Husky Oil

**Form: QR-19.7e**
Rev: 0, Date 12/13

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

| ***SHELL & TUBE STATIC DATA*** | | | | | |
|---|---|---|---|---|---|
| **Plant** | **Ansell Gas Plant** | **Op Unit** | | **System** | |
| **Prov. Insp. #** | **A0194704** | **CRN** | **F-1711.2** | **Equip Tag #** | **E-101** |
| **Equipment Description** | **Condi Stabilizer Reboiler** | | | **Serial #** | **18765** |
| **Manufacturer** | **Ellett Copper and Brass Co** | | | **Vessel Class** | |
| **Internal Access:** | **YES** | **Description: 16" channel flange** | | **Year Built** | **1984** |

| ***SHELL SIDE DATA*** | | | | | |
|---|---|---|---|---|---|
| **MAWP** | **PSI** @ **ºF** | | | **MDMT** | **ºF** |
| **CODE** : | | | **Sweet** | **PWHT :** | **NO** |
| **Diameter** 16" | **Length** | (T/T) in | **OAL** 186 in | Horizontal | |
| **Shell Mat'l** | | **Thickness** in | | **Corr Allowance** | in |
| **Nozzle Mat'l** | | **Thickness** mm / in | | **Corr Allowance** | mm / in |
| **Internal Coating:** ~~YES~~ ~~NO~~ | | **Internal Clad :** ~~YES~~ ~~NO~~ | | **Capacity** | $m^3$ |
| **Manway :** yes – 16" channel flange | | **Inspection Port :** NO | | Saddle | |
| **Nozzle Rating** | lb ANSI | **Painted :** YES | | **Insulated** | Yes |
| **Operating Pressure** | **kPa / PSI** | **Operating Temperature** | | | **ºC / ºF** |

| ***TUBE/CHANNEL SIDE DATA*** | | | | | |
|---|---|---|---|---|---|
| **MAWP** | **PSI** @ **ºF** | | | **MDMT** | **ºF** |
| **CODE** : | | | **Sweet** | **PWHT :** | **NO** |
| **Diameter** 16" | **Length** | (T/T) mm/in | **OAL** 16 in channel. | Horizontal | |
| **Shell Mat'l** | | **Thickness** in | | **Corr Allowance** | in |
| **Nozzle Mat'l** | | **Thickness** mm / in | | **Corr Allowance** | mm / in |
| **Internal Coating:** ~~YES~~ ~~NO~~ | | **Internal Clad :** ~~YES~~ ~~NO~~ | | **Capacity** | $m^3$ |
| **Manway :** YES – 16" channel flange | | **Inspection Port :** NO | | ~~Skirt~~ ~~Legs~~ ~~Saddle~~ | |
| **Nozzle Rating** | lb ANSI | **Painted :** YES | | **Insulated** | Not at time of inspection |
| **Operating Pressure** | **kPa / PSI** | **Operating Temperature** | | | **ºC / ºF** |

| ***SHELL SIDE PSV STATIC DATA*** | | | | | | |
|---|---|---|---|---|---|---|
| **Serial No.** | **Location** | **Set Pressure** | **Capacity** SCFM / Lbs/Hr / GPM | **Manufacturer** | **Model / Type** | **Service Date / Company** |
| C27216A10 | Off stabilizer tower | 485psi | 3199scfm | Farris | 286FA12-120/55M | Sept-2011, Wizard. Tag PSV-1003 |

| ***SHELL SIDE PSV DETAILS*** | | | |
|---|---|---|---|
| | **Type (Thread/Flange)** | **ANSI Rating** | **Size (in)** |
| **PRD Inlet** | Flanged | | 1.5" |
| **PRD Outlet** | Flanged | | 2" |

| ***Tube side PSV STATIC DATA*** | | | | | | |
|---|---|---|---|---|---|---|
| **Serial No.** | **Location** | **Set Pressure** | **Capacity** SCFM / Lbs/Hr / GPM | **Manufacturer** | **Model / Type** | **Service Date / Company** |
| 575327-32-KE | Tube side piping | 180psi | 24usgpm | Farris | 27CA23-M20 | 3-Nov-11. Wizard. PSV-1004 |

| ***Tube side PSV DETAILS*** | | | |
|---|---|---|---|
| | **Type (Thread/Flange)** | **ANSI Rating** | **Size (in)** |
| **PRD Inlet** | Flanged | | |
| **PRD Outlet** | Flanged | | |

| **NDE Equipment records** | | | | | |
|---|---|---|---|---|---|
| **Procedure#** | **Description** | **Manufacturer** | **Model#** | **Serial#** | **Due Date** |

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

## *INSPECTION SUMMARY*

Exchanger in plant 1 inlet building. A visual external and internal inspection was conducted on exchanger during plant turnaround.

