Canadian Natural Resources Limited GENERAL PRESSURE VESSEL INFORMATION	4016382 Job 4016101
District: **Fort St. John, BC**	Skid No.
Facility: **Pee Jay Unit 3 – Nancy Battery**	Location (LSD): **d-65-H / 94-A-15**
Vessel Name Equipment Number: **Free Water Knockout Drum**	
Orientation: **Horizontal**	
Status: **In Service**	**Regulatory Inspection**

PRESSURE VESSEL NAMEPLATE DATA

"A" or "G" or "S" (Sask.) or BC Registration Number. **A68932**		CRN Number: **A 6968.21**	
Vessel serial number: L-1059		Size: 10 ft. x 25 ft.	
Shell thickness: 9.5 mm		Shell material: SA 285 C	
Head thickness: 11.1 mm		Head material: SA 283 C	
Tube wall thickness:		Tube material:	
Tube diameter:		Tube length:	
Channel thickness:		Channel material:	
Design pressure	Shell: 50 PSI	Operating pressure	Shell:
	Tubes:		Tubes:
Design Temp.	Shell: 149° C	Operating temperature	Shell:
	Tubes:		Tubes:
X-ray: Nil		Heat treatment: Nil	
Code parameters: ASME VIII, Div. 1		Coated: Yes	
Manufacturer: NATIONAL TANK CO.		Year built: 1967	
Corrosion allowance: N/S		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
2415F	Wellmark / W9503-RN / 67893-4	50 PSI	2445 SCFM	3 x 3	No	Top shell	Unified 05/2015

SERVICE CONDITIONS-INDICATE ALL THAT APPLY

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

Inspection Interval _____PSV Service Interval_____

(Determined by MIC in conjunction with Chief Inspector following guidelines of Canadian Natural Resources Limited'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			**Cladding in fair overall condition – no open or torn sections- minor exposed insulation on the north head due to missing sealant – minor evidence of egress of moisture at 12 O'clock from openings in the roof – currently no wet insulation.**
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 condition – minor flaking and peeling to approximately 10% of shell surface, concentrated at 12 O'clock position - scattered areas of surface corrosion – pitting to 0.020 inch deep max.**
Leakage Record any leakage at flanges, threaded joints, weep holes on repads, etc.		X			**Product seeping at inlet flanged connection and threaded connection to liquid level controller.**
Saddle 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				**Saddles: No distortion or buckling.** **No corrosion at saddle to shell area – no leaks.** **Paint in good condition – no corrosion.** **Ground attached to skid.**
Anchor Bolts Hammer tap to ensure secure. Look for cracking in treads or signs of deformation.	X				**Supports securely welded to skid deck.**
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	**None**
Nozzle Assess paint, look for leakage, and ensure stud threads are fully engaged. Record any damage, deflection, etc. Are nozzles gusseted?	X				**Stud threads fully engaged through nuts – no short bolts.** **No deflection – no leaks.** **No gussets.**
Gauges Ensure gauges are visible, working, no leakage, and suitable for range of MAWP/ Temp.	X				**Gauges are clear and functional – no leaks** **Suitable for MAWP: 50 – 400° F** **Suitable for MDMT: -20 - 120°C**
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				**Well supported, no deflection, all clamps and supports in place.** **Piping is painted – in fair condition – patches of missing paint on inlet piping with surface corrosion – no deep pitting.**
Valving Ensure no leaks are visible. Valves are properly supported and chained if necessary.	X				**Well supported – no leaks.**
PSV Ensure PSV is set at pressure at or below that of vessel. Discharge piping is same size as inlet to valve and is properly supported and routed. Ensure no block valves between PSV and vessel or if there are they are locked open.	X				**Located on top shell – set at MAWP of vessel.** **Seal is intact // No block Valve // Discharges to closed header.**

NDE methods Was UT/ MPI done on vessel (MI coordinator to review results)	**X**				**Ultrasonic corrosion survey carried out – shell metal thickness detected below nominal minus corrosion allowance. Thickness calculations carried out:** **1. UT point 735 (shell) – nominal thickness is 9.5mm / min thickness is 8.9mm / T min thickness is 7.9mm.** **2. 3 inch piping circ band - normal thickness is 7.6mm/min thickness is 3.4mm/T min thickness is 1.6 mm.**

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. Seal high level control connections to vessel – seeping product.
Summary: This vessel is in good condition, visual external and ultrasonic thickness inspection carried out – shell and 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 (shell) 0.029mm per year. Retirement Date to "T"min is year 2022.
Vessel is fit for service.

