Canadian Natural Resources Limited
GENERAL PRESSURE VESSEL INFORMATION **Job 10.113250**

District: **Fort St. John**	Skid No.
Facility: **Milligan Battery**	Location (LSD): **b-63-G/94-H-02**
Vessel Name Equipment Number:	
Orientation: **Horizontal**	
Status: **In Service**	**Regulatory Inspection**

PRESSURE VESSEL NAMEPLATE DATA

"A" or "G" or "S" (Sask.) or BC Registration Number. **A0225408**		CRN Number: F 5480.21	
Vessel serial number: 85C-3422-01		Size: 12 ft. x 24ft.	
Shell thickness: 19 mm		Shell material: SA 516 70	
Head thickness: 17.2 mm		Head material: SA 516 70	
Tube wall thickness:		Tube material:	
Tube diameter:		Tube length:	
Channel thickness:		Channel material:	
Design pressure	Shell: 862 kPa	Operating pressure	Shell:
	Tubes:		Tubes:
Design Temp.	Shell: 66° C	Operating temperature	Shell:
	Tubes:		Tubes:
X-ray: RT-1		Heat treatment: HT	
Code parameters: ASME VIII, DIV. 1		Coated: Yes	
Manufacturer: ALCO GAS AND OIL		Year built: 1985	
Corrosion allowance: 1.6 mm		Manway: Yes	

PRESSURE SAFETY VALVE NAMEPLATE DATA

PSV Tag #	Manufacture / Model / Serial	Set Pressure (PSI / kPa)	Capacity (scfm)	Size	Block Valve	Location	Service by Date
1927V	Farris / 26PA10-120-55M / CE-27748-A10	862 kPa	16930	4 x 6	No	Top Shell	Unified 06/2013

SERVICE CONDITIONS-INDICATE ALL THAT APPLY

Sweet	Sour X	Oil X	Gas X	Water X
Amine	LPG	Condensate	Air	Glycol
Other (Describe):				

Inspection Interval _____PSV Service Interval_____
(Determined by MIC in conjunction with Chief Inspector following guidelines of CNRL's Owner-User Inspection Program)
Reports reviewed and accepted by:

Mechanical Integrity Coordinator_____Date_____

Fill out all forms as completely as possible. <u>All information</u> is important! Use back of sheets to record additional information or sketch if required.
Copy of report to be filed by MIC at site, and copy sent to Chief Inspector

External Inspection Items	G	F	P	N/A	Comments
Insulation Verify sealed around manways, nozzles, no damage present, and there is no egress of moisture.				X	**Vessel not insulated**
External Condition Assess paint condition, areas peeling, record any corrosion, damage, etc (record location, size and depth of corrosion or damage)	X				**Paint in fair overall condition – top coat is peeling to 50% previous coat remains intact – no exposed metal – no corrosion**
Leakage Record any leakage at flanges, threaded joints, weep holes on repads, etc.	X				**No leaks found**
Saddle/skirt Assess condition of paint, fire protection, and concrete. Look for corrosion, buckling, dents, etc. Look at vessel surface area near supports. Verify no signs of leakage at attachment to vessel and attachment welds are acceptable. Ground wire attached?	X				**Saddle Paint in good condition – no corrosion, buckling or dents – no sign of leaks at attachment welds – ground wire is attached**
Anchor Bolts Hammer tap to ensure secure. Look for cracking in treads or signs of deformation.		X			**West saddle is welded to support steel – east saddle is not securely attached to skid – bolts not tightened – no deformation**
Concrete foundation Check for cracks, spalling, etc.				X	**None**
Ladder / Platform Describe general condition, ensure support is secure to vessel, and describe any hazards.		X			**Ladders are in good condition – secured directly to shell – no loose or missing section – Platform in fair overall condition – holes noted in floor – secured to support steel**
Nozzle Assess paint, look for leakage, and ensure stud threads are fully engaged. Record any damage, deflection, etc. Are nozzles gusseted?	X				**Nozzle paint in good condition – no leaks – stud threads fully engaged – no damage or deflection – nozzles are not gusseted**
Gauges Ensure gauges are visible, working, no leakage, and suitable for range of MAWP/ Temp.	X				**Gauges clear and functional – within range for service**
External Piping Ensure pipe is well supported. All clamps, supports, shoes, etc. in place. Look for evidence of structural overload, deflection, etc. Paint condition, external corrosion?	X				**Piping is well supported – all clamps in place – no evidence of structural overload – no deflection – paint in good condition**
Valving Ensure no leaks are visible. Valves are properly supported and chained if necessary.	X				**Valves properly supported – no leaks**
PSV Ensure PSV is set at pressure at or below that of vessel.	X				**PSV found lying on side, not in proper handling condition set at MAWP – seal intact – no block valve – discharge piping does not reduce -**
NDE methods Was UT/ MPI done on vessel (MI coordinator to review results)	X				**Ultrasonic corrosion survey carried out – pipe metal thickness detected below nominal minus corrosion allowance. Thickness calculations carried out:** **UT point 261 (3" Nozzle) – nominal thickness is 15.2mm / min thickness is 7.6mm / T min thickness is 1.6mm.** **UT point 263 (4" Nozzle) – nominal thickness is 17.1mm / min thickness is 15.4mm / T min thickness is 1.6mm.**