**External:**

Dataplate was not located. Either it is missing or under insulation. A# was found stamped in shell to channel flange (shell side). Shell side and piping is insulated, preventing visual access to shell surface. Cladding and banding in good condition, no damage noted. Exposed nozzles show signs of heat caused paint deterioration. No corrosion noted on exposed surfaces. Channel bonnet was found to be in fair condition. Extensive paint caused paint deterioration and surface rusting / very light corrosion noted, however no significant wall loss was measured. Vessel saddle support anchor bolts are securely attached to structural beams, which are in good condition. Building skid is grounded but no direct ground connection to exchanger found. No visual access to support to shell connections. All associated piping appears well supported and in acceptable condition. Tube side PSV (off tube side piping) service is up to date. PSV inlet and outlet isolation valves are carsealed open. Shell side PSV was found to be off the stabilizer tower. UT corrosion survey performed by Streamline Inspection June 2014.

**Internal:**

Exchanger bonnet was removed and tube bundle pulled and cleaned for internal inspection. Shell side was found to be in fair condition. Several minor wear areas were noted on shell where tube bundle baffle plates are in contact with shell. These were located at approx. 83” and 56” in from shell flange. Wall loss was not measureable due to no access and vessel being insulated. Wall loss does not appear significant and is not a concern at this time. No other areas of corrosion or damage noted on shell, shell side nozzles or shell flange face. No visible corrosion or defects on shell or nozzle welds was observed. No visual access to far shell and head was possible due to distance from shell opening. Channel bonnet was found to be in fair condition. No corrosion or erosion noted on head, shell or nozzles. The partition plate was found to be securely attached with no deformation noted. Channel and channel nozzle flange faces were found to be in acceptable condition with no corrosion or damage noted. Tube bundle was found to be in fair condition. Tubes near return bends are being held in place by insulation straps. These tubes were found to be bent out of place at previous inspection. Some external pitting noted on one tube. This tube and one other have been historically plugged. Some bowing of the tubes was noted. A hard scale was found on tubes externally. No significant corrosion noted under scaling on tubes still in service. No fretting damage noted at or near where tubes pass through baffle plates. Eddy current was performed on tubes by FGG. Wall loss (approx. 0.030%) was noted on several tubes – see FGG report for details. As a result of the Eddy Current test, it was decided to plug 5 tubes.

Exchanger was found to be in fair condition and fit for continued service.

## *RECOMMENDATIONS*

Review UT survey report.
It appears the tube bundle is reaching the end of it serviceable life span. Consider replacing tube bundle at next outage.

## *NONCONFORMANCES / INSPECTION DEFICIENCIES*

Tube bundle wall loss noted during FGG Eddy Current inspections – See FGG report for details.

## *INSPECTION PLANNING*

| | | | | | |
|---|---|---|---|---|---|
| **Inspection Strategy** | | **Availability** | | **Inspection Interval** | |
| **Inspection Date** | **June 07, 2014** | **Date of Last Inspect** | | **Date of Next Inspect** | |

## *REPORT CERTIFICATION*

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

**The signatures below certify that inspections/tests have been completed in accordance with the identified inspection strategy and that the specified equipment is considered fit for service until the date of next inspection.**

| | | | | | |
|---|---|---|---|---|---|
| **Inspected by** | **Ed Tymensen** | | | **Date** | **June 07, 2014** |
| **Company** | **Streamline Inspection** | **PESL #** | **000711** | **API #** | **27479** |
| **Reviewed and Approved by** | | | | **Date** | |
| | | **PESL #** | | **API #** | |
| **Criticality Assessment Rerun** | | **Inspection Planning Rerun** | | | |
| **Assessed Next Inspection Date** | | | | | |

