

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

Job # 05.002999

District: Fort St. John BC.	Skid No.
Facility: Milligan Main	Location (LSD): b-63-G/94-H-02W6M
Vessel Name Equipment Number: Glycol Contactor	
Orientation: Vertical	
Status: Out of Service	Repair / Alteration Inspection

PRESSURE VESSEL NAMEPLATE DATA

"A" or "G" or "S" (Sask.) or BC Registration Number. A445902		CRN Number: N 7770.21	
Vessel serial number: 99-1401-1		Size: 24 in. x 28 ft.	
Shell thickness: 31.8 mm		Shell material: SA 516-70MT	
Head thickness: 30.3 mm /30.8 mm		Head material: SA 516-70MT	
Tube wall thickness:		Tube material:	
Tube diameter:		Tube length:	
Channel thickness:		Channel material:	
Design pressure	Shell: 9915 KPa	Operating pressure	Shell:
	Tubes:		Tubes:
Design Temp.	Shell: 54 Deg C	Operating temperature	Shell:
	Tubes:		Tubes:
X-ray: RT 1		Heat treatment: nil	
Code parameters: ASME VIII, Div 1		Coated: no	
Manufacturer: Serval Process Industries		Year built: 1999	
Corrosion allowance: 3.2 mm		Manway: no	

PRESSURE SAFETY VALVE NAMEPLATE DATA

PSV Tag #	Manufacture	Model #	Serial #	Set Pressure (kPa)	Capacity (scfm)	Service Date
7762F	Farris	26FA13-120	409138-1-A10	1440 PSI	9330	4/05
CRN #	Service By	Block Valve	Location	Size	Code Stamp	
OG 2369.5C	unified valve	no	lower shell	1.5"x2"	UV	

SERVICE CONDITIONS-INDICATE ALL THAT APPLY

Sweet	Sour X	Oil	Gas X	Water X
Amine	LPG	Condensate	Air	Glycol X

Other (Describe):

Inspection Interval _____ **PSV Service Interval** _____

(Determined by MIC in conjunction with Chief Inspector following guidelines of CNRL Owner-User Inspection Program)

Reports reviewed and accepted by:
Mechanical Integrity Coordinator _____ **Date** _____

Fill out all forms as completely as possible. All information 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 good overall condition – No exposed metal.
Leakage Record any leakage at flanges, threaded joints, weep holes on repads, etc.	X				No leaks observed.
Saddle/Skirt Assess condition of paint, fire protection, 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				Skirt: No buckling or dents. No corrosion at attachment welds to vessel.
Anchor Bolts Hammer tap to ensure secure. Look for cracking in treads or signs of deformation.				X	
Concrete foundation Check for cracks, spalling, etc.				X	
Ladder / Platform Describe general condition, ensure support is secure to vessel, describe any hazards.				X	
Nozzle Assess paint, look for leakage, and ensure stud threads are fully engaged. Record any damage, deflection, etc. Are nozzles gusseted?				X	
Gauges Ensure gauges are visible, working, no leakage, and suitable for range of MAWP/ Temp.				X	
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	
Valving Ensure no leaks are visible. Valves are properly supported and chained if necessary.				X	
PSV Ensure PSV is set at pressure at or below that of vessel.				X	
NDE methods Was UT/ MPI done on vessel (MI coordinator to review results)				X	
Repairs Required:	X				<ol style="list-style-type: none"> 1. Install 9 new nozzles – 3 inch diameter – between trays for cleaning on line. 2.
<p>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: See repairs required. Summary: Vessel is in overall good condition, visual inspection performed during pressure test of vessel after repairs. No leaks were detected. Vessel is fit for service.</p>					

Inspected By: Gerry Avery

Date: March 27, 2009

Notes: Vessel filled with water start at 8:30 and completed at 9:15 AM.
 Hydro started at 9:45, pressure set at 1027.1 PSI and held for 10 minutes.
 At 10:18 am pressure increased to 2093.8 PSI and held.
 10:54 pressure at 2157.3 PSI.
 10:56 drop pressure to 1041 PSI.
 11:00 pressure drop to 0 PSI and test completed.

Photo Table



vessel data plate



vessel overview



nozzle attachment



nozzle overview



vessel overview



vessel bottom head



top replaced nozzle 1st.



2nd



3rd



4th



5th



6th



7th



8th



9th



vessel overview



pressure test



pressure test completion time

CNRL Procedure 4: Installation of Nozzles (PWHT Vessel)

A#	0445902	Facility	District: Fort St. John South, Field: Milligan	
CRN#	N-7770.21	LSD	B63G/94H2	
S/N	99-1401-1			
MAWP	1438 psig	Vessel Description	24-inch Diameter Glycol Contactor Tower	
Material	SA-516-70MT			
Shell Thickness	1.250"	Scope of Work: - Installation of nozzles in shell of ASME Section VIII Div 1 vessel - Nozzles to be installed in upper tray section between trays - Location of trays to be determined by radiographic inspection - All nozzles to be installed are 3", RFLWN, 600# SA-105N		
Head Thickness	Top: 1.191" Bottom: 1.214"			

Scope

1. Installation of nozzles in an ASME Section VIII Division I pressure vessel (tower) constructed of P-I Group 1 or 2 materials.
2. Materials shall be of the same specification, grade, and dimensions as defined in the manufacturer's original registered design.

