Canadian Natural

PRESSURE VESSEL VISUAL INSPECTION REPORT

Report #:	156732-MD-50
Inspect Date:	03/20/2012
Page:	1 of 14
Insp. Co. Job #:	156732

Criticality Designation: Yellow

Insp. Comp:	Matrix_Inspection	District:	Grande Prairie - North	Field:	Firebird
Location:	14-01-098-08W6	Unit / Skid #:	15330	LSD:	14-01-098-08W6
Jurisdiction #:	A0516951	Equip Tag #:	HS	Serial #:	HS-12472
CRN #:	R8469.21	Nat'l Bd #:	N/A	Year Built:	2004
Manufacturer:	Larsen & D'Amico Mfg. Ltd	Equipment Description:	Other: Horizontal Separator		
Status:	In Service -	Equip. Type:	Vessel: Separator	Service:	Sweet
MAWP Shell:	1440 Psi @ 127 °F	Volume:	N/A	Code Stamp:	☒ Y ☐ N
MAWP Tube:	@	Height/Length:	184 in.	Insulated:	☐ Y ☒ N
MDMT:	-20 °F	RT: RT-1	Size/Diameter.: 48 in. O.D.	PWHT:	☐ Y ☒ N
Support	Saddle	Vessel on Original CNRL Inventory List:	☒ Y ☐ N	Manway:	☒ Y ☐ N
C.A.:	0.125 in.	Coated: N/A	Clad: N/A	J.E.: 1.00	Remote Access: ☒ - Winter Road

	Component	Material	Nominal Thk	Diameter	OD/ID	Tube Side	Shell Side
1	Main - Shell	SA-516-70	2.070 in.	48.000 in.	OD	☐	☒
2	North - Head	SA-516-70	1.910 in.	48.000 in.	OD	☐	☒
3	South - Head	SA-516-70	1.910 in.	48.000 in.	OD	☐	☒
4	Boot - Shell	SA-516-70		18.000 in.	OD	☐	☒
5	Boot - Head	SA-516-70MT	1.000 in.	18.000 in.	OD	☐	☒

Static Data: Confirmed ☐ Changed (See Comments) ☒

Comments:
Static data updated

PSV Static Data

PSV –1 Tag #:	G707684	Serial #:	506484-1-A10	CRN:	OG8842.5C
Model #:	26EA13-120	Capacity:	2926 SCFM	Set Pressure:	1440 psi
Manufacturer:	Farris			Service Company:	Unified Valve
Inlet Size & Type:	1.00 in. - Flanged			Last Service Date:	10/06/2011
Outlet Size & Type:	2.00 in. - Flanged			Block Valve:	N/A - -
Carseal Intact:	Yes			Code Stamp:	Yes
Shell Side / Tube Side:	Shell Side	Out for Service During Insp.:	N	Location of PSV:	On Vessel

PSV –2 Tag #:		Serial #:		CRN:	
Model #:		Capacity:		Set Pressure:	
Manufacturer:				Service Company:	
Inlet Size & Type:	-			Last Service Date:	
Outlet Size & Type:	-			Block Valve:	- -
Carseal Intact:				Code Stamp:	
Shell Side / Tube Side:		Out for Service During Insp.:		Location of PSV:	