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

***DETAILED INSPECTION VISUAL EXTERNAL***

| ID | Description | Condition | Location | NCR / IDR | Comments |
|---|---|---|---|---|---|
| V1 | General Other (Please Explain) | Fair | | | Overall |
| V2 | General Corrosion | n/a | | | Minor surface rusting, very light general corrosion on channel bonnet and exposed shell side nozzles |
| V3 | General Leaks | n/a | | | None noted |
| V4 | Vibration | n/a | | | Inspection done during shutdown |
| V5 | Dissimilar Flange Rating | n/a | | | Similar flange ratings |
| V6 | Ladder/Stairway | n/a | | | |
| V7 | Heads | Good | Channel bonnet head | | No significant corrosion or damage noted |
| V9 | Electrical Ground | Good | Building skid | | Skid ground cable present and secure. No direct ground connection to vessel found |
| V10 | Painted Inactive Corrosion | n/a | | | |
| V11 | Coating/Painting | Poor | | | Extensive paint deterioration on channel bonnet and exposed shell side nozzles, due to heat |
| V12 | Expansion Joint or Bellows | n/a | | | |
| V13 | Gauge/Site Glass | Good | | | Gauge clear and legible |
| V14 | Shell | n/a | | | Insulated, no access |
| V15 | Jacket | n/a | | | |
| V21 | Support Other (Please explain) | Good | Piping | | Well supported |
| V22 | Foundation | Good | Steel skid | | Skid on steel piles |
| V23 | Anchor Bolts | Good | | | Tight and secure |
| V24 | Saddle/Skirt | Good | Saddle | | Saddle support to shell connection insulated |
| V25 | Davit | n/a | | | |
| V26 | Fireproofing | n/a | | | |
| V31 | Connections Other (Please explain) | Good | | | All connections appear secure |
| V32 | Small Branches | n/a | | | |
| V33 | Nozzles | Fair | | | No significant corrosion or damage noted |
| V34 | Manways | n/a | | | Internal access through channel flange |
| V35 | Reinforcing Pads | n/a | | | |
| V36 | Inadequate Thread Engagement | Good | | | Adequate thread engagement |
| V37 | Bolting | Good | | | All bolting tight and secure, no corrosion of threads |
| V38 | Flanges | Good | | | No leaks or surface corrosion noted |
| V39 | Leak Clamps | n/a | | | |
| V41 | Insulation Other (Please explain) | Good | Shell and piping | | Insulated and clad |
| V42 | Damage | n/a | | | No damage noted |
| V43 | Penetrations | Good | | | All penetrations sealed |
| V44 | Insulation Jacket | Good | Shell and piping | | Tin cladding |
| V45 | Banding | Good | | | |
| V46 | Seals/Joints | Good | | | All penetrations sealed |
| V51 | Relief Devices Other (Please explain) | Good | | | No access to shell side PSV off stab. tower |
| V52 | Corrosion | n/a | | | None noted |
| V53 | Leaks | n/a | | | None noted |
| V54 | Restricted Inlet/Outlet | n/a | | | No restrictions |
| V55 | Manual Operation Lever | Good | Tube side PSV inlet and outlet isolation valves | | All valves to and from tube side PSV are carsealed open |

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

***DETAILED INSPECTION VISUAL INTERNAL***

| ID | Description | Condition | Location | NCR / IDR | Comments |
|---|---|---|---|---|---|
| V1 | General Other (Please Explain) | Fair | | | Overall |
| V2 | Corrosion (depth, length, width) | n/a | | | No significant corrosion noted. Light surface rusting on channel bonnet and exposed shell side nozzles |
| V3 | Erosion | Fair | Shell | | Minor shell wall loss, wear marks, where tube bundle baffles contact shell, no concern at this time – at 83" and 56" in from shell flange |
| V4 | Distortion | n/a | | | No distortion noted |
| V5 | Blisters | n/a | | | No blisters noted |
| V6 | Deposits | n/a | | | No deposits noted |
| V7 | Heads | Good | Channel bonnet head | | No corrosion or damage noted |
| V8 | Welds | Good | | | No corrosion or defects noted |
| V9 | Nozzles | Good | | | No corrosion or damage noted |
| V10 | Shell | Good | Shell | | Minor shell wall loss, wear marks, where tube bundle baffles contact shell, no concern at this time – at 83" and 56" in from shell flange |
| V11 | Gasket Surfaces | Good | Shell and channel flange faces and channel nozzle flange faces | | No corrosion or damage noted |
| V21 | Internals Other (Please explain) | Good | Channel partition plate | | Securely attached, no distortion |
| V22 | Demister | n/a | | | |
| V23 | Baffle/Weir | n/a | | | |
| V24 | Sparger | n/a | | | |
| V25 | Thermowells | n/a | | | |
| V26 | Metallic Linings | n/a | | | |
| V27 | Nonmetallic Linings | n/a | | | |
| V30 | Other Welded Attachments | n/a | | | |
| V31 | Tubes | Fair poor | Tube bundle | | Eddy current found wall loss on 5 tubes. These tubes are to be plugged. Tubes near tube return bends are being held together by insulation banding (several tubes were bent out of place at previous inspection.) |
| V32 | Tube sheet | Good | | | |