Procedure

Cut Out

1. For each nozzle to be installed, define the area to be cut out of the shell.
2. Perform UT of the cut areas to determine if any laminations or discontinuities exist.
3. If laminations or discontinuities are identified, move the cut out area to attempt to avoid these defects.
4. Owner's Inspector shall approve the layout of the area to be removed prior to the initial cut being made.
5. Ensure the vessel has been sanitized and there are no explosive environments present either in the general atmosphere within the vessel or in trapped sites behind internal attachments. If there is any question about the certainty of this step consideration should be given to alternative cutting methods such as high-pressure water.
6. Perform the cut.

Procedure

continued...

Weld Preparation

7. The joint preparation shall be in accordance with the manufacture's original registered design.
8. Area to be welded to shall be cleaned to white metal for a distance of 10 mm beyond the expected weld area.
9. The weld area shall be MT examined for laminations and surface discontinuities. If laminations or surface discontinuities are identified they shall be brought to the attention of the Chief Inspector and dealt with in accordance with the requirement of the Company's Owner User Program.

Hydrogen Bake out and Sulfur removal (Required Only if Vessel Has Been Exposed to Sour Service):

10. Vessels that have been exposed to sour or sulfur bearing process streams shall required the weld attachment area to undergo a "Bake Out" procedure. This procedure shall consist of heating the weld attachment area and 10 cm on each side to 315 C (600 F) for and holding that temperature for a minimum of 60 minutes. Bake out should be done prior to cutting out, if cutout is done thermally. Stipulate controls methods.

11. Bake Out is performed by either induction coil (use thermocouples as control instrumentation) or propane torch (use temperature-sensitive crayons – upper and lower temperature to be controlled). Oxyacetylene torches are not acceptable.

12. If induction coils are used, a 250 C (482 F) four-hour heat treatment may be substituted for the normal 315 C (600 F) one-hour heat treatment.

**Procedure
continued...**

Preheat and Welding:

Post Weld Heat Treated Equipment:

13. Minimum pre-heat shall be 175 C (350 F) for a 100 mm band on both sides of the weld attachment area.

14. Maximum interpass temperature shall not exceed 230 C (450 F).

15. The Owner's Inspector shall witness seal on the box being broken and ensure that once the box has been opened the electrodes are stored in an oven.

16. Perform PWHT, either by oven or thermal truck, at 1150F for 60 minutes.

Post Welding NDE:

17. MT 12 hours after completion of the work

18. Hydrotest as per ASME Section VIII Division I.

Documentation:

19. Ensure Company Approved Contractor has completed QC documentation.

20. Sign off repair documentation and ensure one copy is submitted to regulatory body and one is retained on file in the equipment inspection file.

Procedure 4: Installation of Nozzles			
Section	Comments	Sign Off	Date
Scope	Reviewed.	D. Wiedman	25 Mar 2009
Procedure	Procedure reviewed with repair group.	D. Wiedman	25 Mar 2009
Cut Out			
Step 1	Shell was radiographed and trays identified – nozzle insertion areas marked out.	D. Wiedman	25 Mar 2009
Step 2	Ultrasonic thickness inspection carried out to ensure metal is sound before nozzle openings cut out.	D. Wiedman	25 Mar 2009
Step 3	No laminations detected.	D. Wiedman	25 Mar 2009
Step 4	Lay out checked and approved by Authorized inspector.	D. Wiedman	25 Mar 2009
Step 5	Vessel steamed out for 12 hours and then vessel was sent for bake out – 650 deg for 1 hour.	D. Wiedman	25 Mar 2009
Step 6	Nozzle openings cut into shell of vessel at all tray areas.	D. Wiedman	25 Mar 2009
Weld Preparation			
Step 7	Cut out areas on shell are cleaned up and nozzles are prepped for stub on installation.	D. Wiedman	25 Mar 2009
Step 8	Areas surrounding weld prep is cleaned for installation.	D. Wiedman	25 Mar 2009
Step 9	MT inspection carried out on prep areas. No defects detected.	Paladin Inspections	26 Mar 2009
Hydrogen Bake Out and Sulphur Removal			
Step 10	Bake out completed using induction coils – 650 deg F for 1 hour.	D. Wiedman	26 Mar 2009
Step 11	Bake out completed using induction coils – 650 deg F for 1 hour.	D. Wiedman	26 Mar 2009
Step 12	Bake out completed using induction coils – 650 deg F for 1 hour.	D. Wiedman	26 Mar 2009

Preheat and Welding			
Post Weld Heat Treated Equipment			
Step 13	Pre heat maintained at 350 deg F.	D. Wiedman	27 Mar 2009
Step 14	Interpass temp not exceeded.	D. Wiedman	27 Mar 2009
Step 15	New welding rods used – seal broken in presence of authorized inspector.	D. Wiedman	27 Mar 2009
Step 16	PWHT carried out 1150 deg F for 1 hour.	D. Wiedman	27 Mar 2009
Post Welding NDE			
Step 17	MT inspection carried out 12 hours after PWHT cool down period.	Paladin Inspections	27 Mar 2009
Step 18	Hydro Test carried out at 1.5 x MAWP = 2152.5 PSI. for 1 hour / Passed.	Gerry Avery	27 Mar 2009
Documentation			
Step 19	Bring It Welding responsibility.		28 Mar 2009
Step 20	Bring It Welding responsibility.		28 Mar 2009