Canadian Natural	PRESSURE VESSEL VISUAL INSPECTION REPORT	Report #: 156960-MD-07 Inspect Date: 10/16/2012 Page: 1 of 14 Insp. Co. Job #: 156960

Criticality Designation: Yellow

Insp. Comp:	Matrix_Inspection	District:	Grande Prairie - North	Field:	Chincaga
Location:	01-24-096-05W6	Unit / Skid #:	N/A	LSD:	01-24-096-05W6
Jurisdiction #:	A0146844	Equip Tag #:	V-301C	Serial #:	79-087-05C
CRN #:	D 3193.2	Nat'l Bd #:	N/A	Year Built:	1979
Manufacturer:	KML Manufacturing	Equipment Description:	Other: Gas Dehydrator		
Status:	Out of Service - 888 -	Equip. Type:	Vessel: Tower	Service:	Sweet
MAWP Shell:	8619 kPa @ 343 °C	Volume:	N/A	Code Stamp:	☒ Y ☐ N
MAWP Tube:	@	Height/Length:	8992 mm	Insulated:	☐ Y ☒ N
MDMT:	-20 °F RT: RT-1	Size/Diameter.:	1677 mm I.D.	PWHT:	☒ Y ☐ N
Support	Skirt	Vessel on Original CNRL Inventory List:	☒ Y ☐ N	Manway:	☒ Y ☐ N
C.A.:	0.063 in.	Coated: N/A	Clad: N/A	J.E.: 1.00	Remote Access: ☐ -

	Component	Material	Nominal Thk	Diameter	OD/ID	Tube Side	Shell Side
1	Main - Shell	SA-516-70	88.500 mm	1677.000 mm	ID	☐	☒
2	Top - Head	SA-516-70	69.270 mm	1677.000 mm	ID	☐	☒
3	Bottom - Head	SA-516-70	69.270 mm	1677.000 mm	ID	☐	☒
4	-					☐	☐
5	-					☐	☐

Static Data: Confirmed ☒ Changed (See Comments) ☐

Comments:
Static data confirmed
Maximum Design Pressure: 9481 kPa

PSV Static Data

PSV –1 Tag #:	N/A	Serial #:	N/A	CRN:	N/A
Model #:	N/A	Capacity:	N/A	Set Pressure:	N/A
Manufacturer:	N/A			Service Company:	N/A
Inlet Size & Type:	-			Last Service Date:	N/A
Outlet Size & Type:	-			Block Valve:	- -
Carseal Intact:	N/A			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

Not applicable

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Insp. Company: Matrix_Inspection LSD: 01-24-096-05W6 Jurisdiction #: A0146844

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 firmly affixed to North side	☐	☐	☐
Foundation and Supports	☐	Accept	Welded skirt anchored to skid	☐	☐	☐
Anchor Bolts	☐	Accept	Secure with minor surface corrosion	☐	☐	☐
Grounding	☐	Accept	Grounded directly to South side of skirt	☐	☐	☐
Insulation Condition	☐	Reject	Piping cladding damaged and punctured	☐	☐	☒
PSV	☒		Not applicable	☐	☐	☐
Shell Heads & Nozzles	☐	Accept	Minor surface corrosion through out	☐	☐	☐
Metal Surfaces (Paint)	☐	Accept	Chipped and flaking exposing base metal	☐	☐	☒
Aux Equipment	☒		Not applicable	☐	☐	☐
Cathodic Protection	☒		No external anode	☐	☐	☐
Alignment	☐	Accept	Vertical and upright	☐	☐	☐
Flange Connections	☐	Accept	Adequate thread engagement and hardware	☐	☐	☐
Pressure Gauge	☒		No pressure gauge	☐	☐	☐
Temperature Gauge	☐	Reject	Multiple gauges, 2 not within range	☐	☐	☒
Sight Glass	☒		No sight glass	☐	☐	☐
Ladder / Platform	☐	Accept	Mechanical damage on West top platform support	☐	☐	☐
Leaks	☐	No	No evidence of leaks	☐	☐	☐
Piping from Vessel	☐	Accept	Riser saddle and lug supports for associated piping			
Previous UT Survey	☐	Yes	Locations marked, no history provided	UT Company: N/A		

External Visual Observations

At the time of inspection the dehydrator was not in service and the vessel is tagged out of service

The coating is flaking and chipped throughout exposing the base metal to minor surface corrosion with no evidence of pitting.

There are two 24" manways on the vessel. The East side manway, hardware and davit arm are in acceptable condition
The top head davit arm and pin have been removed

The two 0-300 C temperature gauges are not within design temp range and the 0-500 C gauge needle is at the 500 C mark

All platforms and ladders are secure with well supported cages on the ladder
There is moss growth on the top 8" inlet elbow cladding interface that may result in MIC
The outlet piping has a small section of cladding/insulation removed, the insulation is exposed, discolored and deteriorating which may result in CUI to the piping system
The top platform support beam is bent on the West side
There is mechanical damage noted thru out the surfaces on the shells
There is also mechanical damage on the top head below the paint

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

Recommendations:

Remove/ replace insulation on piping
Remove moss and treat area
Consider replacing temp gauges if temp is expected to exceed 300 C
Clean and touch up the coating to aid in the protection against corrosion

If this vessel is to be moved and/or placed into service the lifting lugs and top nozzle should be MT examined as well as ABSA document AB-10 completed

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Internal Inspection Results – VI N/A (Not Applicable)

