



1595 So. Hwy 150, Suite F
Evanston, WY 82930

Inspections Performed for: FMC Technologies Completion	
Inspection Report for: LH-0033	
Remaining Life: 20+ YRS	Date of this Report: 08/27/2013
Average Corrosion Rate: 9 MPY	Next Inspection Due Date: 08/27/2014
Manufacturer: DynaCorp Fabricators	Mfg Serial #: 6J111050
Date Built: 2012	National Board #: None
Alberta registration #: 617901	Canadian Registration #: T9862.2

FMC Technologies Completion LH-0033 Line Heater



PRESSURE VESSEL INVENTORY

☒ Code ☐ Code-invalidated ☐ Non-Code ☐ Unknown ☐ Code-Exempt

☐ High Consequence (HCO) ☐ Medium Consequence (MCO) ☐ Low Consequence (LCO)

VESSEL ID INFORMATION

Company Name : FMC Technologies Completion
Facility/Location Name : PA District
Field Name : N/A
Equipment Number : LH-0033
Eq/Circ. ID : LH0033-C1/ LH0033-C2
Equipment Name/Service : LH0033 Line Heater (w/two coils)
Physical Location : Canonsburg Yard
GPS Coordinates :

VESSEL DESCRIPTION AND SERVICE CONDITIONS

Type of Vessel: Horizontal Line Heater

Vessel Size: N/A Coils = 4.500"

Operating Pressure Range (psig):

Operating Temperature Range (°F):

Does the vessel have Internal Access? ☒ Yes ☐ No

Specify type of internal access, if available: When coils are removed (only internal access)

Vessel is located: ☐ Inside ☒ Outside ☐ Under Roof

MISCELLANEOUS VESSEL INFORMATION: (IF VESSEL HAS NO NAMEPLATE, PLEASE OBTAIN AS MUCH OF THE FOLLOWING AS POSSIBLE FOR WORST CASE TMIN CALCULATIONS, *may have to check with operations personnel*).

Is there a Long Seam? ☐ Yes ☐ No

Any stamping pertaining to materials of construction? ☐ Yes ☐ No

****Diameter****(strap equipment): _____

Pressure (highest the equip. sees in the process and/or check PSV setting if available) _____ psi

Temperature (highest the equipment would ever see in the process) _____

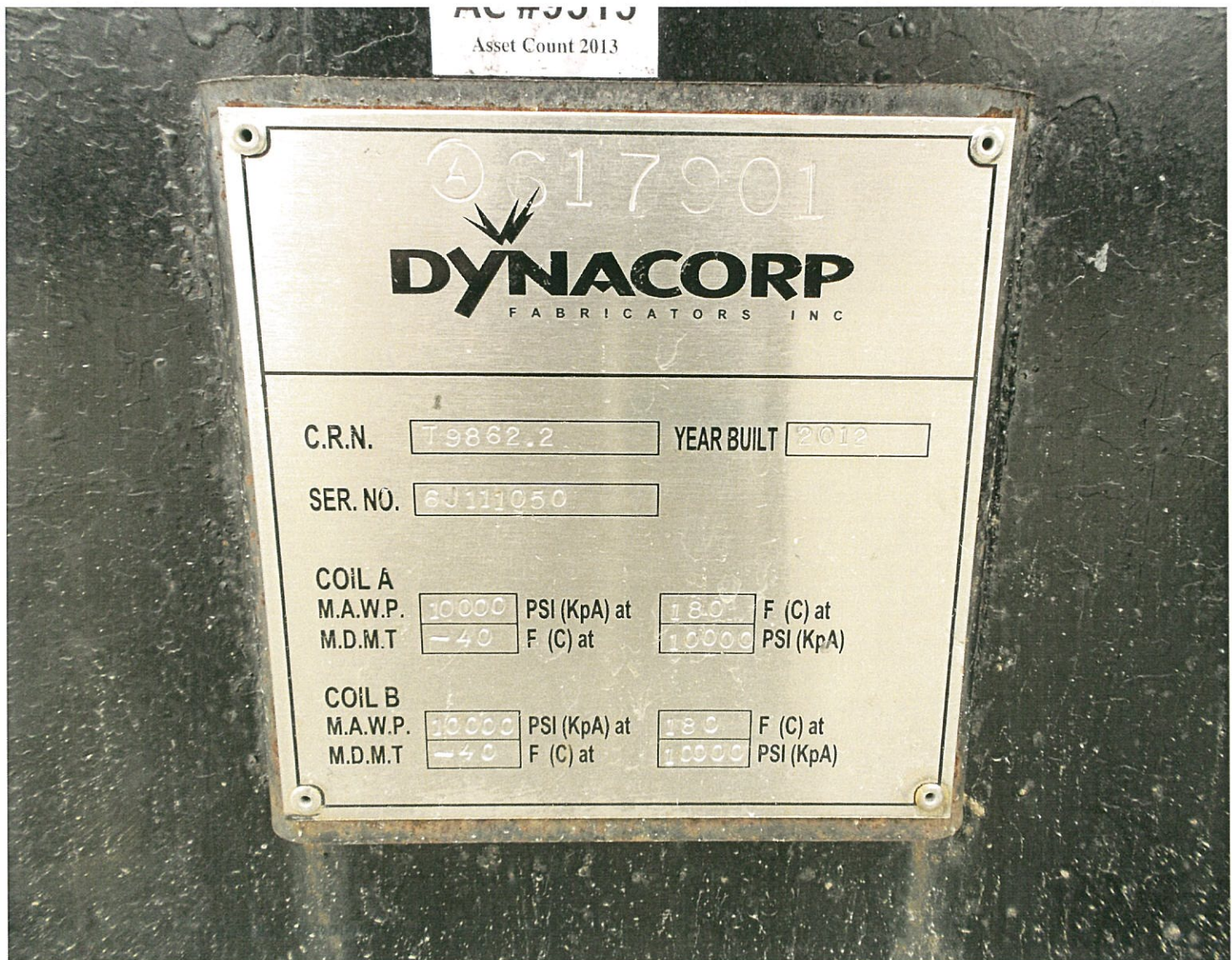
Approximate Date built or installed (check associated equipment or info at facility) _____

