Canadian Natural

PRESSURE VESSEL VISUAL INSPECTION REPORT

Report #:	91609-KS-01
Inspect Date:	07/22/2011
Page:	1 of 13
Insp. Co. Job #:	91609

Criticality Designation: Green

Insp. Comp:	Matrix_Inspection	District:	St Albert - South	Field:	Duhamel
Location:	03-32-045-21W4	Unit / Skid #:	Plant	LSD:	03-32-045-21W4
Jurisdiction #:	A0102602	Equip Tag #:		Serial #:	L10124
CRN #:	B1788.2	Nat'l Bd #:	6489	Year Built:	1974
Manufacturer:	CE NATCO	Equipment Description:	Other: TREATER		
Status:	In Service -	Equip. Type:	Vessel: Treater	Service:	Sour
MAWP Shell:	75 Psi @ 200 °F	Volume:		Code Stamp:	☒ Y ☐ N
MAWP Tube:	Psi @ °F	Height/Length:	360 in.	Insulated:	☒ Y ☐ N
MDMT:		RT:	Size/Diameter.: 120 in.	PWHT:	☐ Y ☒ N
Support	Saddle	Vessel on Original CNRL Inventory List:	☒ Y ☐ N	Manway:	☒ Y ☐ N
C.A.:	0.062 in.	Coated: Yes	Clad: No	J.E.: N/A	Remote Access: ☐ -

	Component	Material	Nominal Thk	Diameter	OD/ID	Tube Side	Shell Side
1	Main - Shell	SA285 C	0.500 in.	120.000 in.	OD	☐	☐
2	East - Head	SA516 70	0.500 in.	120.000 in.	OD	☐	☐
3	West - Head	SA516 70	0.500 in.	120.000 in.	OD	☐	☐
4	-					☐	☐
5	-					☐	☐

Static Data: Confirmed ☐ Changed (See Comments) ☒

Comments:
More data added to the vessel static data section of the report. Nameplate is secure and provides adequate information.

PSV Static Data

PSV –1 Tag #:		Serial #:		CRN:	
Model #:		Capacity:		Set Pressure:	psi
Manufacturer:				Service Company:	
Inlet Size & Type:	in. -			Last Service Date:	
Outlet Size & Type:	in. -			Block Valve:	- -
Carseal Intact:				Code Stamp:	
Shell Side / Tube Side:		Out for Service During Insp.:		Location of PSV:	

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

PSV was removed for service at the time of inspection.
Ensure PSV is properly rated and plumbed for the intended service.

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External Inspection Results – VE

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Nameplate	☐	Accept		☐	☐	☐
Foundation and Supports	☐	Accept		☐	☐	☐
Anchor Bolts	☐	Accept		☐	☐	☐
Grounding	☐	Accept		☐	☐	☐
Insulation Condition	☐	Accept	Minor insulation damage at isolated areas.	☐	☐	☐
PSV	☐	Accept	PSV removed for servicing	☐	☐	☐
Shell Heads & Nozzles	☐	Accept		☐	☐	☐
Metal Surfaces (Paint)	☐	Accept		☐	☐	☐
Aux Equipment	☐	Accept		☐	☐	☐
Cathodic Protection	☒		N/A	☐	☐	☐
Alignment	☐	Accept		☐	☐	☐
Flange Connections	☐	Accept	Attached piping removed to isolate the vessel	☐	☐	☐
Pressure Gauge	☐	Accept		☐	☐	☐
Temperature Gauge	☐	Accept		☐	☐	☐
Sight Glass	☐	Accept		☐	☐	☐
Ladder / Platform	☐	Accept		☐	☐	☐
Leaks	☐	No	No evidence of previous process leaks	☐	☐	☐
Piping from Vessel	☐	Accept	Piping in good condition			
Previous UT Survey	☒			UT Company:		

External Visual Observations

Extenal inspection was carried out on the vessel. Vessel was off-steream during the plant shut-down to perform a routine inspection and necessary repairs required. The vessel nameplate is secure and readable but provides limited informaion.The vessel is partially insulated. Part of the vessel is inside the building. Inside section of vessel is painted. Overall condition of the insuated part of the vessel is in good condition with monor damage noted on the south side. All attached instrumention was found in good physical and working condition. All external painted surfaces show minor paint deterioration and a light general corrosion. All gasket surfaces are free of damage and no evidence of corrosion or pitting observed.

External and internal UT thickness testing results showed no concerns. UT thickness was carried out as accessible due to having limited access because of vesssel is partially insulated. Ultrasonic thickness performed with DMS-2 IRIS# 31089.
Based on external observations and UT thickness results recorded the vessel was found in good operable condition.

Recommendations:

Ensure PSV is properly rated and plumbed for the intended service.
Attach all required instrumention and piping disconnected to isolate the vessel.
Continue with regular external visual and ultrasonic thickness survey to maintain the integrity of the vessel.

