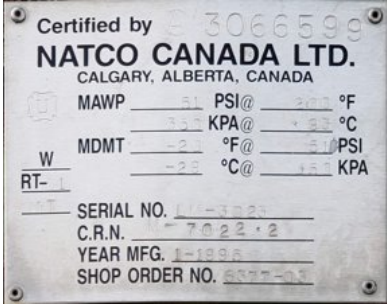


11-30-039-21W4M
 Flare Knock Out
 A3066599 LM 3023
 REPORT # A#3066599_GRADY INSPECTION LTD VE VI UT INSP_6NOV2018

DATE 11/6/2018
 CLIENT CNRL

Phone:403-793-7697

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 grady.rustebakke@gmail.com



PRESSURE EQUIPMENT			
DISTRICT	SHELL TUBE		
FACILITY	MAWT	200	F
A#	A3066599	YR	1995
		MAWP	51
			psi
SERIAL #	LM 3023	PSV	
		psi	
CRN	M7022.2	PSV CRN	
EQUIP#		SERVICED	
STATUS	OUT OF SERVICE	UNIT	
MANUFACTURER	Natco Canada		
DH LSD	L	24 Ft	OD 6 Ft

AB-506 INTERVAL				
Upstream pressure vessels not				
GRADE	YEARS			REG
	Equip	PSV	UT	
1	3	3	3	

INSPECTION TYPE					
VE	VI	MT	PT	ET	UT
X	X				X

INSPECTION RESULT:

NCR-OPERATIONS

NCR-REGULATORY/ADMIN

ACTION ITEM RAISED

REPAIR REQUIRED

SUITABLE FOR SERVICE

RECOMMENDATIONS:

VE Inspection:
 Addition of extra inspection ports vertically on the shell and head recommended to monitor existing corrosion lines.
 VI Inspection:
 Option 1: Blast clean and coat vessel to mitigate corrosion found.
 Option 2: Use as is and plan for weld repairs at the next interval. The FKO is PWHT and will require a heat treat or temper bead weld repair once corrosion exceeds the corrosion allowance and is longer than 2" in length in an 8" area.
 Addition of extra inspection ports vertically on the shell and head

RESULTS OF INSPECTION:

VE Inspection:
 Fit For Service. Vessel is in good visual condition.
 UT Inspection:
 Vessel has internal isolated pitting in general corrosion along the 3:00, 6:00 and 9:00 positions.
 37% (4.1 mm) wall loss found on CML 11 Int T-Nominal: (11.1 mm) T-Actual: (7 mm) T-Required: (2.6 mm) RL: (25.31 years)
 36% (4 mm) wall loss found on CML 09 Int T-Nominal: (11.1 mm) T-Actual: (7.1 mm) T-Required: (2.6 mm) RL: (26.51 years)
 14% (1.5 mm) wall loss found on CML 10 T-Nominal: (11.1 mm) T-Actual: (9.6 mm) T-Required: (2.6 mm) RL: (109.15 years)
 VI Inspection:
 Fit For Service. Due to the vessel being out of service for over a 5 year period and half full of fluid, a corrosion fluid line has developed at the 3:00 & 9:00 positions of the shell sections and both heads. Maximum pitting found along this area was 2.55 mm.
 In addition a corrosion line has formed along the 6:00 position of the vessel. The corrosion is limited to the North and Center can sections. A maximum pit depth of 2.85 mm was found at the North end of the vessel. (Limited access due to the coil position).
 The corrosion found is within the allowances of the U1A corrosion allowance of 0.125" (3.2 mm)
 1 - 2" inches of water in the bottom of the vessel limited the access to measure the corrosion on the bottom shell.
 Limited access to the bottom 6:00 of the shell from the placement of the welded in place heater coil.
 Limited access to the shell corrosion due to cleanliness.