Any other pertinent information: _____

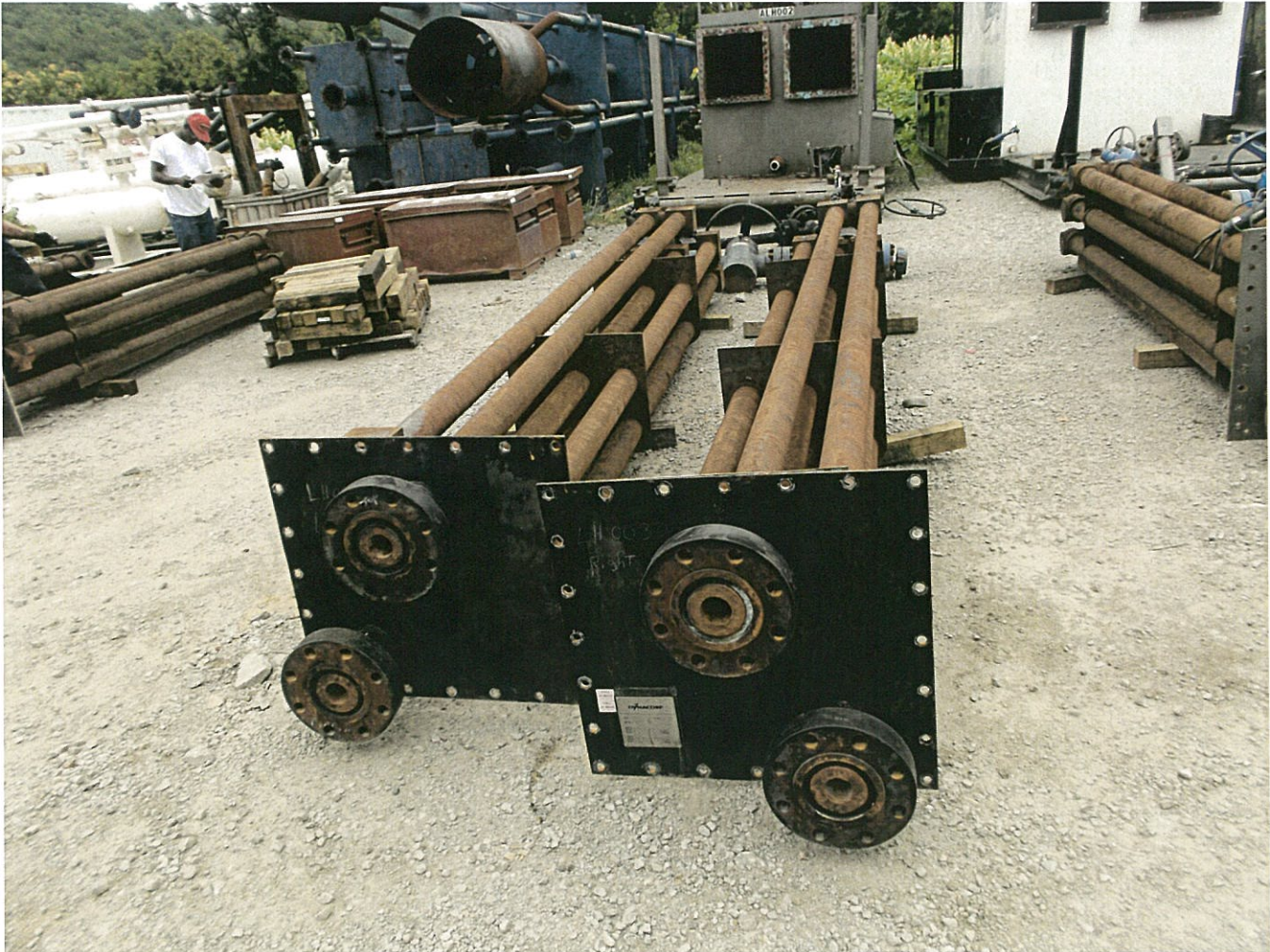
ORIGINAL VESSEL NAMEPLATE/STAMPING INFORMATION

Code stamp: ☐ U stamp ☐ U2 stamp ☐ UM stamp ☐ API-ASME ☒ No stamp

Nameplate Coils # 1 and Coils # 2



Coil # 1 and Coil # 2



VESSEL DOCUMENTATION

Manufacturer Data Sheets: ☐ ASME U-1 or U-1A Forms ☐ U2 or U4 Supplemental Forms
☐ Documentation relating to repair/alteration/rerating work: (R-1 form, calculations, revised drawings, inspection reports, etc.)

Name: Eric Crandall

Date: 08/27/2013

API 510 PRESSURE VESSEL EXTERNAL INSPECTION

Company Name: FMC Technologies Completion	
Facility/Location Name: PA District	
Equipment Number: LH-0033	Eq/Circ. ID: LH0033 C1 /C2
Equipment Name/Service: Line Heater	
Physical Location: Canonsburg Yard	
Manufacturer: DynaCorp Fabricators, INC	Manufacturer Serial Number: 6J111050
Year Built: 2012	National Board Number: None
Alberta Registration #: 617901	Canadian Registration # T9862.2

Reason for Inspection: Initial API-510 Stream Inspection

Condition of Nameplate and/or Bracket: Nameplate is intact and legible. The nameplate bracket is securely attached. Nameplate is in new condition with no surface corrosion present.

Internal Access: Yes, when coils removed (only internal access).

Corrosion Monitoring Locations (CMLs) and baseline thickness data established: CMLs and baseline thickness data will be established as part of this inspection.

Grounding Device in Place and Secure?: N/A. The equipment is grounded through the skid. The line heater was not in service at the time of this inspection.

Condition of Foundation and Anchor Bolts: There are no anchor bolts. Line heater is welded directly to the skid. All attachment welds are smooth with good weld profile.

Condition of Steel Supports, Saddles, and Bolting: N/A

Condition of Paint and/or Insulation: The paint is in good condition with no chipping or peeling. Line Heater coating is in acceptable condition.

Condition of Nozzles, Flanges, Repads, and Weepholes: Nozzles and flanges are in new condition. All flange bolting is in place and secure. There is no evidence of flange leaks or leaks at any of the threaded connections. There is no evidence of leaks at any of threaded connections. All Line Heater flanges are in new condition with no surface corrosion present.

Condition of Welds; Head and Shell Metal Surfaces: All (exposed) metal surfaces are painted. There is no distortion or indication of corrosion beneath the paint coating. The pressure boundary welds have no visual weld defects.

Condition of Ladders, Stairways, and Brackets: Access ladders and stairways are in acceptable condition. Ladder is in acceptable condition.

If Equipment has Anomalous Data, did the Inspector check it? N/A

Is There a PSV on the Vessel? Overpressure protection is on the associated piping

If yes, is it set at or below the MAWP? N/A

Date PSV last tested (if there is a tag on the valve): N/A

Comments:

Fire tube is in acceptable condition with light scale surface corrosion present

Recommendations:

Repairs Needed:

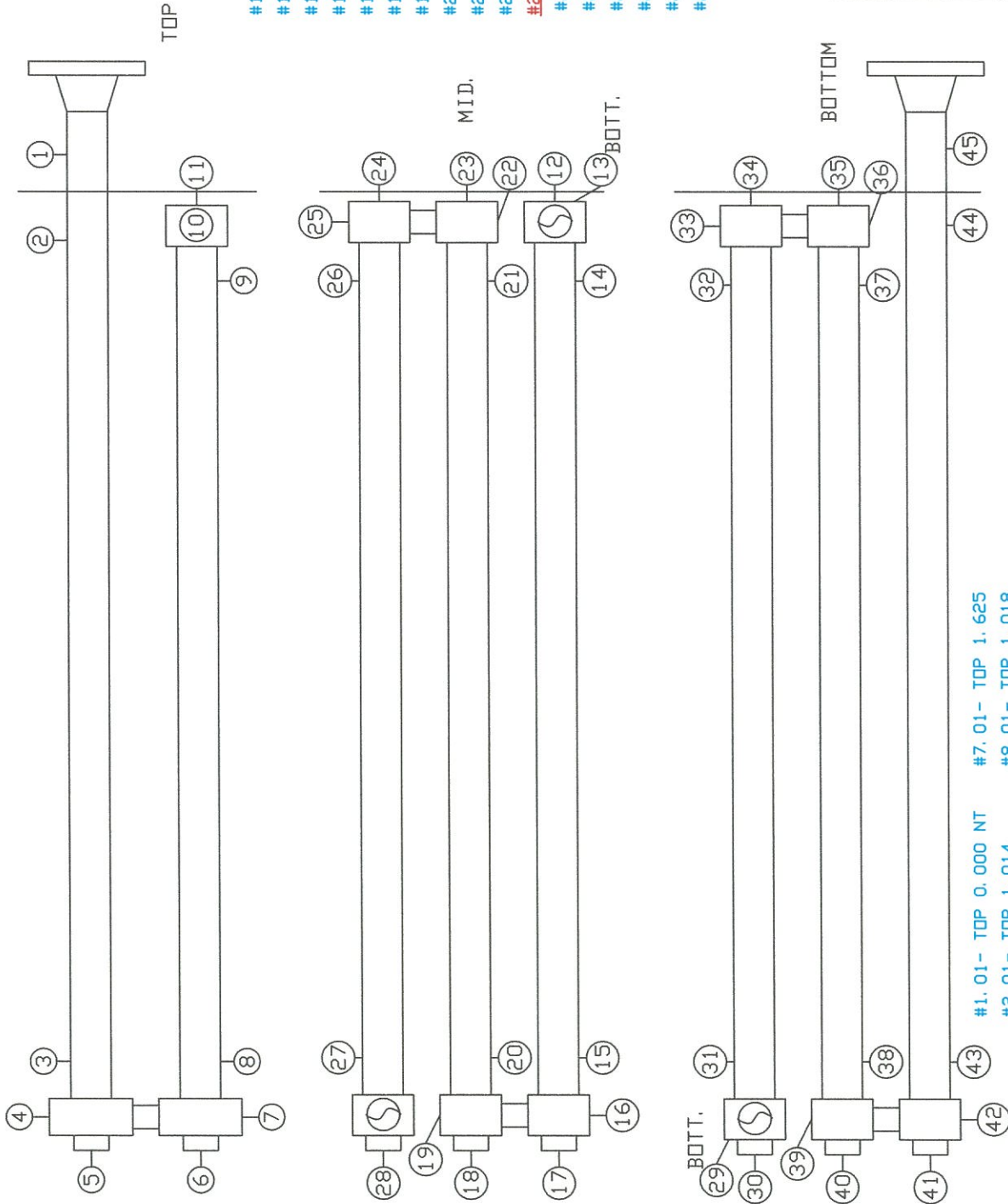
API 510 Inspector Signature
Robert W. Menke/EAC

API 510 Inspector Number
0131

Date
08/27/2013

EQUIP RETIREMENT DATE: 4/17/2046
NEXT INSPECTION IS DUE: 8/27/2014

NAMEPLATE INFO	
MFG	DYNACORP
SERIAL NUMBER	6J111050
A NUMBER	617901
DATE BUILT	2012
DESIGN P & T	10,000 psi @ 180°F
NOTE	CRN # T9862-2



- #13.01- MID 1.104 #30.01- BTM 1.629
- #14.01- MID 1.026 #31.01- BTM 1.025
- #15.01- MID 0.997 #32.01- BTM 1.003
- #16.01- MID 1.618 #33.01- BTM 1.637
- #17.01- MID 2.496 #34.01- BTM 2.511
- #18.01- MID 1.617 #35.01- BTM 1.663
- #19.01- MID 0.000 NT #36.01- BTM 2.535
- #20.01- MID 0.997 #37.01- BTM 1.007
- #21.01- MID 1.008 #38.01- BTM 1.062
- #22.01- MID 1.674 #39.01- BTM 0.000 NT
- ~~#23.01- MID 2.476~~ #40.01- BTM 1.742
- #24.01- MID 1.612 #41.01- BTM 2.520
- #25.01- MID 2.490 #42.01- BTM 1.648
- #26.01- MID 1.000 #43.01- BTM 0.996
- #27.01- MID 1.023 #44.01- BTM 1.982
- #28.01- MID 2.490 #45.01- BTM 1.034
- #29.01- BTM 0.000 NT

CAL= 70°F		PIPE= 70°F	
BUSINESS UNIT	FMC TECHNOLOGIES	COMPLETION	
EQ/CIRC ID #	LH0033-C1		
EQUIP NAME	LINE HEATER (WITH 2 COILS)		
DWG #	LH0033-C1		

DESC: COIL A ON LH-0033 LINE HTR; SN: 6J111050
DWG#: LH0033-C1-1.01-45.01

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C1
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL A ON LINE HEATER; SN:6J111050

Summary: Group Name:
Insp. Due Date = 08/27/2014
Pred. Ret. Date = 04/17/2046

Group Description:
RCR = 7.2 MPY
Rem. Life (from last survey 08/27/2013) = 32.6 yrs

0 C.A. Status: No
Total Caution TMLs = 1

TML No	Location	Ctn TML	First Survey Thick Nt	First Date	Previous Survey Thick Nt	Previous Date	Last Survey Thick	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
1.01	TOP	N		N/A		N/A	1.000 NM	06/15/2012	N/A	N/A	N/A	0	0.875 U	0.1	06/25/3262	06/15/2013
2.01	TOP	N	1.000 NM	06/15/2012		N/A	1.014	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3403	08/27/2014
3.01	TOP	N *	1.000 NM	06/15/2012		N/A	0.987	08/27/2013	N/A	10.8	N/A	10.8	0.875 U	10.8	01/10/2024	08/27/2014
4.01	TOP	N	1.625 NM	06/15/2012		N/A	2.516	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
5.01	TOP	N	1.000 NM	06/15/2012		N/A	1.369	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/11/4013	08/27/2014
6.01	TOP	N	1.625 NM	06/15/2012		N/A	1.757	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
7.01	TOP	N	1.625 NM	06/15/2012		N/A	1.625	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
8.01	TOP	N	1.000 NM	06/15/2012		N/A	1.018	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3443	08/27/2014
9.01	TOP	N	1.000 NM	06/15/2012		N/A	1.012	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/07/3383	08/27/2014
10.01	TOP	N	1.625 NM	06/15/2012		N/A	1.653	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
11.01	TOP	N	2.500 NM	06/15/2012		N/A	2.494	08/27/2013	N/A	5.0	N/A	5.0	2.000 U	5.0	06/16/2112	08/27/2014
12.01	MID	N	1.625 NM	06/15/2012		N/A	1.668	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
13.01	MID	N	1.000 NM	06/15/2012		N/A	1.104	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/11/4013	08/27/2014
14.01	MID	N	1.000 NM	06/15/2012		N/A	1.026	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/09/3523	08/27/2014
15.01	MID	N *	1.000 NM	06/15/2012		N/A	0.997	08/27/2013	N/A	2.5	N/A	2.5	0.875 U	2.5	06/15/2062	08/27/2014
16.01	MID	N	1.625 NM	06/15/2012		N/A	1.618	08/27/2013	N/A	5.8	N/A	5.8	1.300 U	5.8	06/25/2068	08/27/2014
17.01	MID	N	2.500 NM	06/15/2012		N/A	2.496	08/27/2013	N/A	3.3	N/A	3.3	2.000 U	3.3	12/17/2163	08/27/2014
18.01	MID	N *	1.625 NM	06/15/2012		N/A	1.617	08/27/2013	N/A	6.7	N/A	6.7	1.300 U	6.7	12/19/2060	08/27/2014
19.01	MID	N		N/A		N/A	1.625 NM	06/15/2012	N/A	N/A	N/A	0	1.300 U	0.1	06/30/4012	06/15/2013
20.01	MID	N *	1.000 NM	06/15/2012		N/A	0.997	08/27/2013	N/A	2.5	N/A	2.5	0.875 U	2.5	06/15/2062	08/27/2014