Recommendations or corrective actions : Vessel is Fit for Service or describe corrective actions required)
(MIC to review corrective actions with Operations, discuss with Chief Inspector where necessary, and get remedial action implemented)
Recommendations: Monitor 3" Water Dump nozzle on regular basis – not to exceed 1 year.
Summary: This vessel is in good condition, visual external and ultrasonic thickness inspection carried out – pipe metal thickness detected below nominal minus corrosion allowance. Thickness calculations carried out to ensure sufficient metal exists for safe operation.
Corrosion rate based on greatest thickness loss (nozzle) 0.271mm per year. Retirement Date to "T"min is year 2035.
Vessel is fit for service.

Inspected By: Andrew Neis / Dellas Weidman **Date:** June 23, 2013

Internal Inspection Items	G	F	P	N/A	Comments
Coating Assess coating. Describe area coated, general condition of coating.		X			**Internal surface is 100% coated with epoxy – coating failure to 5% of total area - three 3 inch nozzles with total coating loss – blistering and failed coating along 6 o'clock region**
Anodes. How many, type, condition. % consumed. Are they being replaced?			X		**Two anode removed from vessel – in poor condition - over 60% consumed**
Internal Piping Is there any? If so, carbon or stainless steel. Describe condition, dents, corrosion, erosion, etc. Ensure supports are secure and any bolts are suitable for future use.			X		**Internal piping removed for inspection – poor condition – through wall corrosion – Internal piping has no use and will not be reinstalled after inspection**
Trays How many? Type of material. Are valves in place. Check for erosion/ corrosion; wear on tray valve legs. Cleanliness?				X	**None**
Baffles, deflector plates, etc. If present, describe condition. Look closely at welds attached to vessel wall.	X				**Baffle in good overall condition – isolated area of corrosion at attachment weld to shell – pitting to 0.060 inch – inlet deflector in good condition – minor coating loss – no corrosion or mechanical damage**
West Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	X				**Isolated pitting found – pit depths to 0.150 inch –**
East Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	X				**No corrosion found – coating in good overall condition – small isolated holidays located at 6:00 – no mechanical damage**
Shell Sections Record number of shell sections. Record location, size and depth of all erosion, corrosion or mechanical damage. Describe general condition. If any corrosion greater than corrosion allowance is observed in either shell or head, discuss with Chief Inspector before closing vessel.		X			**Shell sections – exposed metal with corrosion pitting found throughout 6 o'clock region – pith depths from 0.050 to 0.250 inch – no mechanical damage noted**
Demister pad Is it in place? Is it clean? If any corrosion is apparent in vessel, lift pad and check top head for corrosion.			X		**Vane pack demister was removed after initial inspection – found to be collapsed and full of solids**
Welds Inspect all welds, including attachment welds. Record all service-related damages and if there is any discuss with Chief Inspector before closing.	X				**Three nozzle welds found to be corroded – wall loss from 0.300 to 0.600 inch –** **All Shell and head weld found in good condition with minimal coating loss and no corrosion or defects noted**
Repairs Required. If yes, ensure procedure and copy of AB 40 is on file, and one sent to local ABSA, and Chief Inspector	X				**Yes – Weld repair required to build up wall loss on bottom shell and nozzle metal loss on three 3 inch nozzles**
NDE Was any NDE done. (MI coordinator to review results)	X				