SIGN OFF	API 510	EXP.	IPV	EXP.	INSPECTOR - PRIMARY	INSPECTOR - REVIEW	CLIENT SIGN OFF
INSPECTED BY	Rick Graves	47215	1/31/2019				
REVIEWED BY	Grady Rustebakke	28850	6/30/2021	290 11/22/2021			

Ultrasonic Report
LSD 11-30-039-21W4M
DH-LSD
Jurisdiction # A3066599
Serial # LM 3023

Date 11/6/2018
Facility
Field Nevis Field

Phone:403-793-7697

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Ultrasonic Report #: A#3066599_GRADY INSPECTION LTD VE VI UT INSP_6NOV2018

ULTRASONIC SET			COMPONENT DETAILS				CODE					
EQUIPMENT	CALIBRATION DUE	SERIAL NUMBER	MATERIAL GRADE	SURFACE PREP	TEMP	THICKNESS	CALIBRATION	EVALUATION				
USN58L	5/1/2019	01CV2X	Carbon Steel	Painted	14 C	Various	ASME V	ASME VIII Div 1				
CALIBRATION BLOCK		PROBE				COUPLING		METHOD				
TYPE	SERIAL#	REF dB	SCAN dB	FREQ.	SIZE.	ANGLE	SERIAL #	TYPE	COUPLANT	CABLE	TECHNIQUE	PROCEDURE
5 Step Metric	11961	66	66	5 MHz	0.25"	0	01C9M7	Dual	UT-X	6' BNC to Micro	LW Dual	UT01T1R1

SCOPE	As requested by Dustin Rumohr an ultrasonic inspection was completed on the flare knockout drum
LIMITATIONS	Vessel was insulated. UT readings done in existing windows.

RESULTS	<p>Vessel has internal isolated pitting in general corrosion along the 3:00, 6:00 and 9:00 positions.</p> <p>37% (4.1 mm) wall loss found on CML 11 Int T-Nominal: (11.1 mm) T-Actual: (7 mm) T-Required: (2.6 mm) RL: (25.31 years)</p> <p>36% (4 mm) wall loss found on CML 09 Int T-Nominal: (11.1 mm) T-Actual: (7.1 mm) T-Required: (2.6 mm) RL: (26.51 years)</p> <p>14% (1.5 mm) wall loss found on CML 10 T-Nominal: (11.1 mm) T-Actual: (9.6 mm) T-Required: (2.6 mm) RL: (109.15 years)</p>
----------------	---

Technician Name	Certification Body	Certification #	Expiry	Technician Signature				
1 Rick Graves	CGSB FRONT	13102	12/15/2020					
					Client Name	Dustin Rumohr	Company Name	CNRL
					Client Signature			

External Inspection - (Vessel)

LSD 11-30-039-21W4M
DH-LSD
Jurisdiction # A3066599

Date

11/6/2018

Facility**Field**

Nevis Field

Phone:403-793-7697

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Fit For Service: Fit For Service.

Inspection Summary: Vessel is in good visual condition.

Recommendations: Addition of extra inspection ports vertically on the shell and head recommended to monitor existing corrosion lines.

External Inspection Items	G/F/P	Comments										
General Condition:	Good	No notable external corrosion, mechanical damage, areas of wear/fretting, distortion, misalignment, current leaks, or visible weld defects.										
External Coating:	Good	Paint is intact and well adhered to the vessel.										
Insulation / Cladding:	Good	Insulation is in good visual condition.										
Nozzles, Piping and Connections:	Good	Nozzles and piping in good visual condition										
Buried Vessels:	N/A	Above Ground										
Ladders, Platforms and Walkways:	N/A											
Foundations and Supports:	Good	Building on pilings										
Shell:	Good	Partially insulated										
Saddles / Skirts:	Good	Saddle is in good visual condition										
Grounding:	N/A											
Gauges and Instrumentation:	N/A	<table style="width:100%; border:none;"> <tr> <td style="text-align:center;">Shell Gauge</td> <td style="text-align:center;">(</td> <td style="text-align:center;">-</td> <td style="text-align:center;">@</td> <td style="text-align:center;">)</td> <td style="text-align:center;">Temp Gauge</td> <td style="text-align:center;">(</td> <td style="text-align:center;">-</td> <td style="text-align:center;">@</td> <td style="text-align:center;">)</td> </tr> </table>	Shell Gauge	(-	@)	Temp Gauge	(-	@)
Shell Gauge	(-	@)	Temp Gauge	(-	@)			
Pressure Protection:	N/A											
NDE Summary:												
Manway Davits/Quick Closure:	Good	Manway is in good visual condition.										
Nameplate:	Good	Nameplate is legible and readily accessible and securely affixed										