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C1
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL A ON LINE HEATER; SN:6J111050

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 04/17/2046

Group Description:
RCR = 7.2 MPY
Rem. Life (from last survey 08/27/2013) = 32.6 yrs

0 C.A. Status: No
Total Caution TMLs = 1

TML No	Location	Ctn TML	First Survey Thick Nt	First Date	Previous Survey Thick Nt	Previous Date	Last Survey Thick	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
21.01	MID	N	1.000 NM	06/15/2012		N/A	1.008	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/07/3343	08/27/2014
22.01	MID	N	1.000 NM	06/15/2012		N/A	1.674	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/11/4013	08/27/2014
23.01	MID	Y *	2.500 NM	06/15/2012		N/A	2.476	08/27/2013	N/A	20.0	N/A	20.0	2.000 U	20.0	06/15/2037	08/27/2014
24.01	MID	N *	1.625 NM	06/15/2012		N/A	1.612	08/27/2013	N/A	10.8	N/A	10.8	1.300 U	10.8	07/18/2042	08/27/2014
25.01	MID	N	1.000 NM	06/15/2012		N/A	2.490	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/11/4013	08/27/2014
26.01	MID	N	1.000 NM	06/15/2012		N/A	1.000	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/06/3263	08/27/2014
27.01	MID	N	1.000 NM	06/15/2012		N/A	1.023	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/07/3493	08/27/2014
28.01	MID	N	2.500 NM	06/15/2012		N/A	2.490	08/27/2013	N/A	8.3	N/A	8.3	2.000 U	8.3	09/09/2072	08/27/2014
29.01	BTM	N		N/A		N/A	1.625 NM	06/15/2012	N/A	N/A	N/A	0	1.300 U	0.1	06/30/4012	06/15/2013
30.01	BTM	N	1.625 NM	06/15/2012		N/A	1.629	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
31.01	BTM	N	1.000 NM	06/15/2012		N/A	1.025	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3513	08/27/2014
32.01	BTM	N	1.000 NM	06/15/2012		N/A	1.003	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/05/3293	08/27/2014
33.01	BTM	N	1.625 NM	06/15/2012		N/A	1.637	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
34.01	BTM	N	2.500 NM	06/15/2012		N/A	2.511	08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
35.01	BTM	N	1.625 NM	06/15/2012		N/A	1.663	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
36.01	BTM	N	2.500 NM	06/15/2012		N/A	2.535	08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
37.01	BTM	N	1.000 NM	06/15/2012		N/A	1.007	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/06/3333	08/27/2014
38.01	BTM	N	1.000 NM	06/15/2012		N/A	1.062	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/11/3883	08/27/2014
39.01	BTM	N		N/A		N/A	1.000 NM	06/15/2012	N/A	N/A	N/A	0	0.875 U	0.1	06/25/3262	06/15/2013
40.01	BTM	N	1.625 NM	06/15/2012		N/A	1.742	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
41.01	BTM	N	2.500 NM	06/15/2012		N/A	2.520	08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C1
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL A ON LINE HEATER; SN:6J111050

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 04/17/2046

Group Description:
RCR = 7.2 MPY
Rem. Life (from last survey 08/27/2013) = 32.6 yrs

0 C.A. Status: No
Total Caution TMLs = 1

TML No	Location	Ctn TML	First Survey Thick	First Survey Nt	First Date	Previous Survey Thick	Previous Survey Nt	Previous Date	Last Survey Thick	Last Survey Nt	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
42.01	BTM	N	1.625 NM		06/15/2012			N/A	1.648		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
43.01	BTM	N *	1.000 NM		06/15/2012			N/A	0.996		08/27/2013	N/A	3.3	N/A	3.3	0.875 U	3.3	04/28/2050	08/27/2014
44.01	BTM	N	1.625 NM		06/15/2012			N/A	1.982		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
45.01	BTM	N	1.000 NM		06/15/2012			N/A	1.034		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/09/3603	08/27/2014

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date: 10/21/2013

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Description: COIL A ON LINE HEATER; SN:6J111050

Unit: LH-0033
Eq/Circ ID: LH0033-C1
Design Code: S8/D1
Eq Type: PIPING
Class:
CM RBI:

TML Corrosion Rates are each the Maximum of:	:	
(A) -- Calculated Corrosion Rates x 1.00	:	Varies
(B) -- Default Corrosion Rate	:	0.1 MPY
Representative Corrosion Rate is the Maximum of:		
(A) -- Average Corrosion Rate x 1.00	:	1.8 MPY
(B) -- Average Max 25.0% of TMLs, Min of 2	:	7.2 MPY
(C) -- Formula Corrosion Rate (Sigma = 1.28)	:	2.1 MPY
(D) -- Default Corrosion Rate	:	0.1 MPY
Representative Corrosion Rate = 7.2 MPY	:	

TML thickness readings have not been compensated for high Temperatures.
TML thickness readings have been compensated for growths.

TML Life calculations are based on the Representative TML Corrosion Rate using Short Term and Long Term Corrosion Rates.

Nominal thickness is used for TML corrosion rate calculations with less than 3 surveys.

Minimum time between inspections required for corrosion rate calculation is 3 months.

TML Inspection Interval is:
(A) -- 1.00 years.

Eq/Circ ID Last Survey Date is based on the LAST of the last 0% of TML survey dates (Min 1).

Eq/Circ ID Estimated life = 32.6 years from the most recent survey date.
(Estimated Life based on the ave of the earliest 0% (Min 6) TML retirement dates.)