Inspected By: Dellas Wiedman // API 20981 // IBPV 275 **Date:** February 11, 2020

Internal Inspection Items	G	F	P	N/A	Comments
Coating Assess coating. Describe area coated, general condition of coating.		**X**			**Lower 2/3^{rds} of vessel shell and head is coated – coating in the front-end found in good overall condition – a few small chips on the shell and head. In the back-end, the coating was found in fair condition – clusters of blistering and exposed metal noted throughout the bottom shell. Damage to 10% of total area**
Anodes. How many, type, condition. % consumed. Are they being replaced?		**X**			**Two anodes: both are completely consumed – to be replaces**
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**				**2 inch carbon steel piping – not in service – in corroded condition.** **1 inch carbon steel fuel gas preheat piping in good condition. No corrosion or damage – well supported**
Trays How many? Type of material. Are valves in place? Check for erosion/ corrosion; wear on tray valve legs. Cleanliness?	**X**				**Two horizontal screens in the back-end – welded in place – well supported and in good overall condition – no corrosion or mechanical damage noted**
Baffles, deflector plates, etc. If present, describe condition. Look closely at welds attached to vessel wall.	**X**				**Two baffle plates are welded in place. Partially coated – Both are in generally good condition with no corrosion or mechanical damage – no failed areas of coating. Space between baffles was not cleaned for inspection**
North Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	**X**				**Fire Tube side: North head is coated – one 5cm area of damaged coating noted – previous corrosion and pitting at 5:00 to 7:00 position to 0.030 inch depth – no new corrosion detected**
South Head Note all corrosion, erosion or mechanical damage. (If vessel is horizontal identify direction of this head)	**X**				**South head (Back-end) is in good overall condition – no corrosion or damaged coating**
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**				**This vessel has 3 shell sections – previous general corrosion and pitting on the 5:00 to 7:00 position to 0.040 inch depth in the front end – new corrosion detected in the back-end – one isolated pit to 0.065 inch max**

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**	**None**
Welds Inspect all welds, including attachment welds. Record all service-related damages and if there is any discuss with Chief Inspector before closing.	**X**				**Welds are in good condition – no corrosion or service related damage**
Repairs Required. If yes, ensure procedure and copy of AB 40 is on file, and one sent to local ABSA, and Chief Inspector	**X**				**Coating repairs recommended**
NDE Was any NDE done. (MI coordinator to review results)	**X**				**Magnetic particle inspection carried out on fire tube – cracking detected on one fire tube – see MPI report for details**