Internal Inspection - (Vessel
LSD 11-30-039-21W4M
Jur # A3066599
Serial # LM 3023

Date	11/6/2018
FACILITY	
FIELD	Nevis Field

Phone:403-793-7697
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Fit For Service: Fit For Service.

Inspection Summary: Overview of Inspection Findings

Due to the vessel being out of service for over a 5 year period and half full of fluid, a corrosion fluid line has developed at the 3:00 & 9:00 positions of the shell sections and both heads. Maximum pitting found along this area was 2.55 mm.

In addition a corrosion line has formed along the 6:00 position of the vessel. The corrosion is limited to the North and Center can sections. A maximum pit depth of 2.85 mm was found at the North end of the vessel. (Limited access due to the coil position).

The corrosion found is within the allowances of the U1A corrosion allowance of 0.125" (3.2 mm)

1 - 2" inches of water in the bottom of the vessel limited the access to measure the corrosion on the bottom shell.
 Limited access to the bottom 6:00 of the shell from the placement of the welded in place heater coil.
 Limited access to the shell corrosion due to cleanliness.

Internal Inspection Items	G/F/P	Comments
Inlet Area:	Fair	Both heads have welded distribution boxes. There was no visual access to either North or South boxes due to scale and cleaning limitations. Shell attachment welds were of full profile with not corrosion.
Internal Piping:	Fair	Heater coil is registered as a separate A# and is welded into the shell and not removable. The coil was not inspected as per direction of FIC Caroline Dreaver as the coil is not in service.
Baffles, Deflector Plates, Weir, etc:	N/A	
Trays:	N/A	
Demister Pad:	N/A	
Head (1): North	Fair	Nominal Head thickness of 9.5 mm with general pitting corrosion at the fluid level mid head ranging in depth from 0.1 mm - 1.5 mm. Corrosion liquid level is approximately 6" in width.
Head (2): South	Fair	Nominal Head thickness of 9.5 mm with general pitting corrosion at the fluid level mid head ranging in depth from 0.1 mm - 1.0 mm. Corrosion liquid level is approximately 6" in width.
Shell: 3	Fair	6:00 shell corrosion found on the vessel 16' long x 8" wide located on the North and Center can sections. A maximum pit depth of 2.85 mm was found at the North end of the vessel. Nominal shell thickness of 9.8 mm. 3:00 & 9:00 shell corrosion found on the vessel 24' long x 6" wide. Nominal shell thickness of 9.8 mm with general pitting corrosion at the fluid level mid shell ranging in depth from 0.1 mm - 2.55 mm. Corrosion liquid level is approximately 6" in width. The top half of the vessel is as new.
Tubesheet:	N/A	

Internal Inspection - (Vessel)		Date	11/6/2018
LSD	11-30-039-21W4M	FACILITY	
Jur #	A3066599	FIELD	Nevis Field
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Channel Section: N/A

Bundle / Tubes: N/A

Nozzles / Manways: Good Bottom nozzles on south end were full of debris.

Welds: Fair Corrosion near the North Head to Shell weld.

Vortex Breakers, Drains, etc: Good Vortex breaker was at the South End. Welded to the shell. No corrosion on the South End near the vortex breaker.

- Internal Coating:**
- Not Coated
 - Coated
 - Coating Failure
 - Blisters
 - Cracks/Flake
 - Repaired
 - Replaced

- Weld Repairs:**
- Weld Repairs Required
 - None Required

Internal Anodes: Internal Anodes None

Non-Conformances and Corrective Actions: Vessel was filled with water prior to being isolated from service.