Item	N/A	Condition	Comment (Check Status Bar or Press F1 for Help)	NCR	Action Item Integrity	Action Item Maintenance
Shell	☒		No Internal Inspection Carried Out	☐	☐	☐
Heads	☒		No Internal Inspection Carried Out	☐	☐	☐
Manway	☒		No Internal Inspection Carried Out	☐	☐	☐
Gasket Surfaces	☒		No Internal Inspection Carried Out	☐	☐	☐
Welds	☒		No Internal Inspection Carried Out	☐	☐	☐
Refractory	☒		No Internal Inspection Carried Out	☐	☐	☐
Heating Coils	☒		No Internal Inspection Carried Out	☐	☐	☐
Demister Pad	☒		No Internal Inspection Carried Out	☐	☐	☐
Vane Pack	☒		No Internal Inspection Carried Out	☐	☐	☐
Baffles	☒		No Internal Inspection Carried Out	☐	☐	☐
Trays	☒		No Internal Inspection Carried Out	☐	☐	☐
Filter	☒		No Internal Inspection Carried Out	☐	☐	☐
Internal Coating	☒		No Internal Inspection Carried Out	☐	☐	☐
Tubesheet	☒		No Internal Inspection Carried Out	☐	☐	☐
Tube Bundle	☒		No Internal Inspection Carried Out	☐	☐	☐

Internal Visual Observations

No Internal Inspection Carried Out

Recommendations:

No Internal Inspection Carried Out

Insp. Company: Matrix_Inspection LSD: 01-24-096-05W6 Jurisdiction #: A0146844

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

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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):

Coating deteriorated exposing base metal to surface corrosion
Damaged insulation on piping
2 temperature gauges not within range
Moss growth on top 8" elbow at the cladding interface

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

Remove/ replace insulation on piping
Remove moss and treat area
Consider replacing temp gauges if temp is expected to exceed 300 C
Clean and touch up the coating to aid in the protection against corrosion

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

No actions were corrected at the time of inspection

Additional Visual Observations

No additional visual 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: 01-24-096-05W6 Jurisdiction #: A0146844

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
Top - Head
- Shell
Bottom - Head
Bottom - Drain Nozzle
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:
Circumferential stress used for nozzles

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
Top - Head	2.374
- Shell	1.162
Bottom - Head	2.374
Bottom - Drain Nozzle	0.302
N/A - N/A	N/A

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)
Top - Head	99
- Shell	99
Bottom - Head	99
Bottom - Drain Nozzle	99
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 #: 156960-MD-07 Inspect Date: 10/16/2012 Page: 8 of 14 Insp. Co. Job #: 156960

Insp. Company: Matrix_Inspection LSD: 01-24-096-05W6 Jurisdiction #: A0146844

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.

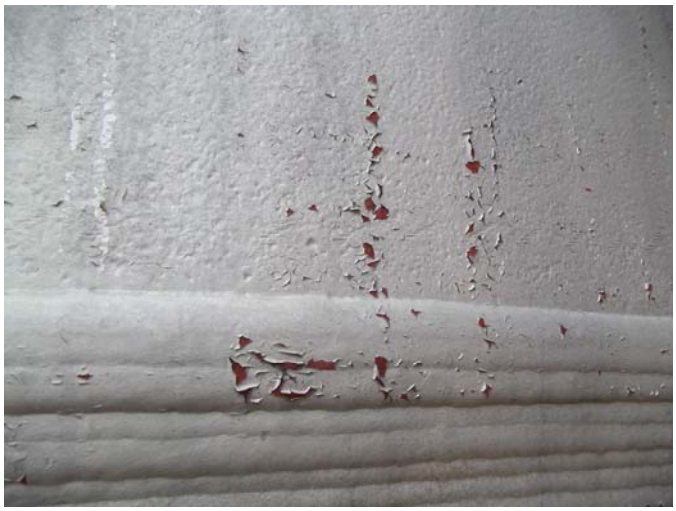
Criticality Designation			Yellow	

Vehicle #:	380	Kms:		Inspector (Name):	Matthew B Dickinson PESL: 601
Time In:	00:00	Time Out: 00:00	Hrs	Inspector (Signature):	Inspector Signature 06/30/2010 08:43:20 am API: 39483
Time In:	00:00	Time Out: 00:00	Hrs	CNRL Coordinator (Name):	
Personnel:	SJ			CNRL Coordinator (Signature):	Coordinator Signature
Billing Info:	AFE :			CNRL Chief Inspector (Signature):	06/30/2010 08:44:03 am (I am in full agreement with report contents) Chief Inspector Signature
					06/30/2010 08:45:29 am (I am in full agreement with report contents)

Equipment Photographs:

01 nameplate

02 overview

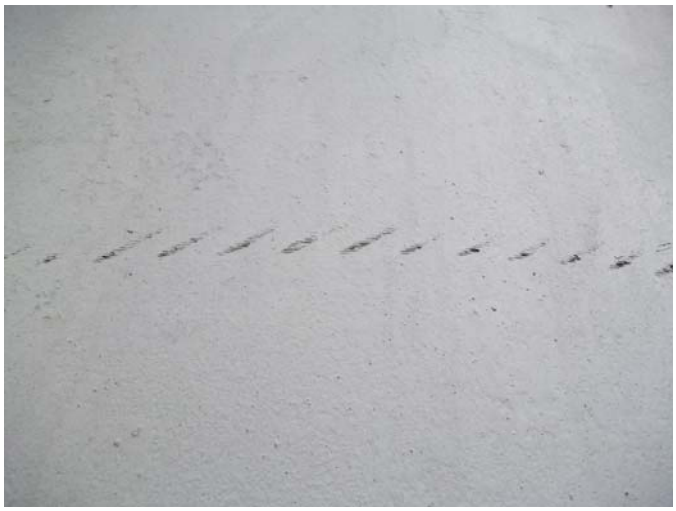


03 paint deterioration

04 not within range

05 surface corrosion

06 damaged cladding



07 mechanical damage

08 bent platform support

09 surface corrosion

10 damaged cladding

11 moss growth

12 punctured cladding