Recommendations or corrective actions : Vessel is Fit for Service or describe corrective actions required)
(MIC to review corrective actions with Operations, discuss with Chief Inspector where necessary, and get remedial action implemented)

Recommendations: 1. Cut out and replace corroded nozzles #2 and #3 - Weld build-up on corroded nozzle #1. Grit blast failed epoxy coating on bottom shell from 5 – 7 o'clock position for entire length of shell and inside repaired nozzles. Re coat epoxy to bottom shell. Repair minor coating damage around man way, internal supports and ladder with Devoe 142

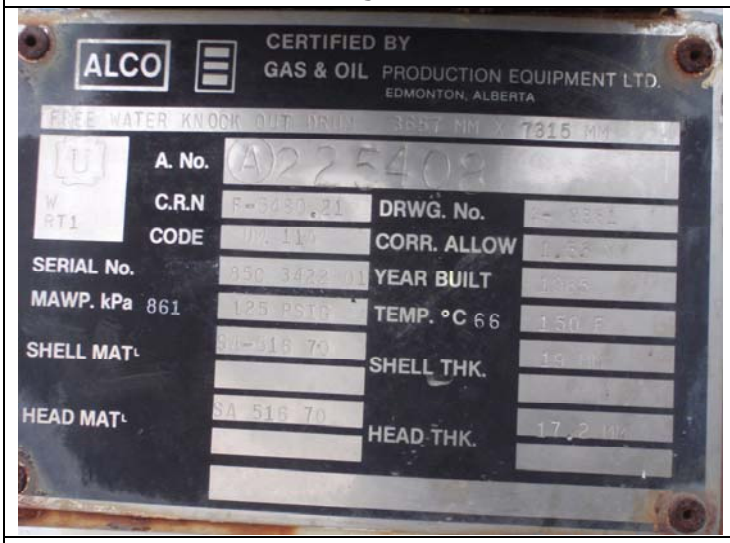
Summary: Vessel is in overall good condition, visual external inspection and ultrasonic corrosion survey performed—no metal thickness detected below nominal minus the corrosion allowance.

Vessel is fit for service.