Preparatory Work Required for Next Inspection:

Recommendations for Next Inspection: Option 1: Blast clean and coat vessel to mitigate corrosion found.
 Option 2: Use as is and plan for weld repairs at the next interval. The FKO is PWHT and will require a heat treat or temper bead weld repair once corrosion exceeds the corrosion allowance and is longer than 2" in length in an 8" area.

Addition of extra inspection ports vertically on the shell and head recommended to monitor existing corrosion lines.

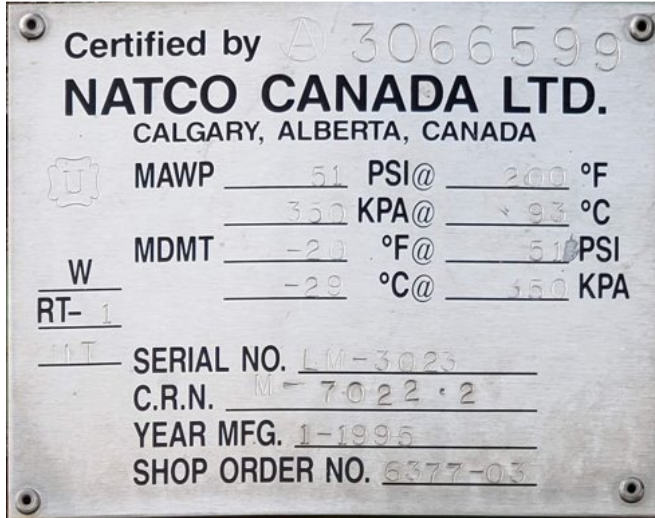
Overview Photo

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Nameplate



Overview



South Head



North Head to Shell 6:00 Pitting

Overview Photo

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North Head to Shell 6:00 Pitting



North Head



North Shell Section West Side 9:00 Pitting



North End of Vessel Showing Fluid Corrosion Line 9:00 & 3:00

Overview Photo

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South End of Vessel Corrosion Line



Vortex Breaker



Corrosion Line Along 6:00 Below Coil

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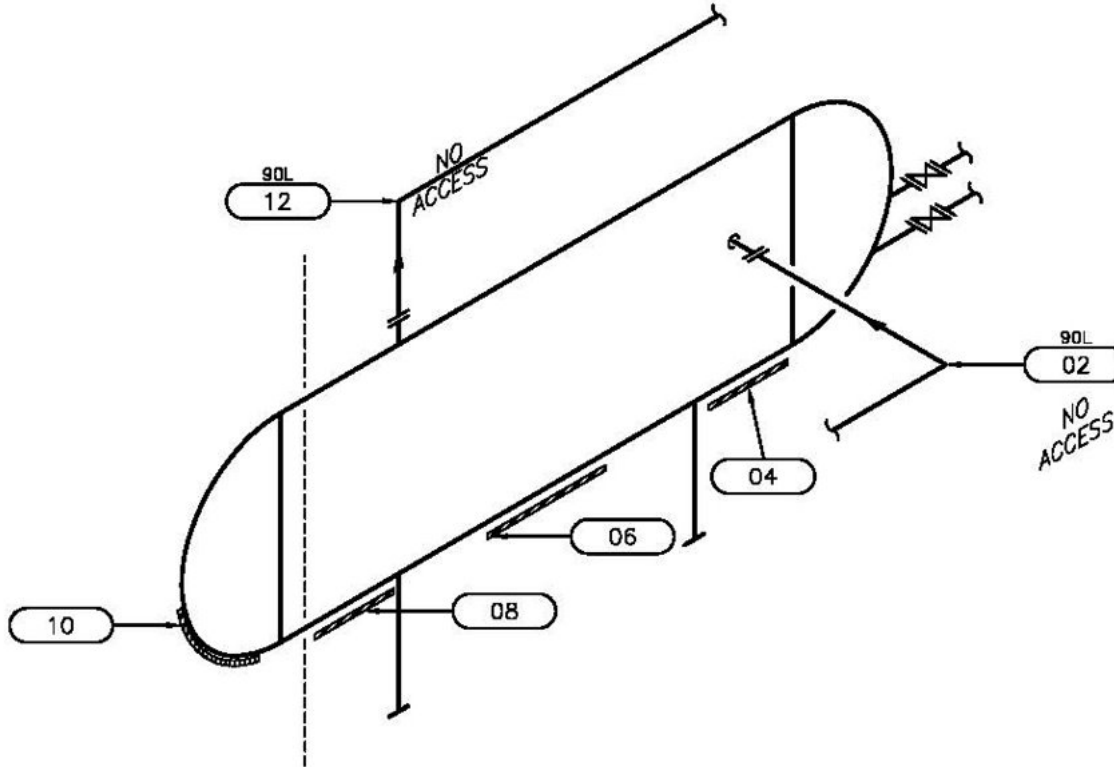
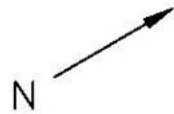
Jur # A3066599

