

## Field Inspection Report - Long\_Run 3162237\_11/08/2013\_VT\_Internal

<b>Vessel Number</b>	3162237	<b>Vessel Name</b>	GAS/GAS EXCHANGER	<b>Province</b>	Alberta
<b>District</b>	NORTHERN - AB	<b>LSD</b>	03-26-074-01W6	<b>Location</b>	PUSKWASKAU
<b>Method</b>	VT	<b>Access</b>	Internal	<b>Cleaning</b>	Good
<b>Inspection Date (mm/dd/yyyy)</b>	11/08/2013	<b>Inspection Interval (months)</b>	60	<b>Next Inspection (mm/dd/yyyy)</b>	11/08/2018
<b>CRN</b>	N1341.2	<b>Skid Number</b>	PKG62777	<b>Service</b>	Sweet
<b>Internal Access</b>	Yes	<b>Internal Coating</b>	No	<b>Status</b>	In Service
<b>MAWP (PSI)</b>	1320	<b>MAWP (kPa)</b>	9101.14	<b>Outstanding NCRs</b>	0
<b>MAWT (°C)</b>	66.11	<b>MAWT (°F)</b>	151		

### General

The vessel was blinded, opened and cleaned for internal inspection as part of the 2013 T/A. Exchanger is a 2 piece exchanger which are tied together with nozzles at either end. Both exchangers are mainly indoors with the first pass/exchanger is painted and uninsulated and the second pass/exchanger is painted, insulated and clad. The integral heads are the only sections not in the building. Tubes were very dirty prior to cleaning. Clean Harbors cleaned tubes with a 15K lance.

PSV protecting the vessel was serviced during this T/A.

In sweet service.  
RT-2.  
PWHT - No  
See attached pictures.

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PWHT - No  
See attached pictures.

### Safety Valves

PSV P99578 Shell side. Set pressure: 1320 PSI / 9101.14 KPa. MAWP: 1320 PSI / 9101.14 KPa. Capacity: 21007 SCFM / 594.85 m3/min.

PSV P99578 Tube side. Set pressure: 1320 PSI / 9101.14 KPa. MAWP: 1320 PSI / 9101.14 KPa. Capacity: 21007 SCFM / 594.85 m3/min.

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### External Condition

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All visible shell surfaces and nozzles appear in good condition. Name plate is intact and legible. Vessel supports, foundation and electrical grounding appear good. The external coating and insulation and cladding appears to be in good condition. Associated piping, supports and components appear in good condition and alignment with no signs of leaks or defects present at the time of inspection. No evidence of short studding or nut rounding at time of inspection.

PSVs have been verified, but are out for service at time of inspection. Verify vessel has Alberta CRN and A# stamping, PSV has correct code stamp, set pressure and MWS tagging, and was last serviced within the required interval guidelines.

Assign inspection interval.

### Internal Condition

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This is a pair of fixed tube sheet exchangers with integral channel heads and dollar plate closures; tied together with nozzles on the integral heads to make it a 2 pass exchanger.

Tubes were very dirty prior to cleaning. Clean Harbors cleaned tubes with a 15K lance.

Shells:

Internal inspection cannot be done on shells due to design of exchangers. Only integral heads, tubes, tubesheets and dollar plates could be washed and cleaned.

3/4" tubes were cleaned with a 15K lance followed with hydro blasting of the tubesheets, heads and dollar plates.

Top exchanger integral head inlet (West):

Tubes protrude through tube sheet by 3/16", but lower tubes have eroded flush with the tube sheet. The ID of the tubes appear to be very thin and should have Remote Field Testing (RFT) completed to determine remaining wall of tubes. Tubes maybe losing there ability at the rolled area in tube sheet to retain a good seal. The tube sheet itself does not look like it has any substantial wall loss or pitting. The integral head walls are etched from erosion, but to no significant depth. Dollar plate for the end also has the light etching. All circs and Cat. D welds appear in good order. The nozzles are clear. Gasket faces in good condition.

Top exchanger integral head outlet (East):

Tubes protrude through tube sheet by 3/16". Tubes had some product remaining product in upper tubes, but have communication from East to West. The ID of the tubes appear to be in like new condition unlike the inlet side. The tube sheet itself does not look like it has any substantial wall loss or pitting, but has some light etching. The integral head walls have surface oxidization and product scaling. Dollar plate for the end also has the light etching and product scaling. All circs and Cat. D welds appear in good order. The nozzles are clear. Gasket faces in good condition.