PSV Comments

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

External Inspection Results – VE External Inspection Performed

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Nameplate	☐	Accept	Legible and secure	☐	☐	☐
Foundation and Supports	☐	Accept	Welded saddles anchored to skid	☐	☐	☐
Anchor Bolts	☐	Accept	Secure with no deformation	☐	☐	☐
Grounding	☐	Accept	Grounded directly to both saddles	☐	☐	☐
Insulation Condition	☒		No insulation	☐	☐	☐
PSV	☐	Accept	Carsealed and adequately vented	☐	☐	☐
Shell Heads & Nozzles	☐	Accept	Mechanical damage below the coating	☐	☐	☐
Metal Surfaces (Paint)	☐	Accept	Scratched and chipped on top shell	☐	☐	☒
Aux Equipment	☐	Accept	Intact and well supported	☐	☐	☐
Cathodic Protection	☒		No external anode	☐	☐	☐
Alignment	☐	Accept	Level with skid	☐	☐	☐
Flange Connections	☐	Reject	Loose bolt on PSV discharge piping blind flange	☐	☐	☒
Pressure Gauge	☐	Accept	0-1500 psi: acceptable range	☐	☐	☐
Temperature Gauge	☐	Accept	0-250° F: acceptable range	☐	☐	☐
Sight Glass	☐	Accept	Clear view of liquid levels	☐	☐	☐
Ladder / Platform	☐	Accept	Ladder and platform in good condition	☐	☐	☐
Leaks	☐	No	No evidence of leaks	☐	☐	☐
Piping from Vessel	☐	Accept	Secure with multiple u-bolts			
Previous UT Survey	☐	Yes	Locations marked, no history provided	UT Company: N/A		

External Visual Observations

Dirt and dust noted throughout the top surface of the separator

There is mechanical demerge on the North head below the coating. Approximately 1" long by 1/64" deep
Mechanical damage on the drain boot below the coating approximately 1.25" long by 3/128" deep

The manway is located on the South head with the davit arm and hardware in acceptable condition

The coating is flaking and chipped on the top shell exposing the base metal with very minor surface corrosion

The PSV discharge piping has a blind flange, (that does not obstruct flow) with a loose stud and nut

A UT corrosion survey was performed at the time of inspection with no significant wall losses recorded.

Recommendations:

Clean and touch up the coating to aid in the protection against corrosion
Tighten loose bolt on PSV discharge piping blind flange

TA Recommendation:

Open manway and clean for internal inspection

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

Internal Inspection Results – VI Internal Inspection Performed

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Shell	☐	Accept	Flash corrosion from oxidation	☐	☐	☐
Heads	☐	Accept	Flash corrosion from oxidation	☐	☐	☐
Manway	☐	Accept	Flash corrosion from oxidation	☐	☐	☐
Gasket Surfaces	☐	Accept	Good serrated sealing surface	☐	☐	☐
Welds	☐	Accept	Flash corrosion from oxidation	☐	☐	☐
Refractory	☒		Not applicable	☐	☐	☐
Heating Coils	☒		Not applicable	☐	☐	☐
Demister Pad	☐	Accept	misaligned from set position	☐	☐	☐
Vane Pack	☒		Not applicable	☐	☐	☐
Baffles	☐	Accept	baffle/ weir in good condition with no damage	☐	☐	☐
Trays	☒		Not applicable	☐	☐	☐
Filter	☒		Not applicable	☐	☐	☐
Internal Coating	☒		Not applicable	☐	☐	☐
Tubesheet	☒		Not applicable	☐	☐	☐
Tube Bundle	☒		Not applicable	☐	☐	☐

Internal Visual Observations

An internal visual inspection was performed June 6 2012 during the 2012 TA

The overal condition of the vessel is good, with minor flash corrosion from wash out and oxidation

The demister pad is misaligned from the original set position with some minor build-up noted in the demister pad

New anodes were installed during the 2012 TA

The baffle/ weir were found to be in good condition with no mechanical damage noted as well as no service related damage/ knife edging from erosion/ corrosion

Recommendations:

Realign the demister pad to the original rest position

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

Firetube Static Data N/A (Not Applicable)

Diameter: Not Applicable Nom Thickness: Not Applicable Bend: Not Applicable

Length: Not Applicable Firetube Description: Not Applicable

Firetube NDE Performed:

UT ☐	Report#: Not Applicable		ET ☐	Report#: Not Applicable	
MT ☐	Report#: Not Applicable		RT ☐	Report#: Not Applicable	
PT ☐	Report#: Not Applicable		Other ☐	Report#: Not Applicable	