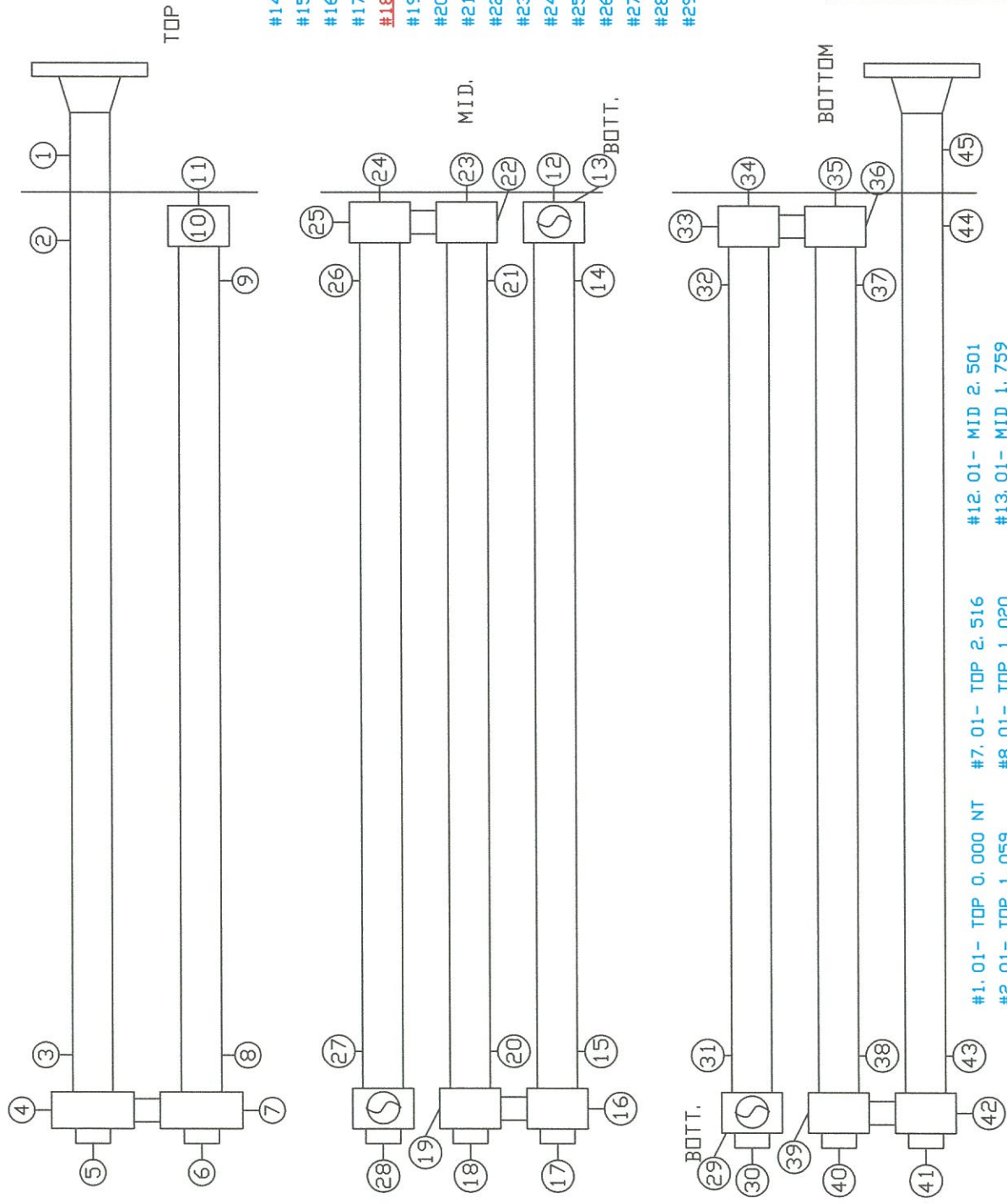
Predicted Eq/Circ ID Retirement date is 04/17/2046

Recommended Eq/Circ UT/RT Inspection Date is 08/27/2014
UT/RT Inspection Interval is 1.00 years.

Caution TML Logic: TML Corrosion Rate > 15.0 MPY .OR. TML Remaining Life < 3.00 Years.
There are 1 Caution TMLs in this Eq/Circ ID.

EQUIP RETIREMENT DATE: 1/2/2031
NEXT INSPECTION IS DUE: 8/27/2014

NAMEPLATE INFO	
MFG	DYNACORP
SERIAL NUMBER	6J11050
A NUMBER	617901
DATE BUILT	2012
DESIGN P & T	10,000 psi @ 180°F
NOTE	CRN # T9862-2



- | | |
|----------------------|----------------------|
| #14.01- MID 1.014 | #30.01- BTM 2.503 |
| #15.01- MID 0.983 | #31.01- BTM 1.002 |
| #16.01- MID 2.523 | #32.01- BTM 0.996 |
| #17.01- MID 1.623 | #33.01- BTM 2.494 |
| #18.01- MID 2.459 | #34.01- BTM 1.895 |
| #19.01- MID 1.620 | #35.01- BTM 2.520 |
| #20.01- MID 1.037 | #36.01- BTM 1.859 |
| #21.01- MID 1.009 | #37.01- BTM 0.977 |
| #22.01- MID 0.000 NT | #38.01- BTM 1.039 |
| #23.01- MID 1.662 | #39.01- BTM 0.000 NT |
| #24.01- MID 2.593 | #40.01- BTM 1.613 |
| #25.01- MID 1.650 | #41.01- BTM 2.506 |
| #26.01- MID 1.003 | #42.01- BTM 1.634 |
| #27.01- MID 1.034 | #43.01- BTM 1.030 |
| #28.01- MID 1.609 | #44.01- BTM 1.047 |
| #29.01- BTM 1.893 | #45.01- BTM 1.031 |

CAL= 70°F		PIPE= 70°F	
BUSINESS UNIT	FMC TECHNOLOGIES COMPLETION	EQ/CIRC ID #	LH0032-C2
EQUIP NAME	LINE HEATER (WITH 2 COILS)	DWG #	LH0033-C2

- | | | |
|---------------------|-------------------|-------------------|
| #1.01- TOP 0.000 NT | #7.01- TOP 2.516 | #12.01- MID 2.501 |
| #2.01- TOP 1.059 | #8.01- TOP 1.020 | #13.01- MID 1.759 |
| #3.01- TOP 1.008 | #9.01- TOP 1.016 | |
| #4.01- TOP 1.625 | #10.01- TOP 2.521 | |
| #5.01- TOP 2.469 | #11.01- TOP 1.640 | |
| #6.01- TOP 1.609 | | |

DESC: COIL B ON LH-0033 LINE HTR; SN: 6J111050
DWG#: LH0033-C2-1.01-45.01

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C2
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL B ON LINE HEATER; SN:6J111050