***DETAILED INSPECTION OTHER TECHNIQUES***

| ID | Location | Observation/Measurement | Acceptance Criteria | NCR / IDR | Comments |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
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| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

***DETAILED INSPECTION TUBE INSPECTION***

| Tube # | Flaw Type | Flaw Length | Location on Tube | Wall Loss | NCR / IDR | Comments |
|---|---|---|---|---|---|---|
| | | | | | | |
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***DETAILED INSPECTION UT THICKNESS***

| CML | Nom. Thk | Current Reading | Short Term Corr Rate | Long Term Corr Rate | Remaining Life | Comments |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

**PHOTOS**


LSD sign


A# stamped in shell flange

Exchanger overview

Nozzle paint deterioration due to heat, no significant corrosion

Saddle supports bolted to beams

Shell side internal

# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

## PHOTOS

Shell side internal

Shell nozzle internal

Tube side piping internal

Shell flange face

Channel bonnet

Channel nozzle flange face

## *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

**PHOTOS**

Tube bundle

Tube bundle return bends – bundle tubes have insulation banding holding it together

Tube bundle

Tubes – scaly buildup

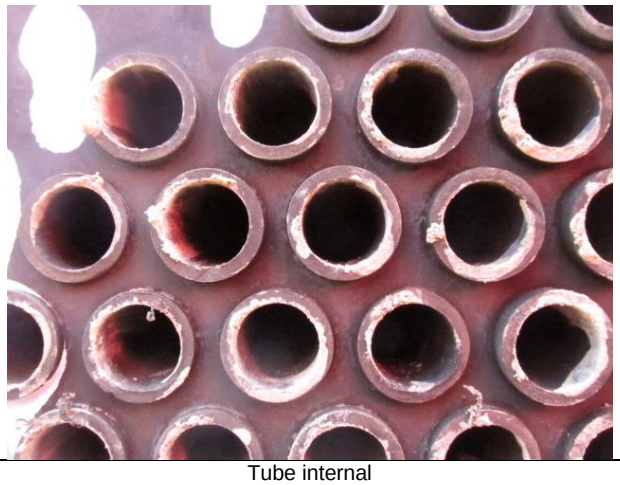
Tube sheet – 5 tubes marked for plugging after Eddy Current testing