Bottom exchanger integral head 2nd pass inlet (East):

Tubes protrude through tube sheet by 3/16", but lower tubes have eroded almost flush with the tube sheet. The ID of the tubes appear to be very thin and should have Remote Field Testing (RFT) completed to determine remaining wall of tubes. Tubes maybe losing there ability at the rolled area in tube sheet to retain a good seal. The tube sheet itself does not look like it has any substantial wall loss or pitting. The integral head walls are etched from erosion and has thin oval worm like corrosion noted on the bottom 1/3 of head, but to no significant depth. Dollar plate for the end also has the light etching. All circs and Cat. D welds appear in good order. The nozzles are clear. Gasket faces in good condition.

Bottom exchanger integral head outlet (West):

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Tubes protrude through tube sheet by 3/16". Tubes had some product remaining product in upper tubes, but have communication from East to West. The ID of the tubes appear to be in like new condition unlike the inlet side. The tube sheet itself does not look like it has any substantial wall loss or pitting, but has some light etching. The integral head walls have surface etching. Dollar plate for the end also has the light etching and product scaling. All circs and Cat. D welds appear in good order. The nozzles are clear. Gasket faces in good condition, but there is some etching on the inner edge of the gasket surface.

### Recommendations

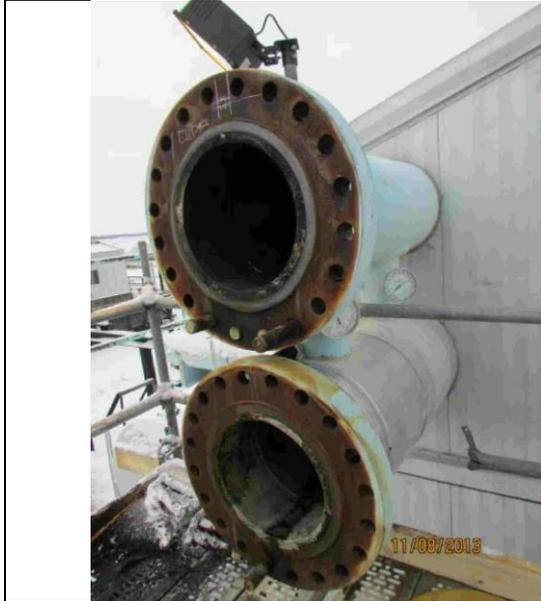
- Complete a Remote Field Test (RFT) on 50% of tubes or possibly IRIS.
- Exchanger was given a 60 month inspection window based on the exchanger leaking between tubes to shell, not external to vessel. Would highly recommend RFT ASAP to get a base line of remaining life of tubes. May require FGG to use the IRIS technique to determine wall loss at tube sheet.
- Clean tubes better as this will be required to complete RFT. 40K dual lance on an indexing stand.
- Internally inspect again in 5 years.
- Pop-A Plug for exchanger tube plugging. Call the Pickford Group for details and search Pop-A Plug on the internet.

The above recommendations have been reviewed with operations prior to closure. Tubes protrude through tube sheet by 3/16", but lower tubes have eroded flush with the tube sheet. The ID of the tubes appear to be very thin and should have Remote Field Testing (RFT) completed to determine remaining wall of tubes. Tubes maybe losing there ability at the rolled area in tube sheet to retain a good seal. The tube sheet itself does not look like it has any substantial wall loss or pitting. The integral head walls are etched from erosion, but to no significant depth. Dollar plate for the end also has the light etching. All circs and Cat. D welds appear in good order. The nozzles are clear. Gasket faces in good condition. Tubes were very dirty prior to cleaning. Clean Harbors cleaned tubes with a 15K lance.

<b>Suitable to be returned to Service</b>	Yes	<b>Suggested Inspection interval (Months)</b>	60
<b>Repairs are still required</b>	No		
Daryl Cole Cert 000391 <b>Inspector</b>			11/12/2013 <b>Date (mm/dd/yyyy)</b>
		<b>Signature</b>	

### Pictures

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LRE - 3162237 GAS TO GAS EXCH. EXT. EAST  
11-08-13.JPG



LRE - 3162237 GAS TO GAS EXCH. INT WEST TOP  
11-08-13 (3).JPG



LRE - 3162237 GAS TO GAS EXCH. INT WEST  
TOP 11-08-13 (4).JPG



LRE - 3162237 GAS TO GAS EXCH. INT. EAST  
BOTTOM 11-08-13 (4).JPG