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 01/02/2031

Group Description:
RCR = 10.8 MPY

Rem. Life (from last survey 08/27/2013) = 17.4 yrs

0 C.A. Status: No
Total Caution TMLs = 2

TML No	Location	Ctn TML	First Survey Thick Nt	First Date	Previous Survey Thick Nt	Previous Date	Last Survey Thick Nt	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
1.01	TOP	N		N/A		N/A	1.000 NM	06/15/2012	N/A	N/A	N/A	0	0.875 U	0.1	06/25/3262	06/15/2013
2.01	TOP	N	1.000 NM	06/15/2012		N/A	1.059	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/10/3853	08/27/2014
3.01	TOP	N	1.000 NM	06/15/2012		N/A	1.008	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/07/3343	08/27/2014
4.01	TOP	N	1.625 NM	06/15/2012		N/A	1.625	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
5.01	TOP	N	1.625 NM	06/15/2012		N/A	2.469	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
6.01	TOP	N *	1.625 NM	06/15/2012		N/A	1.609	08/27/2013	N/A	13.3	N/A	13.3	1.300 U	13.3	11/20/2036	08/27/2014
7.01	TOP	N	1.625 NM	06/15/2012		N/A	2.516	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
8.01	TOP	N	1.000 NM	06/15/2012		N/A	1.020	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3463	08/27/2014
9.01	TOP	N	1.000 NM	06/15/2012		N/A	1.016	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3423	08/27/2014
10.01	TOP	N	1.625 NM	06/15/2012		N/A	2.521	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
11.01	TOP	N	1.625 NM	06/15/2012		N/A	1.640	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
12.01	MID	N	2.500 NM	06/15/2012		N/A	2.501	08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
13.01	MID	N	1.625 NM	06/15/2012		N/A	1.759	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
14.01	MID	N	1.000 NM	06/15/2012		N/A	1.014	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3403	08/27/2014
15.01	MID	N *	1.000 NM	06/15/2012		N/A	0.983	08/27/2013	N/A	14.2	N/A	14.2	0.875 U	14.2	04/05/2021	08/27/2014
16.01	MID	N	1.625 NM	06/15/2012		N/A	2.523	08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
17.01	MID	N	1.625 NM	06/15/2012		N/A	1.623	08/27/2013	N/A	1.7	N/A	1.7	1.300 U	1.7	08/29/2203	08/27/2014
18.01	MID	Y *	2.500 NM	06/15/2012		N/A	2.459	08/27/2013	N/A	34.2	N/A	34.2	2.000 U	34.2	01/28/2027	08/27/2014
19.01	MID	N	1.625 NM	06/15/2012		N/A	1.620	08/27/2013	N/A	4.2	N/A	4.2	1.300 U	4.2	11/05/2089	08/27/2014
20.01	MID	N	1.000 NM	06/15/2012		N/A	1.037	08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3633	08/27/2014

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C2
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL B ON LINE HEATER; SN:6J111050

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 01/02/2031

Group Description:
RCR = 10.8 MPY
Rem. Life (from last survey 08/27/2013) = 17.4 yrs

0 C.A. Status: No
Total Caution TMLs = 2

TM L No	Location	Ctn	First Survey Thick Nt	First Date	Previous Survey Thick Nt	Previous Date	Last Survey Thick	Last Nt	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TM L Retirement Date	TM L Inspection Date
21.01	MID	N	1.000 NM	06/15/2012		N/A	1.009		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/06/3353	08/27/2014
22.01	MID	N		N/A		N/A	1.000 NM		06/15/2012	N/A	N/A	N/A	0	0.875 U	0.1	06/25/3262	06/15/2013
23.01	MID	N	1.625 NM	06/15/2012		N/A	1.662		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
24.01	MID	N	2.500 NM	06/15/2012		N/A	2.593		08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
25.01	MID	N	1.625 NM	06/15/2012		N/A	1.650		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
26.01	MID	N	1.000 NM	06/15/2012		N/A	1.003		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/05/3293	08/27/2014
27.01	MID	N	1.000 NM	06/15/2012		N/A	1.034		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/09/3603	08/27/2014
28.01	MID	N *	1.625 NM	06/15/2012		N/A	1.609		08/27/2013	N/A	13.3	N/A	13.3	1.300 U	13.3	11/20/2036	08/27/2014
29.01	BTM	N	1.625 NM	06/15/2012		N/A	1.893		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
30.01	BTM	N	2.500 NM	06/15/2012		N/A	2.503		08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
31.01	BTM	N	1.000 NM	06/15/2012		N/A	1.002		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/06/3283	08/27/2014
32.01	BTM	N	1.000 NM	06/15/2012		N/A	0.996		08/27/2013	N/A	3.3	N/A	3.3	0.875 U	3.3	04/28/2050	08/27/2014
33.01	BTM	N	2.500 NM	06/15/2012		N/A	2.494		08/27/2013	N/A	5.0	N/A	5.0	2.000 U	5.0	06/16/2112	08/27/2014
34.01	BTM	N	1.625 NM	06/15/2012		N/A	1.895		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
35.01	BTM	N	2.500 NM	06/15/2012		N/A	2.520		08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014
36.01	BTM	N	1.625 NM	06/15/2012		N/A	1.859		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
37.01	BTM	Y *	1.000 NM	06/15/2012		N/A	0.977		08/27/2013	N/A	19.2	N/A	19.2	0.875 U	19.2	12/19/2018	08/27/2014
38.01	BTM	N	1.000 NM	06/15/2012		N/A	1.039		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3653	08/27/2014
39.01	BTM	N		N/A		N/A	1.000 NM		06/15/2012	N/A	N/A	N/A	0	0.875 U	0.1	06/25/3262	06/15/2013
40.01	BTM	N *	1.625 NM	06/15/2012		N/A	1.613		08/27/2013	N/A	10.0	N/A	10.0	1.300 U	10.0	12/14/2044	08/27/2014
41.01	BTM	N	2.500 NM	06/15/2012		N/A	2.506		08/27/2013	N/A	0	N/A	0	2.000 U	0.1	09/11/4013	08/27/2014

Corrosion Monitoring Eq/Circ ID Analysis Report

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date: 10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-C2
Eq Type: PIPING
Class:
CM RBI:
Design Code: S8/D1

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL B ON LINE HEATER; SN: 6J111050

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 01/02/2031

Group Description:
RCR = 10.8 MPY
Rem. Life (from last survey 08/27/2013) = 17.4 yrs

0 C.A. Status: No
Total Caution TMLs = 2

TML No	Location	Ctn TML	First Survey Thick	First Survey Nt	First Date	Previous Survey Thick	Previous Survey Nt	Previous Date	Last Survey Thick	Last Survey Nt	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
42.01	BTM	N	1.625 NM		06/15/2012			N/A	1.634		08/27/2013	N/A	0	N/A	0	1.300 U	0.1	09/11/4013	08/27/2014
43.01	BTM	N	1.000 NM		06/15/2012			N/A	1.030		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/09/3563	08/27/2014
44.01	BTM	N	1.000 NM		06/15/2012			N/A	1.047		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/09/3733	08/27/2014
45.01	BTM	N	1.000 NM		06/15/2012			N/A	1.031		08/27/2013	N/A	0	N/A	0	0.875 U	0.1	09/08/3573	08/27/2014