Tube sheet – 5 tubes marked for plugging after Eddy Current testing

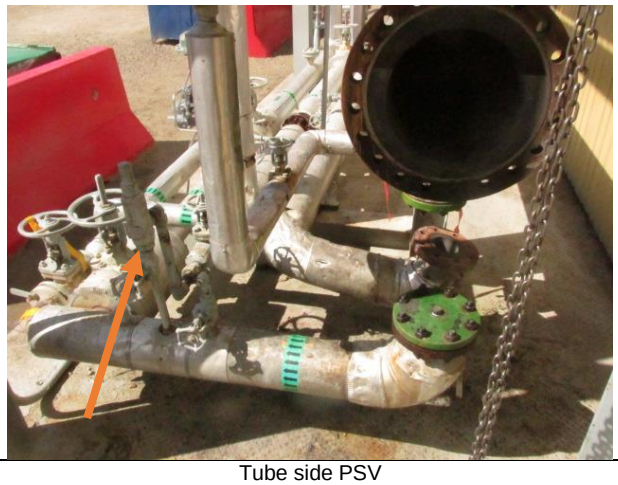
# *SHELL & TUBE INSPECTION REPORT*

LSD: 07-27-051-19W5M Date: JUNE 07, 2014 SAP Equipment ID: 66036274

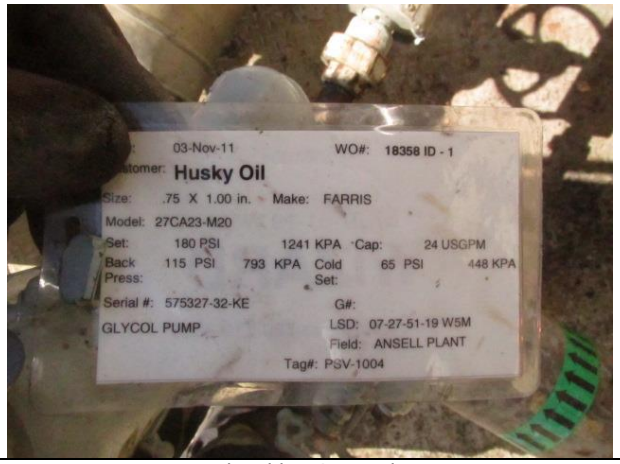
## PHOTOS



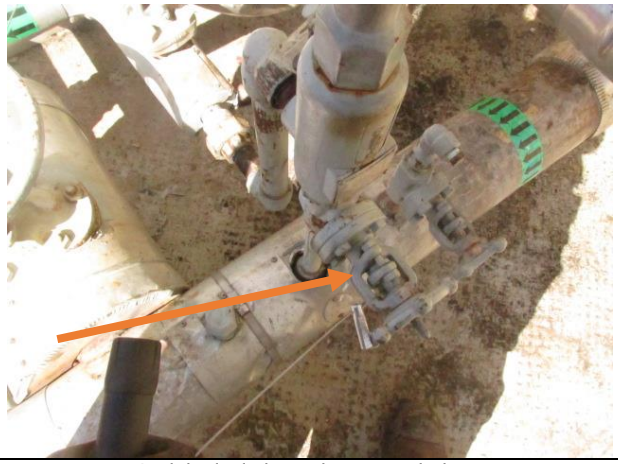
Tube internal



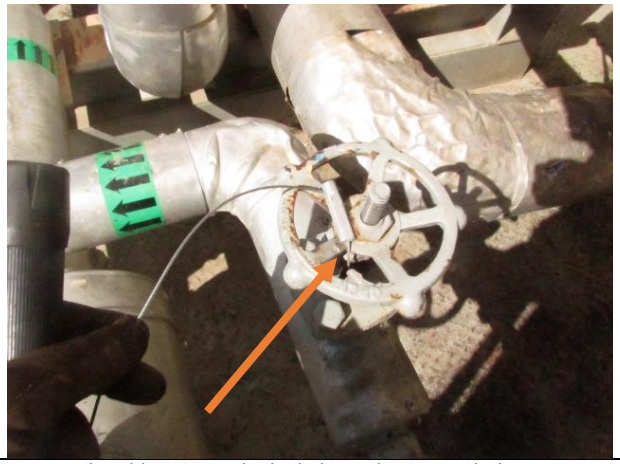
Tube side PSV




Tube side PSV service



PSV inlet isolation valve carsealed open



Tube side PSV outlet isolation valve carsealed open

Shell side PSV – off stabilizer tower

Husky Energy

| | | | |
|---|---|---|---|
| Location Name: | ANSELL GAS PLANT | LSD: | 7-27-51-19W5 |
| A#: | A0194704 | Equipment/Tag No. | E-101 |
| Equipment Description: | STABILIZER REBOILER | Serial Number: | 18765 |
| | | CRN: (or other ID#) | F-1711.2 |
| MAWP: | SHELL 486 PSI, TUBESIDE 180 PSI | Design Temp: | SHELL 355°F TUBESIDE 270°F |
| Shell Material: | SA-106-B | Head Material: | SA 234 WPB |
| Shell Thickness: | .500” | Head Thickness: | 0.500” |
| Corrosion Allowance: | 0.1250” | Date Built: | 1984 |
| Size: | 16” | Manufacturer: | ELLETT |
| RT: | | Pipe / Rolled Plate: | PIPE |

Notes: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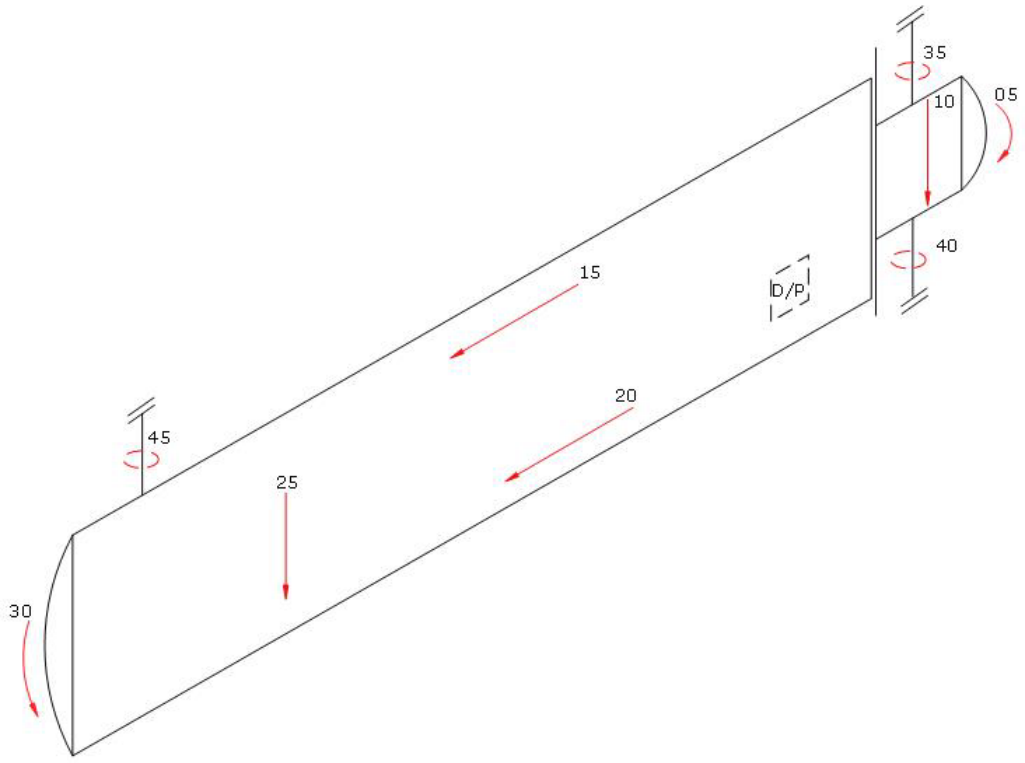
Husky Energy