DWG 1

Location: FLARE KNOCKOUT DRUM

Ser # LM 3023

CML#	Nom	CA/Tol	SFlag	STmin	PTmin	> Tmin	Comp Type	Pipe Size	Code	MOP	Inspection Dates and Thickness Values				# of Insp	% Nom Wall Loss	+/- Variance				Corrosion Rates				Rem Life Date	Rem Life (yrs)	Next Insp Date	Insp Int (yrs)	Inspection Comments
											Baseline Insp Date	Min	3rd Last Insp Date	Min			2nd Last Insp Date	Min	Last Insp Date	Min	Nom	Tmin	LTi	ST					



CML	Min	Yrs	Date
06	9.4	3.0	11/5/2021
10	9.1	3.0	11/5/2021
11 Int	7.0	3.0	11/5/2021
09 Int	7.1	3.0	11/5/2021
04	9.6	3.0	11/5/2021
08	9.9	3.0	11/5/2021

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LSD 11-30-039-21W4M

FACILITY

DH-LSD

FIELD Nevis Field

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Jur # A3066599

DWG 1

Location: FLARE KNOCKOUT DRUM

Ser # LM 3023



CML#	Nom	CA/Tol	SFlag	STmin	PTmin	> Tmin	Comp Type	Pipe Size	Code	MOP	Inspection Dates and Thickness Values				# of Insp	% Norm Wall Loss	+/- Variance				Corrosion Rates			Rem Life Date	Rem Life (yrs)	Next Insp Date	Insp Int (yrs)	Inspection Comments			
											Baseline Insp Date	Min	3rd Last Insp Date	Min			2nd Last Insp Date	Min	Last Insp Date	Min	Nom	Tmin	LTi						ST	ST	LTn
04	11.1	8.0		2.6	2.6		Shell		UG27ShellInt	51	6/2/08	9.6				11/6/18	9.6	2	14%	1.5	7.0	0.0	0.0						11/5/2021	3.0	
06	11.1	8.0		2.6	2.6		Shell		UG27ShellInt	51	6/2/08	9.4				11/6/18	9.8	2	12%	1.3	7.2	0.4	0.4						11/5/2021	3.0	
08	11.1	8.0		2.6	2.6		Shell		UG27ShellInt	51	6/2/08	10.0				11/6/18	9.9	1	11%	1.2	7.3	-0.1	-0.1	0.01		3/22/2777	758.9	11/5/2021	3.0		
09 Int	11.1	8.0		2.6	2.6		Shell		UG27ShellInt	51	11/6/18	7.1						1	36%	4.0	4.5			0.17	5/4/2045	26.5	11/5/2021	3.0			
10	11.1	8.0		2.6	2.6		Head		UG32HeadElli	51	6/2/08	9.1				11/6/18	9.6	2	14%	1.5	7.0	0.5	0.5			0.0	11/5/2021	3.0			
11 Int	11.1	8.0		2.6	2.6		Head		UG32HeadElli	51	11/6/18	7.0						1	37%	4.1	4.4			0.17	2/22/2044	25.3	11/5/2021	3.0			