Firetube Inspection Results

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Burner	☒		No Firetube Inspection Carried Out	☐	☐	☐
Stack	☒		No Firetube Inspection Carried Out	☐	☐	☐
Flange (Throat)	☒		No Firetube Inspection Carried Out	☐	☐	☐
Tube Sheet	☒		No Firetube Inspection Carried Out	☐	☐	☐
Hot Side	☒		No Firetube Inspection Carried Out	☐	☐	☐
Miter	☒		No Firetube Inspection Carried Out	☐	☐	☐
Return Bend	☒		No Firetube Inspection Carried Out	☐	☐	☐
Supports	☒		No Firetube Inspection Carried Out	☐	☐	☐
Butt Welds	☒		No Firetube Inspection Carried Out	☐	☐	☐
Fillet Welds	☒		No Firetube Inspection Carried Out	☐	☐	☐

Firetube Visual Observations

No Firetube Inspection Carried Out

Recommendations:

No Firetube Inspection Carried Out

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

Vessel NDE and Final Summary:

NDE Performed:	UT	☒	Report#:		ET	☐	Report#:
	MT	☐	Report#:		RT	☐	Report#:
	PT	☐	Report#:		Other	☐	Report#:

Maxi-Trak Observations Summary (Summarize inspection results Max 255 Characters):

Coating deteriorated (chipped and flaked) exposing the base metal to minor surface corrosion
Dirt and dust on the top section of the shell and heads
Blind flange on PSV discharge piping has a loose stud and nut assembly
TA 2012 - Demister pad is misalign

Maxi-Trak Recommendations Summary (Summarize Recommendations Max 255 Characters):

Clean and touch up the coating to aid in the protection against corrosion
Tighten loose bolt on PSV discharge piping blind flange
TA 2012 - Realign the demister pad

Actions Corrected at Time of Inspection: (If actions were corrected at the time of Inspection – note the corrected actions here.)

TA 2012 - the demister pad was realigned

Additional Visual Observations

No additional observations

Any other safety concerns or observations from associated equipment: (for example associated piping, buildings, pumps etc…)

No safety concerns noted at the time of inspection

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

Thickness and Remaining Life Evaluation *" Must be Completed"*

MUST BE COMPLETED AND RESOLVED WITH CNRL IMMEDIATELY UPON DISCOVERY OF LOW WALL THICKNESS AREAS

Step 1: Was any thickness measurement location found to be less than (Nominal WT – Corrosion Allowance)?: ***No***

If YES, proceed to Step 2; if NO, proceed to "Crack Evaluation" and "CNRL Criticality Designation".

Step 2: Which component(s) were found below (Nominal WT – Corrosion Allowance)?

Components found below Nom - CA:

Components
N/A - N/A
N/A - N/A
N/A - N/A
N/A - N/A
N/A - N/A

Perform Steps 3 – 8 for each component with actual thickness less than (Nominal WT – Corrosion Allowance).

Step 3: Describe Location and Extent of Corrosion*:*

Components	Location and Extent of Corrosion
N/A - N/A	Not Applicable for this Inspection
N/A - N/A	Not Applicable for this Inspection
N/A - N/A	Not Applicable for this Inspection
N/A - N/A	Not Applicable for this Inspection
N/A - N/A	Not Applicable for this Inspection

Notes:
Not Applicable for this Inspection

Step 4:

- For shells and nozzles, calculate minimum required thickness (T-min) as per ASME Section VIII UG-27.
- For heads, calculate minimum required thickness (T-min) as per ASME Section VIII UG-32.

Components	T-Min
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

Thickness and Remaining Life Evaluation *(Continued)*

Step 5: Is any measured thickness less than calculated minimum required thickness (T-min)? ***N/A***

If YES, complete Step 6
If NO, proceed to Step 7..

Step 6: Is nature and extent of pitting acceptable as per API 510? ***N/A***

Step 7: Calculate Remaining Life as per API 510. How? (Find last reading; use nominal thickness if nothing available). Short Term Corrosion Rates and Long Term Corrosion Rates.

Components	Remaining Life (Yrs)
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A
N/A - N/A	N/A

Step 8: Contact CNRL Integrity Coordinator to discuss above results.