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Husky Energy

STREAMLINE INSPECTION LTD.

# Ultrasonic Corrosion Survey

**Survey Name:** Husky Energy **Date:** Jun 8, 2014

Inspector: W. Gill

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **LSD:** | 07-27-051-19W5 | **Area:** | Ansell | | **Location:** | Gas Plant | | |
| **A #:** | A0194704 | **Tag Number:** | E-101 | | **Vessel Name:** | Stabilizer Reboiler | | |
| **CRN:** | F-1711.2 | **Year Built:** | 1984 | | **Serial Number:** | 18765 | | |
| | | **Vessel CA:** | 3.175 | mm | **Manufacturer:** | Ellett | | |
| | | **Shell MAWP:** | 486psi | **MAWTF:** 355°F | **Tube MAWP:** | | **MAWTF:** | |

| **TML Description** | | | Baseline | | | | **Material:** | SA-234-WPB |
|---|---|---|---|---|---|---|---|---|
| **05** | Head | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Ellipsoidal | **Min** | 9.880 | 7.937 | 1.588 | 9.525 | | |
| **OD:** | 16" | **Avg** | 10.740 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| **TML Description** | | | Baseline | | | | **Material:** | SA-106-B |
|---|---|---|---|---|---|---|---|---|
| **10** | Shell | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Cylindrical | **Min** | 9.190 | 7.937 | 1.588 | 9.525 | | |
| **OD:** | 16" | **Avg** | 9.370 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| **TML Description** | | | Baseline | | | | **Material:** | SA-106-B |
|---|---|---|---|---|---|---|---|---|
| **15** | Shell | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Cylindrical | **Min** | 12.550 | 9.525 | 3.175 | 12.700 | | |
| **OD:** | 16" | **Avg** | 12.830 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| **TML Description** | | | Baseline | | | | **Material:** | SA-106-B |
|---|---|---|---|---|---|---|---|---|
| **20** | Shell | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Cylindrical | **Min** | 12.620 | 9.525 | 3.175 | 12.700 | | |
| **OD:** | 16" | **Avg** | 12.850 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

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# Ultrasonic Corrosion Survey

**Survey Name:** Husky Energy **Date:** Jun 8, 2014

Inspector: W. Gill

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **LSD:** | 07-27-051-19W5 | **Area:** | Ansell | | **Location:** | Gas Plant | |
| **A #:** | A0194704 | **Tag Number:** | E-101 | | **Vessel Name:** | Stabilizer Reboiler | |
| **CRN:** | F-1711.2 | **Year Built:** | 1984 | | **Serial Number:** | 18765 | |
| | | **Vessel CA:** | 3.175 | mm | **Manufacturer:** | Ellett | |
| | | **Shell MAWP:** | 486psi | **MAWTF:** 355°F | **Tube MAWP:** | | **MAWTF:** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TML Description** | | | Baseline | | | | **Material:** | SA-106-B |
| **25** | Shell | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Cylindrical | **Min** | 12.650 | 9.525 | 3.175 | 12.700 | | |
| **OD:** | 16" | **Avg** | 13.130 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TML Description** | | | Baseline | | | | **Material:** | SA-234-WPB |
| **30** | Head | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | Ellipsoidal | **Min** | 15.270 | 11.112 | 1.588 | 12.700 | | |
| **OD:** | 16" | **Avg** | 15.570 | | | | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TML Description** | | | Baseline | | | | **Material:** | A-234-WPB |
| **35** | Nozzle | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | 360° Circ | **Min** | 5.720 | 5.267 | 0.752 | 6.020 | | |
| **OD:** | 4.5" | **Avg** | 6.170 | | | Assumed | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TML Description** | | | Baseline | | | | **Material:** | A-234-WPB |
| **40** | Nozzle | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | 360° Circ | **Min** | 5.720 | 5.268 | 0.753 | 6.020 | | |
| **OD:** | 4.5" | **Avg** | 6.050 | | | Assumed | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