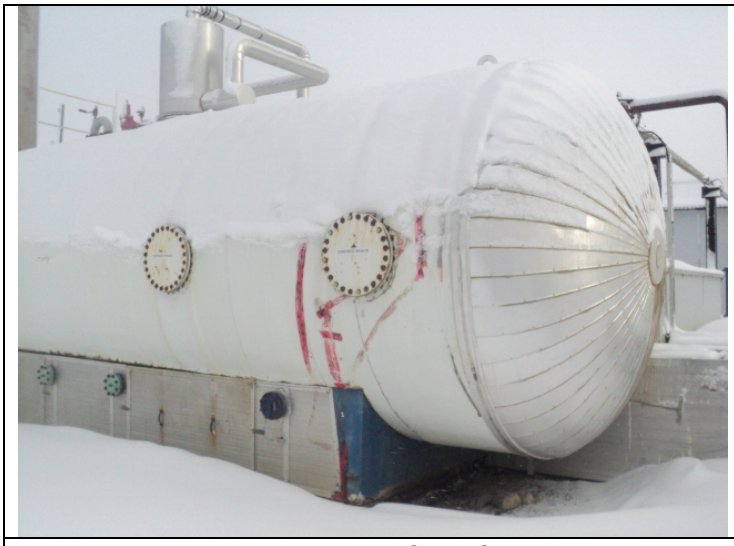
Recommendations or corrective actions : Vessel is Fit for Service or describe corrective actions required)
(MIC to review corrective actions with Operations, discuss with Chief Inspector where necessary, and get remedial action implemented)
Recommendations: 1. Carry out coating repairs in back end 2. One roller for the fire tube support was found broken – repair and reinstall
Summary: Vessel is in overall good condition, visual external inspection and ultrasonic corrosion survey performed—shell metal thickness detected below nominal. New corrosion detected in the back end – one isolated pit on the bottom shell to 0.050 inch max depth.

Vessel is fit for service.