- Name of CNRL contact: Not Applicable for this Inspection
- Date and time of conversation: Not Applicable for this Inspection

Summary/results of conversation:
Not Applicable for this Inspection

Crack Evaluation by Magnetic Particle or Alternative Inspection *" Must be Completed"*

MUST BE COMPLETED AND RESOLVED WITH CNRL IMMEDIATELY UPON DISCOVERY OF CRACK-LIKE INDICATIONS

Were any indications found to suggest the vessel contained cracks? ***N/A***

If NO, proceed to "CNRL Criticality Designation".

If YES, Contact CNRL Integrity Coordinator to discuss results.

- Name of CNRL contact: Not Applicable for this Inspection
- Date and time of conversation: Not Applicable for this Inspection

Summary/results of conversation:
Not Applicable for this Inspection

Canadian Natural	PRESSURE VESSEL VISUAL INSPECTION REPORT	Report #: 156732-MD-50 Inspect Date: 03/20/2012 Page: 8 of 14 Insp. Co. Job #: 156732

Insp. Company: Matrix_Inspection LSD: 14-01-098-08W6 Jurisdiction #: A0516951

CNRL Criticality Evaluation – *"MUST BE COMPLETED"*

The CNRL In-Service Pressure Vessel Inspector MUST answer all the following questions

1. Is the vessel fit-for-service? : ***Yes***
2. Was the measured thickness less than the calculated minimum required thickness (T-min) for any component?: ***No***
3. Were MT indications found?: ***N/A***
4. Was the remaining life less than 6 years for sour service vessels or less than 10 years for sweet service vessels?: ***No***
5. Were NCR's or Action Items generated as a result of the inspection? : ***Yes***
6. Were UT readings below (Nominal WT – Corrosion Allowance) found? : ***No***

Information on CNRL Owner User Program - Criticality Designation and Required Review

RED – Vessel Inspection Results are deemed RED if one of the following occurred:

- The measured thickness was less than the calculated minimum required thickness (T-min) for any component.
- MT indications were found.
- The remaining life was calculated to be less than 6 years for sour-service vessels or less than 10 years for sweet-service vessels.

RED inspection reports must be signed off by the CNRL Chief Inspector.

YELLOW – Vessel Inspection Results are deemed YELLOW if one or more of the following occurred:

- The vessel was declared NOT fit-for-service by the 3rd Party In-Service PV Inspector.
- NCR's or Action Items were generated as a result of the inspection.
- UT readings below (Nominal WT – Corrosion Allowance) were found.

YELLOW inspection reports must be signed off by the CNRL Pressure Equipment Integrity Coordinator.

GREEN – Vessel Inspection Results are deemed GREEN if all of the following are true:

- The vessel was declared fit-for-service by the 3rd Party In-Service PV Inspector.
- UT readings below (Nominal WT – Corrosion Allowance) were NOT found.
- MT indications were NOT found.
- NCR's or Action Items were NOT generated as a result of the VE inspection.

GREEN inspection reports must be signed off by the 3rd Party In-Service Pressure Vessel Inspector.

Criticality Designation				Yellow		

Vehicle #:	380	Kms:		Inspector (Name):	Matthew B Dickinson	PESL:	601
Time In:	00:00	Time Out:	00:00	Hrs	Inspector (Signature):	Matthew Dickinson 2012.11.13 08:10:21 -07'00'	API:	39483
Time In:	00:00	Time Out:	00:00	Hrs	CNRL Coordinator (Name):			
Personnel:	JD, LP				CNRL Coordinator (Signature):			
Billing Info:	AFE :				CNRL Chief Inspector (Signature):	(I am in full agreement with report contents)		
						(I am in full agreement with report contents)		

Equipment Photographs:

01 nameplate

02 overview

03 manway overview

04 surface corrosion

05 loose nut

06 PSV overview

Equipment Photographs:

07 overview

08 misaligned demister pad

09 flash corrosion around drain

10 boot overview

11 anode overview