# Ultrasonic Corrosion Survey

**Survey Name:** **Husky Energy** **Date:** **Jun 8, 2014**

Inspector: W. Gill

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **LSD:** | 07-27-051-19W5 | **Area:** | Ansell | | | **Location:** | Gas Plant | |
| **A #:** | A0194704 | **Tag Number:** | E-101 | | | **Vessel Name:** | Stabilizer Reboiler | |
| **CRN:** | F-1711.2 | **Year Built:** | 1984 | | | **Serial Number:** | 18765 | |
| | | **Vessel CA:** | 3.175 | mm | | **Manufacturer:** | Ellett | |
| | | **Shell MAWP:** | 486psi | **MAWTF:** | 355°F | **Tube MAWP:** | | **MAWTF:** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TML Description** | | | Baseline | | | | **Material:** | A-234-WPB |
| **45** | Nozzle | | **2014** | **Flag** | **CA** | **Nominal** | **T Min** | **Corr. Rate** |
| **Shape:** | 360° Circ | **Min** | 10.590 | 7.798 | 3.175 | 10.973 | | |
| **OD:** | 6.625" | **Avg** | 11.020 | | | Assumed | | **Remaining Life:** |
| **Spec:** | ASME VIII Div.1 | **Comments:** | | | | | | **Retirement Date:** |

0316 A194704

B.C.File F.4138

**FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS**
**As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1** 2P.7946, B.C.

1. Manufactured and certified by Ellett Copper & Brass Co. Limited, 1575 Kingsway Avenue, Port Coquitlam, B.C.
(Name and address of manufacturer)

2. Manufactured for Cord Projects Ltd. 526-10333 Southport Road S.W., Calgary, Alberta (60)
(Name and address of purchaser)

3. Location of installation Western Decalta Petroleum, Diamond Valley Gas Plant, Alberta
(Name and address)

4. Type Horiz. Exchanger | 18765 (Mfg's serial No.) | F-1711.2 (CRN) | P-808-1E (Drawing) | (Nat'l. Bd. No.) | 1984 (Year built)

(A) 194704 E.K. 12-20 HW

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME Boiler and Pressure Vessel Code. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1983 (Year)

Summer, 1984 (Addenda date) | 1899.1 (Code Case No.) | (Special service per UG 120(d))

*Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, or sheets of heat exchangers*

6. Shell: SA 106 B (Matl (Spec No., Grade)) | .500 (Nom Thk (in.)) | 0.1250 (Corr Allow (in.)) | 1'-4" (Diam I.D. (ft & in.)) | 15'-6" (Length (Overall) (ft & in.))

7. Seams: (Long (Dbl., Sngl.)) | Nil (R.T. (Spot or Full)) | 100% (Eff. (%)) | 1100°F (H.T. Temp. (°F))

30 min (Type) | Dbl Butt (Girth (Dbl., Sngl.)) | Full (R.T. (Spot, Partial, or Full)) | Two (No. of Courses)

8. Heads: (a) Matl. SA 234 WPB (Spec No., Grade) (b) Matl. (Spec No., Grade)

| | Location (Top, Bottom, Ends) | Minimum Thickness | Corrosion Allowance | Crown Radius | Knuckle Radius | Elliptical Ratio | Conical Apex Angle | Hemispherical Radius | Flat Diameter | Side to Pressure (Convex or Concave) |
|---|---|---|---|---|---|---|---|---|---|---|
| (a) | End | .500 | 0.1250 | Std. Pipe Cap | | | | | | concave |
| (b) | | | | | | | | | | |

If removable, bolts used (describe other fastenings) (Matl., Spec No., Gr., Size, No.)

9. Type of Jacket Proof Test If bolted, describe or sketch.

10. Jacket Closure (Describe as edge & weld, bar, etc.) If bar, give dimensions

11. MAWP 486 psi at max. temp. 355 °F. Min. temp. (when less than -20°F) °F.
Hydro., pneu., or comb. test press. 728 psi.