Inspected By: Andrew Neis API 48747 IPV cert#880 **Date:** Feb 20, 2020

LSD

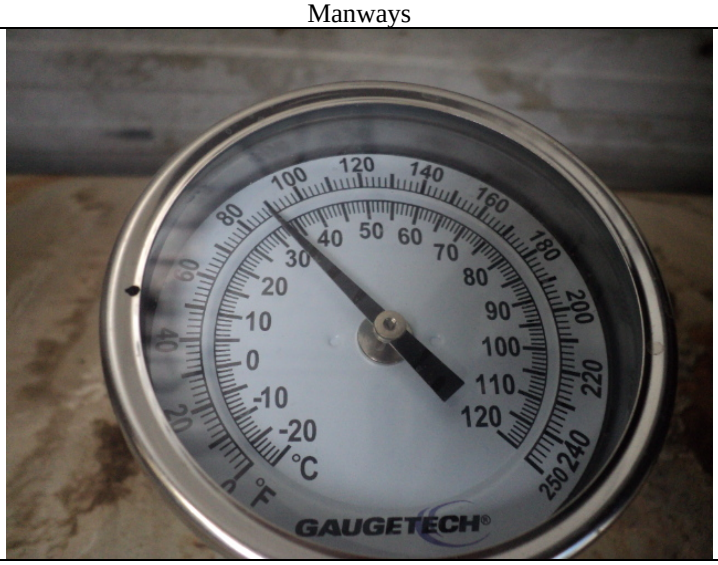
Overview North Head



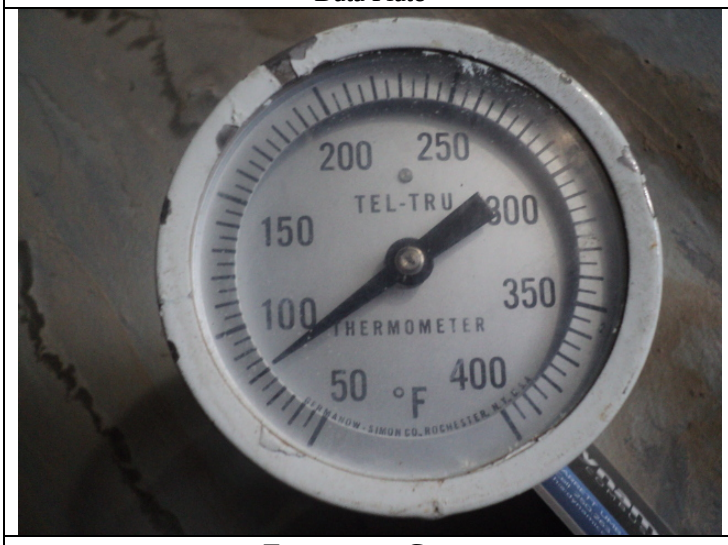
Overview South Head

Manways

Data Plate



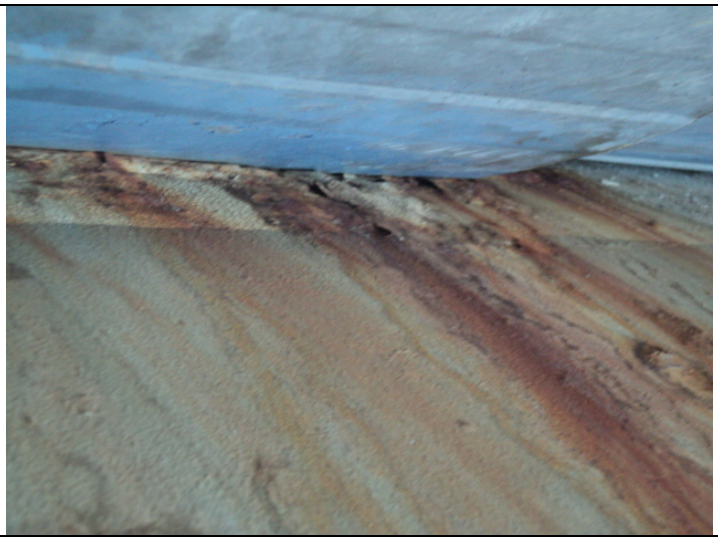
Temperature Gauge



Temperature Gauge

Saddle

Paint peeling at 12 O'clock

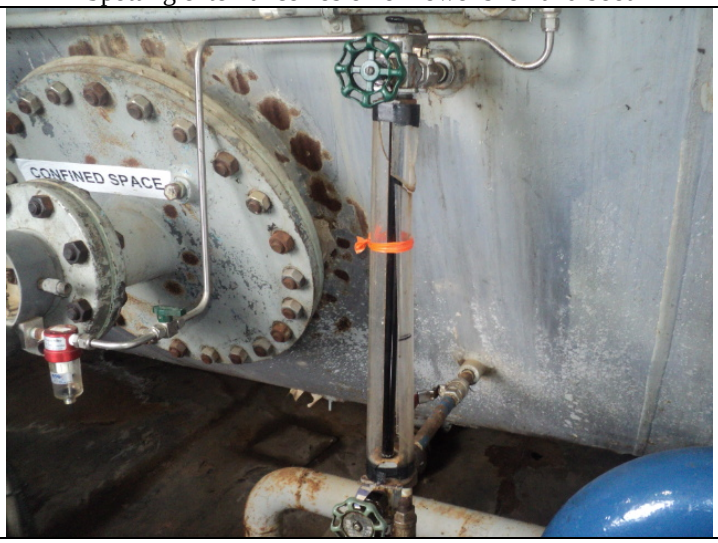


Shell at 12 O'clock

Spotting external corrosion on shell

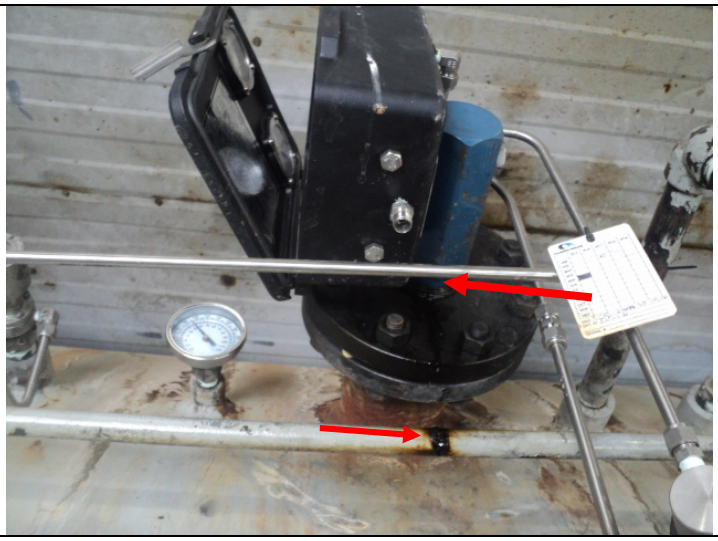
Spotting external corrosion on lower shell and boot

