 ID/OD : Undefined
 Comments : HS 251 Brinell
 Latitude :
 Longitude :
 Elevation : 624.472

	<u>Distance</u>	<u>Comments</u>
M-1	312797.575ft	AGM 3133+50 MP 59.35 Skyline Drive
W-4	314168.542ft	
W-3	314208.267ft	
W-2	314248.058ft	
W-1	314287.942ft	
W+1	314327.717ft	
W+2	314335.867ft	
W+3	314367.758ft	
W+4	314407.558ft	
M+1	318542.317ft	AGM 3172+04 MP 60.08 Skyline and House