*Items 12 and 13 to be completed for tube sections*

12. Tubesheets: SA 516-70 (Stationary Matl (Spec No., Gr.)) | 2 3/4 (Diam (in.) (Subject to pressure)) | 2.421 (Nom Thk (in.)) | 0.0625 (Corr Allow (in.)) | Bolted (Attach (Welded, Bolted))

(Floating Matl (Spec No., Gr.)) | (Diam (in.)) | (Nom Thk (in.)) | (Corr Allow (in.)) | (Attach)

13. Tubes: SA 179 (Matl (Spec No., Gr.)) | 3/4 (OD (in.)) | 14 ga. (Nom Thk (in. or Gauge)) | 52 (Number) | U (Type (Straight or U))

*Items 14-17 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers*

14. Shell: SA 106 B (Matl (Spec No., Grade)) | .375 (Nom Thk (in.)) | 0.0625 (Corr Allow (in.)) | 1'-4" (Diam (ft & in.)) | 2'-0" (Length (Overall) (ft & in.))

15. Seams: (Long (Dbl., Sngl.)) | (R.T. (Spot or Full)) | (Eff. (%)) | (H.T. Temp. (°F))

Dbl Butt (Girth (Dbl., Sngl.)) | Spot (R.T. (Spot or Full)) | 1 (No. of Courses)

16. Heads: (a) Matl. SA234 WPB (Spec No., Grade) (b) Matl. (Spec No., Grade)

| | Location (Top, Bottom, Ends) | Minimum Thickness | Corrosion Allowance | Crown Radius | Knuckle Radius | Elliptical Ratio | Conical Apex Angle | Hemispherical Radius | Flat Diameter | Side to Pressure (Convex or Concave) |
|---|---|---|---|---|---|---|---|---|---|---|
| (a) | End | .375 | 0.0625 | Std Pipe Cap | | | | | | Concave |
| (b) | | | | | | | | | | |

If removable, bolts used (describe other fastenings) SA193 B7X 20 Reg 1¼" dia. x 10-3/4" long (Matl., Spec No., Gr., Size No.)

17. MAWP 180 psi at max. temp. 390 °F. Min. temp. (when less than -20° F) °F.
Hydro., pneu., or comb. test pr 270 psi.

(12/82) This form (E00108) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

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NOV 27 1984

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Form U-1 (Back)

18. Nozzles, Inspection and Safety Valve Openings:

| Purpose (Inlet, Outlet, Drain, etc.) | No. | Diam. or Size | Type | Mat'l. | Nom. Thk. | Reinforcement Mat'l. | How Attached | Location |
|---|---|---|---|---|---|---|---|---|
| Inlet | A | 4" | R.F.W.N | SA 106 B | Sch 40 | | Welded | Channel |
| Outlet | B | 4" | R.F.W.N | SA 106 B | Sch 40 | | Welded | Channel |
| Outlet | C | 6" | R.F.W.N | SA 106 B | Sch 80 | SA 516/70 | Welded | Shell |
| Inlet | D | 4" | R.F.W.N | SA 106 B | Sch 160 | SA 516/70 | Welded | Shell |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

19. Supports: Skirt ___ (Yes or No) Lugs ___ (No.) Legs ___ (No.) Other Saddles (Describe) Attached Welded to shell (Where and how)

20. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: ___ (Name of part, item number, mfg.'s name and identifying stamp)

**CERTIFICATE OF SHOP COMPLIANCE**

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

"U" Certificate of Authorization No. 2901 expires Dec 31, 19 87

Date Nov 14/84 Co. name Ellett Copper & Brass (Manufacturer) Signed Jack Baker (Representative)

**CERTIFICATE OF SHOP INSPECTION**

Vessel constructed by Ellett Copper & Brass Co. Limited at 15[illegible] Kingsway Avenue, Port Coquitlam, B.C.

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of British Columbia and employed by The Government of the Province of British Columbia have inspected the pressure vessel described in this Manufacturer's Data Report on November 14th, 19 84, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in the Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 84.11.14 Signed J.M. Wright (Authorized Inspector) Commissions BC 34 (Nat'l Board, State, Province and No.)

**CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE**

We certify that the field assembly construction of all parts of this vessel conforms with the requirements of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

"U" Certificate of Authorization No. ___ expires ___, 19___.

Date ___ Co. name ___ (Assembler that certified and constructed field assembly) Signed ___ (By Representative)

**CERTIFICATE OF FIELD ASSEMBLY INSPECTION**

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of ___ and employed by ___ of ___ have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items ___, not included in the certificate of shop inspection, have been inspected by me and that, to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with ASME Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of ___ psi. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date ___ Signed ___ (Authorized Inspector) Commissions ___ (Nat'l Board (incl. endorsements), State, Prov. and No.)

(12/82)