Liquid level gauge

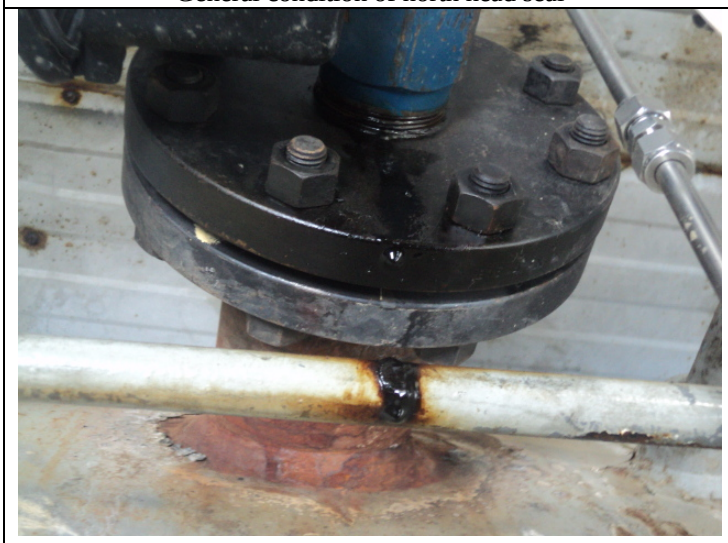


Liquid level gauge

General condition of north head seal



Liquid level gauge evidence of seepage at threaded connection



Macro of threaded connection

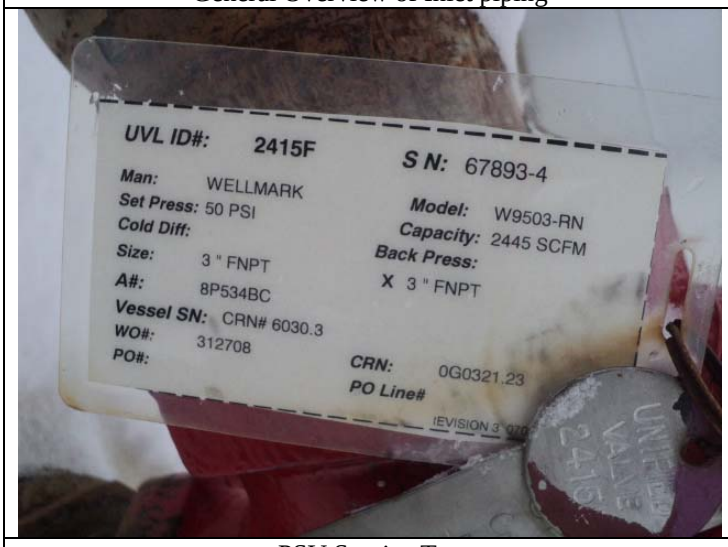
Evidence of external staining due to seepage