Inspected By: Andrew Neis / Dellas Weidman **Date:** June 23, 2013

LSD

Overview



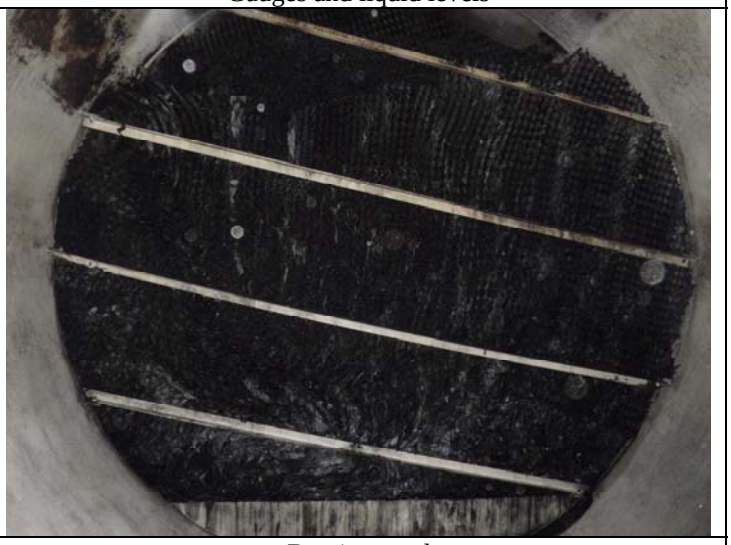
Data Plate

PSV – as found; lying on side

PSV Tag

Gauges and liquid levels

Holes in floor on platform



Demister pad

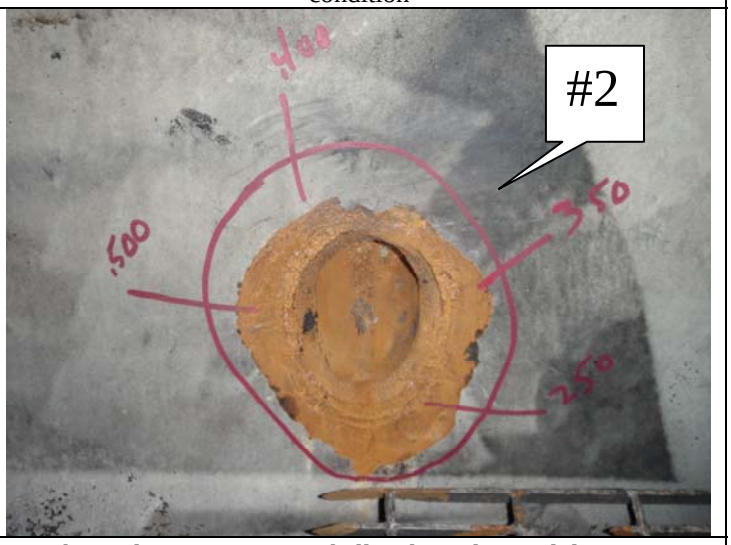
Bottom section of demister pad collapsed – full of solids

Upper section of demister pad -

Pitting on bottom shell – depths from 0.050 to 0.210

Water dump nozzle – vortex breaker and coating in good condition

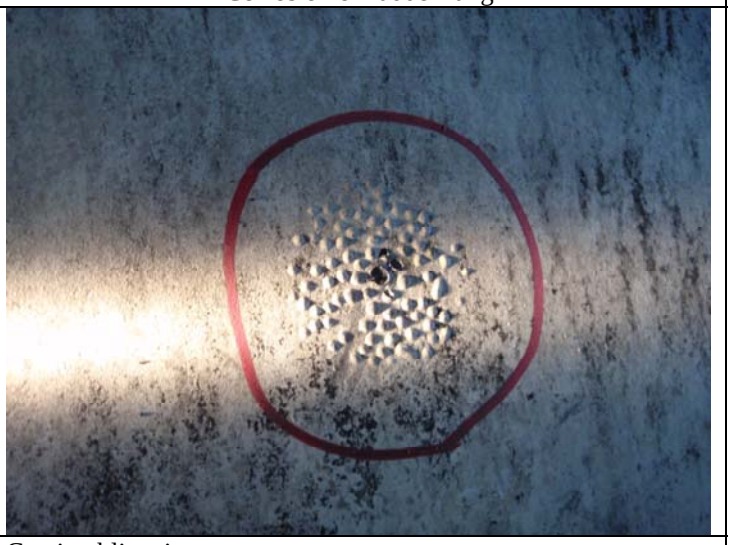
4 inch nozzle – corrosion on shell and nozzle metal loss to 0.300 inch



4 inch nozzle – corrosion on shell and nozzle metal loss to 0.500 inch

3 inch nozzle at 6 o’clock – corrosion on shell and nozzle metal loss to 0.600 inch

Pitting on bottom shell – depths from 0.050 to 0.235

	
After demister pad removal	Spill case
	
Baffle welded to shell – isolated pit – depth to 0.050 inch	Corrosion on ladder rung
	
Pitting in man way – depths to 0.150 inch	Coating blistering

	
Inlet deflector plate	Corrosion on internal piping