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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	General corrosion and general shallow pitting	☐	☐	☐
Heads	☐	Accept		☐	☐	☐
Manway	☐	Accept	Shell MW corrosion noted, epoxy repaire done	☐	☐	☐
Gasket Surfaces	☐	Accept		☐	☐	☐
Welds	☐	Accept		☐	☐	☐
Refractory	☒			☐	☐	☐
Heating Coils	☒			☐	☐	☐
Demister Pad	☒			☐	☐	☐
Vane Pack	☒			☐	☐	☐
Baffles	☐	Accept		☐	☐	☐
Trays	☒			☐	☐	☐
Filter	☒			☐	☐	☐
Internal Coating	☐	Accept	East side coated -Minor epoxy repairs done	☐	☐	☐
Tubesheet	☒			☐	☐	☐
Tube Bundle	☒			☐	☐	☐

Internal Visual Observations

Internal inspection carried out on the vessel. Internal anodes and vessel firetube was replaced with new. Firetube support frame was noted holed out at some areas but still intact and in acceptable condition to support the firetube. Internal shell at the bottom showed gernal corrosion and shallow piting approx. to a depth of 0.015". Firetube manways external edge and bottom had some epoxy damage and was repaired but no active corrosion noted. Internal instrumentation was found intact and in good condition. Interal ultrasonic thickness inspection was carried out on the shell and west head of the vessel as accessible. All UT thickness readings recorded showed no significant wall loss. All five anode nozzles were found having some epoxy damage. UT thickness scan was carried out on all nozzles and readings were near or above the acceptable range. Shell MW 18" Sch 40 was found corroded at the bottom but remaining thickness was found to be above the T-Min. East side internal of the vessel is coated. Overall condition of the shell and east head, all nozzles and welds were acceptable. Minor epoxy damage was noted on the shell to deflector boxes supports contact points. All epoxy coating damaged areas were repaired. A redundant electric grid inside the east side of vessel was removed.

Overall internal condition of the vessel was found in acceptable condition for future service.

Recommendations:

Continue to monitor the condition with UT thickness of shell, shell manway, all 4" anode nozzles at regular inspection intervals. Continue to perform internal visual and UT thickness to maintain its integrity.

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Firetube Static Data Firetube Inspection Performed

Diameter: 12 in. Nom Thickness: 0.500 in. Bend: U-Tube

Length: Firetube Description: Single U-Tube

Firetube NDE Performed:

UT ☐ Report#: ET ☐ Report#:

MT ☐ Report#: RT ☐ Report#:

PT ☐ Report#: Other ☐ Report#:

Firetube Inspection Results

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Burner	☐	Accept		☐	☐	☐
Stack	☐	Accept		☐	☐	☐
Flange (Throat)	☐	Accept		☐	☐	☐
Tube Sheet	☐	Accept		☐	☐	☐
Hot Side	☐	Accept		☐	☐	☐
Miter	☐	Accept		☐	☐	☐
Return Bend	☐	Accept		☐	☐	☐
Supports	☐	Accept		☐	☐	☐
Butt Welds	☐	Accept		☐	☐	☐
Fillet Welds	☐	Accept		☐	☐	☐

Firetube Visual Observations

New firetube installed at the time of inspection.

Recommendations:

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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):

Internal shell gereral pitting to 0.015", Shell MW corroded Min reading 0.220" still above T-Min, all anodes to be replaced, east side shell epoxy damage. Fire tube replaced as per operations decision.

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

Replace all anodes, Intstall serviced PSV, monitor corrosion on shell, nozzles and perform regular external visual and UT survey.

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

Anodes replaced, epoxy damage rapired, firetube replaced and some instrumentation and external piping replaced.

Additional Visual Observations

Site is overall in very good condition. Operators take great care to keep tidy and clean.

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

None noted

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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

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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? ***No***

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

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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?:
5. Were NCR's or Action Items generated as a result of the inspection? : ***No***
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						Green

Vehicle #: 324 Kms:

Time In: 00:00 Time Out: 00:00 Hrs

Time In: 00:00 Time Out: 00:00 Hrs

Personnel:

Billing Info: :

Inspector (Name): Kirandeep Singh PESL: 415

Inspector (Signature): Kirandeep Singh 2011.07.27 10:56:44 -06'00' API: 33038

CNRL Coordinator (Name):

CNRL Coordinator (Signature):

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-South side of vessel Insulated

03-North side of vessel inside the vessel

04-Noth side bottom part of vessel

05-Minor insulation damage

06 -West side Firetube ways

07-West side internal view

08-General Corr. and general pitting

09-thermocouple and floater

10-level gage floater

100_0844

11-East side Internal View

12-Shell MW corroded was epoxy repaired

13-East side internal epoxy damage

14-East side electric grid - Removed

15-East side shell

16-Anodes - Replaced