Evidence of external staining due to seepage

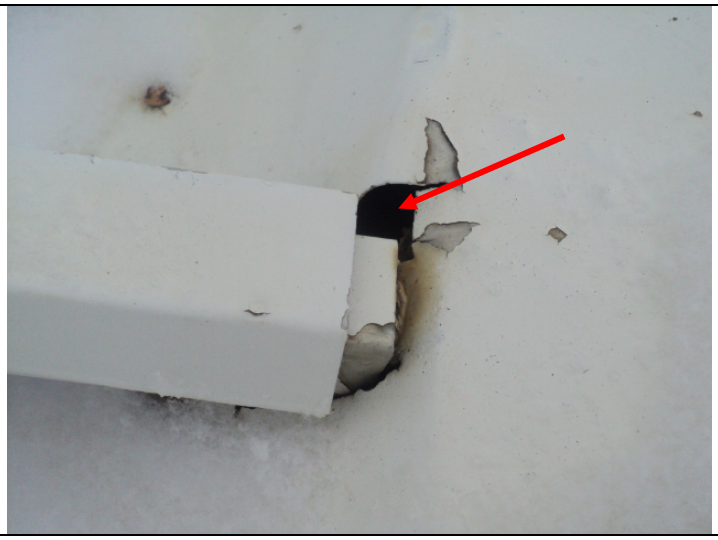
Macro of flanged connection

General Overview of Inlet piping

PSV



PSV Service Tag



Skid roof condition

Overview

Previous corrosion on fire tube access

Internal overview

Coating damage on the north head – previous corrosion

Fuel gas pre-heat piping

North head to shell weld

Sump one

Sump two

Drain stem

High-level float and thermowell

Fire tube supports welded to shell – no corrosion or damaged coating

Fire tube supports welded to shell – no corrosion or damaged coating

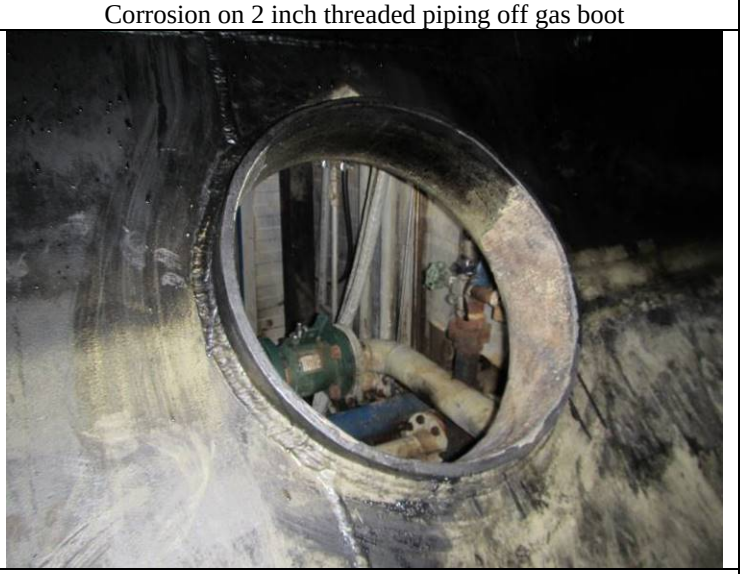
Gas boot

Gas boot nozzle

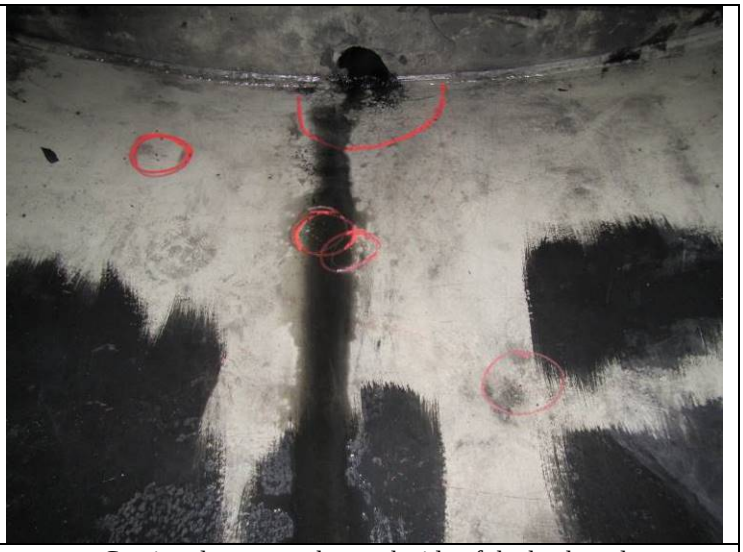
Gas boot

Corrosion on 2 inch threaded piping off gas boot

Small diameter coating blisters on manway



Manway

	
Back-end overview	Coating damage at the north side of the back-end
	
Overview of coating damage in back-end	Small diameter blistering on bottom shell
	
Screens supports are in good condition – no corrosion or mechanical damage noted	Screens supports are in good condition – no corrosion or mechanical damage noted

	
Vortex breaker	Back-end diffuser is corroded out