Eaton Inspection Services
1595 So Hwy 150, Suite F, Evanston, WY 82930
Phone 307-789-3540 FAX 307-789-2822

Report Date: 10/21/2013

Unit: LH-0033
Eq/Circ ID: LH0033-C2
Design Code: S8/D1
Eq Type: PIPING
Class:
CM RBI:

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: COIL B ON LINE HEATER; SN:6J111050

TML Corrosion Rates are each the Maximum of:
(A) -- Calculated Corrosion Rates x 1.00 :
(B) -- Default Corrosion Rate : 0.1 MPY

Representative Corrosion Rate is the Maximum of:
(A) -- Average Corrosion Rate x 1.00 : 2.7 MPY
(B) -- Average Max 25.0% of TMLs, Min of 2 : 10.8 MPY
(C) -- Formula Corrosion Rate (Sigma = 1.28) : 3.2 MPY
(D) -- Default Corrosion Rate : 0.1 MPY
Representative Corrosion Rate = 10.8 MPY

TML thickness readings have not been compensated for high Temperatures.
TML thickness readings have been compensated for growths.

TML Life calculations are based on the Representative TML Corrosion Rate using Short Term and Long Term Corrosion Rates.

Nominal thickness is used for TML corrosion rate calculations with less than 3 surveys.

Minimum time between inspections required for corrosion rate calculation is 3 months.

TML Inspection Interval is:
(A) -- 1.00 years.

Eq/Circ ID Last Survey Date is based on the LAST of the last 0% of TML survey dates (Min 1).

Eq/Circ ID Estimated life = 17.4 years from the most recent survey date.
(Estimated Life based on the ave of the earliest 0% (Min 6) TML retirement dates.)

Predicted Eq/Circ ID Retirement date is 01/02/2031

Recommended Eq/Circ UT/RT Inspection Date is 08/27/2014
UT/RT Inspection Interval is 1.00 years.

Caution TML Logic: TML Corrosion Rate > 15.0 MPY .OR. TML Remaining Life < 3.00 Years.
There are 2 Caution TMLs in this Eq/Circ ID.

API 570 Piping External Inspection

Company Name: FMC Technologies Completion	Facility Name: PA District
Line Name/Number: Coil # 1 & 2 LH-0033 Alberta #617901	
Size/Sched. Of Pipe: 4.500"	Eq/Circ. ID:
Service/System:	Piping Class ☐ 1 ☒ 2 ☐ 3 ☐ Other
Design Pressure: 10,000 psi	Materials: ☒ CS ☐ SS ☐ Other
Design Temperature: 180° F	Note Stamping (If Any)
P&ID#:	Flange Rating: 1000 #

Reason for Inspection: ☒ Initial API-570 on Stream Inspection.
☐ Scheduled API-570 External Inspection. ☐ Other:

Testing Performed:

☒ Visual ☒ UT ☐ PT ☐ MT ☐ Other:

Comments:

Insulation Observations:

- ☐ Serviceable
- ☒ Not Insulated
- ☐ Missing/Damaged
- ☐ CUI Identification
- ☐ Corrosion Present (Describe)
- ☐ Other
- ☒ No Issues

Comments:

Coating Condition:

- ☒ Good
- ☐ Fair, Some Blistering/Peeling
- ☒ Corrosion Present (Describe)
- ☐ Other
- ☒ No Issues

Comments:

Piping coils are in new condition with light surface corrosion present. Only light flaking was observed.

Loss of Containment:

- ☐ Fluid Loss (Indicate How Much)
- ☐ Seeping or Evidence of Past Leakage
- ☐ Dripping (Size of Drops/Drops Per Minute)
- ☐ Leaking (Size of Stream, Noise Level, etc.)
- ☐ Clamps
- ☒ Other
- ☒ None Identified

Comments:

Line

heater was no in service during this inspection.

Condition of Welds:

- ☒ Welds Are Full, Smooth and Well Profiled
- ☐ Incomplete Fusion/Penetration
- ☐ Crack Located Near Weld Seam
- ☐ Weld Does Not Appear to Be Original
- ☐ Joints-Misaligned
- ☐ Undercut
- ☒ Other
- ☒ No Issues

Comments:

All associated welds appear sound.

Relief Device:

- ☐ PSV ☐ No PSV
- ☐ Rupture Disk
- ☐ Atmospheric
- ☐ No Relief Device Identified For This Equipment
- ☐ Tag Secure and Legible
- ☐ Set Pressure At Or Below MAWP
- ☐ Block Valve Not Locked/Car Sealed In Open Position
- ☐ Improper Drain Hole/Weather Cap On Atmos. Discharge
- ☐ Obstruction (i.e. Debris)
- ☐ Relief Installed In A Position Other Than Horiz. Or Upright
- ☒ Other
- ☒ No Issues

Comments:

On associated equipment

Supports/Hangers:

- ☒ In Serviceable Condition
- ☐ Foundation Is Damaged
- ☐ Additional Support Needed
- ☐ Hanger/Support Is Distorted/Broken/Missing
- ☐ Pipe Slide Or Shoe Is Off Of The Support
- ☐ Makeshift Support
- ☐ Loose Support Needs To Be Tightened
- ☐ Fireproofing Missing Or Damaged
- ☐ Support/Hanger Is Corroded
- ☐ Other
- ☒ No Issues

Comments:

Tubesheets are in good condition, all attachment welds appear sound.

Flanged Connections:

- ☒ Bolting Serviceable
- ☐ Short, Missing Or Damaged Bolting
- ☐ Nuts Lack Full Engagement
- ☒ Flanges Serviceable
- ☐ Flange Material Or Rating Inconsistent For System
- ☐ Flanges Deformed Or Damaged
- ☐ Corrosion Present (Describe)
- ☐ Gaskets
- ☐ Flange Rating Issues
- ☐ Other
- ☒ No Issues

Comments:

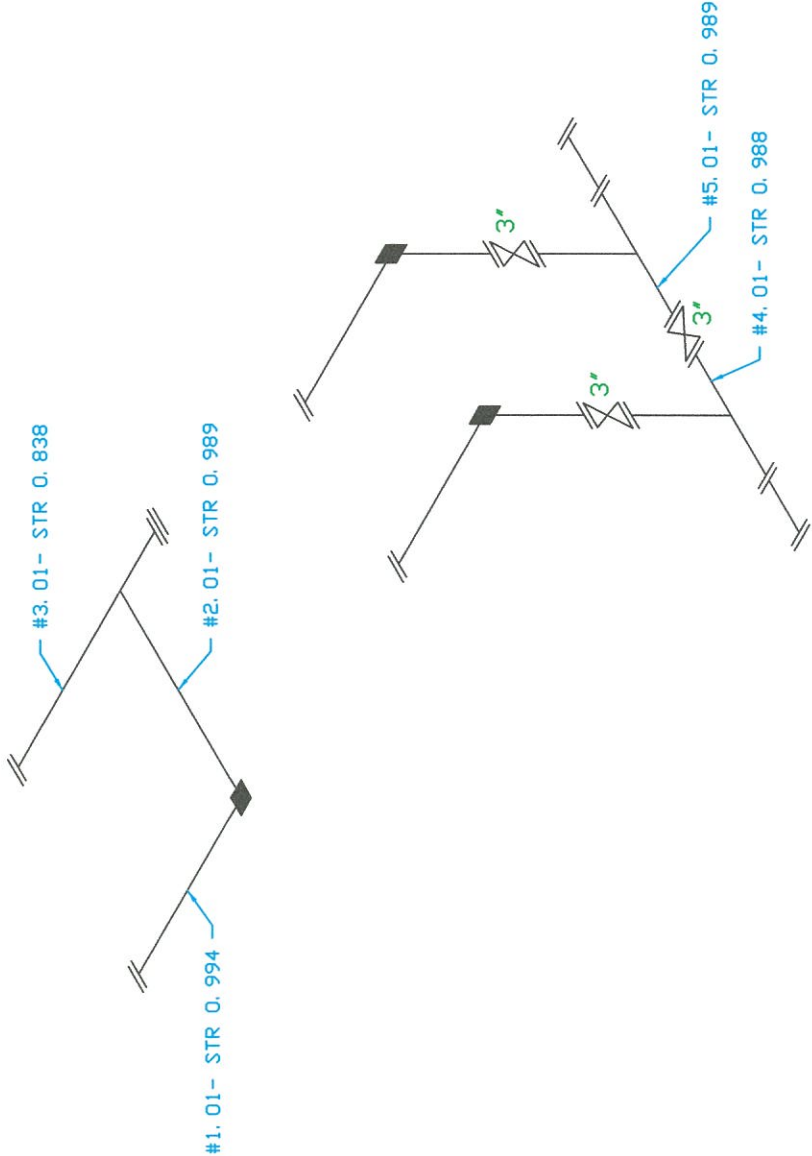
All flanges are in good condition with no surface corrosion present.

Mechanical Observations:

- ☐ Deadleg
- ☐ Damaged Flex Hose
- ☐ Crack
- ☐ Biological Growth
- ☐ Threaded Exposed
- ☐ Threaded Connections Not Seal Welded
- ☐ Expansion Joint Issues
- ☐ Low Point Without Drain
- ☐ Open Ended
- ☐ Vibration (Excessive)
- ☐ Weephole
- ☐ Other
- ☒ No Issues

Comments:

EQUIP RETIREMENT DATE: 9/11/4013
NEXT INSPECTION IS DUE: 8/27/2014



CAL= 70°F

PIPE= 70°F

BUSINESS UNIT	FMC TECHNOLOGIES COMPLETION
EQ/CIRC ID #	LH0033-P
EQUIP NAME	LH0033-P
DWG #	LH0033

DESC: ASSOCIATED PIPING ON LH-0033 LINE HTR
DWG#: LH0033-P-1.01-5.01

Corrosion Monitoring Eq/Circ ID Analysis Report

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Phone 307-789-3540 FAX 307-789-2822

Report Date:10/21/2013

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Unit: LH-0033
Eq/Circ ID: LH0033-P
Eq Type: PIPING
Class:
CM RBI:
Design Code: B31.3

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: ASSOCIATED PIPING ON LINE HEATER 2

Summary: Group Name: Insp. Due Date = 08/27/2014
Pred. Ret. Date = 09/11/4013

Group Description:
RCR = 0.2 MPY
Rem. Life (from last survey 08/27/2013) = 2000.0 yrs

0 C.A. Status: No
Total Caution TMLs = 0

TML No	Location	Ctn	First Survey Thick	First Date	Previous Survey Thick	Previous Date	Last Survey Thick	Last Date	Shrt Term Rate	Long Term Rate	Best Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Date
1.01	STR	N *		N/A		N/A	0.994	08/27/2013	N/A	N/A	N/A	1.1	0.260	0.1	09/11/4013	08/27/2014
2.01	STR	N *		N/A		N/A	0.989	08/27/2013	N/A	N/A	N/A	0.2	0.260	0.1	09/11/4013	08/27/2014
3.01	STR	N *		N/A		N/A	0.838	08/27/2013	N/A	N/A	N/A	0	0.260	0.1	09/11/4013	08/27/2014
4.01	STR	N *		N/A		N/A	0.988	08/27/2013	N/A	N/A	N/A	0.5	0.260	0.1	09/11/4013	08/27/2014
5.01	STR	N *		N/A		N/A	0.989	08/27/2013	N/A	N/A	N/A	0.2	0.260	0.1	09/11/4013	08/27/2014

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Phone 307-789-3540 FAX 307-789-2822

Report Date: 10/21/2013

Unit: LH-0033
Eq/Circ ID: LH0033-P
Design Code: B31.3
Eq Type: PIPING
Class:
CM RBI:

(Report in Inches, Corrosion Rates in MPY)
Analysis: Straight Line

Flange Rating: 5734 lb/in²
Design Pressure: 10000 lb/in²
Design Temperature: 180 °F

Description: ASSOCIATED PIPING ON LINE HEATER 2

TML Corrosion Rates are each the Maximum of:
(A) -- Calculated Corrosion Rates x 1.00 : Varies
(B) -- Default Corrosion Rate : 0.1 MPY

Representative Corrosion Rate is the Maximum of:
(A) -- Average Corrosion Rate x 1.00 : 0.1 MPY
(B) -- Average Max 25.0% of TMLs, Min of 2 : 0.1 MPY
(C) -- Formula Corrosion Rate (Sigma = 1.28) : 0.2 MPY
(D) -- Default Corrosion Rate : 0.1 MPY
Representative Corrosion Rate = 0.2 MPY

TML thickness readings have not been compensated for high Temperatures.
TML thickness readings have been compensated for growths.

TML Life calculations are based on the Representative TML Corrosion Rate using Short Term and Long Term Corrosion Rates.

Nominal thickness is used for TML corrosion rate calculations with less than 3 surveys.

Minimum time between inspections required for corrosion rate calculation is 3 months.

TML Inspection Interval is:
(A) -- 1.00 years.

Eq/Circ ID Last Survey Date is based on the IAST of the last 0% of TML survey dates (Min 1).

Eq/Circ ID Estimated life = 2000.0 years from the most recent survey date.
(Estimated Life based on the ave of the earliest 0% (Min 6) TML retirement dates.)

Predicted Eq/Circ ID Retirement date is 09/11/4013

Recommended Eq/Circ UT/RT Inspection Date is 08/27/2014
UT/RT Inspection Interval is 1.00 years.

Caution TML Logic: TML Corrosion Rate > 15.0 MPY .OR. TML Remaining Life < 3.00 Years.
There are 0 Caution TMLs in this Eq/Circ ID.