

## AIR COOLED HEAT EXCHANGER INSPECTION REPORT

Date: June 6, 2012	Equipment ID: 62048715
Report #: IR120606SHAb	Bar Code #: N/S
Facility: Sask – Tangleflags Field	

Plant	Sask-Tangleflags Field	Op Unit	04-18-051-25W3M	System	N/S
Asset #	N/S	Equipment ID	62048715	Asset Type	Exchanger
Description	Cooler	Prov. Insp. #	A2988254	Serial #	944411.4
Manufacturer	Air-X-Changers	CRN	K2766.2	Year Built	1994
MAWP	4516	KPag	@ 149 °C	MDMT	-29 °C
Code	ASME VIII	Fluid Service	Gas	Sweet	PWHT No
Internal Access	No	Insulated	No	Internal Coating	No
Operating Pressure	N/S	KPag		Operating Temp	N/S °C

### PSV DATA

PSV ID #	Location	Inlet	Size Outlet	Set Pressure	Capacity SCFM / Lbs/Hr / GPM	Manufacturer	Model	Last Service
457980-6-KE	Inlet Piping	38.1mm	63.5mm	1586 kPa	2468 SCFM	Farris	27GA-46-M20	29-Sept-10

### INSPECTION SUMMARY

- CRN does not have a "3" for Saskatchewan.
- In good condition.
- NB# 24491.

M. Lafontaine, 2013-04-01:

- all measured thicknesses were greater than the minimum required thickness stated on the manufacturer's data report
- Saskatchewan CRN confirmed with manufacturer. Confirmation in equipment file in HDMS.

### RECOMMENDATIONS

- Verify CRN to ensure the vessel can be used in Saskatchewan.

### NONCONFORMANCES / INSPECTION DEFICIENCIES

- None

### INSPECTION PLANNING

Inspection Strategy	Availability	Inspection Interval	5 years
Inspection Date	Date of Last Inspect	Date of Next Inspect	2017-06

### REPORT CERTIFICATION

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	Scott Abbott	Date	June 6, 2012
Reviewed and Approved by		Date	
Criticality Assessment Rerun		Inspection Planning Rerun	
Assessed Next Inspection Date			

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### DETAILED INSPECTION VISUAL EXTERNAL

ID	Description	Condition	Location	NCR	Comments
V1	General Other (Please Explain)	N/A			
V2	General Corrosion	No			
V3	General Leaks	No			
V4	Vibration	Minor			
V5	Dissimilar Flange Rating	No			
V6	Ladder/Stairway	N/A			
V7	Heads	Good			
V9	Electrical Ground	Yes			Skid is grounded.
V10	Painted Inactive Corrosion	N/A			
V11	Coating/Painting	Good			
V12	Expansion Joint or Bellows	N/A			
V13	Gauge/Site Glass	N/A			
V14	Shell	Good			
V15	Jacket	N/A			
V21	Support Other (Please explain)	N/A			
V22	Foundation	Skid			
V23	Anchor Bolts	Good			
V24	Saddle/Skirt	Good			
V25	Davit	N/A			
V26	Fireproofing	N/A			
V31	Connections Other (Please explain)	N/A			
V32	Small Branches	N/A			
V33	Nozzles	Good			
V34	Manways	No			
V35	Reinforcing Pads	No			
V36	Inadequate Thread Engagement	No			
V37	Bolting	Good			
V38	Flanges	Good			
V39	Leak Clamps	N/A			
V41	Insulation Other (Please explain)	N/A			
V42	Damage	N/A			
V43	Penetrations	N/A			
V44	Insulation Jacket	N/A			
V45	Banding	N/A			
V46	Seals/Joints	N/A			
V51	Relief Devices Other (Please explain)	Good			
V52	Corrosion	No			
V53	Leaks	No			
V54	Restricted Inlet/Outlet	No			
V55	Manual Operation Lever	No			

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### DETAILED INSPECTION VISUAL INTERNAL

ID	Description	Condition	Location	NCR	Comments
V1	General Other (Please Explain)	N/A			
V2	Corrosion (depth, length, width)	N/A			
V3	Erosion	N/A			
V4	Distortion	N/A			
V5	Blisters	N/A			
V6	Deposits	N/A			
V7	Heads	N/A			
V8	Welds	N/A			
V9	Nozzles	N/A			
V10	Shell	N/A			
V11	Gasket Surfaces	N/A			
V21	Internals Other (Please explain)	N/A			
V22	Demister	N/A			
V23	Baffle/Wier	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	N/A			
V32	Tube sheet	N/A			

### DETAILED INSPECTION OTHER TECHNIQUES

ID	Location	Observation/Measurement	Acceptance Criteria	NCR	Comments
1	N/A				
2	N/A				
3	N/A				
4	N/A				
5	N/A				
6	N/A				
7	N/A				
8	N/A				
9	N/A				
10	N/A				

### DETAILED INSPECTION TUBE INSPECTION

Tube #	Flaw Type	Flaw Length	Location on Tube	Wall Loss	NCR	Comments
N/A						
N/A						
N/A						
N/A						
N/A						
N/A						
N/A						
N/A						
N/A						
N/A						

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### DETAILED INSPECTION UT THICKNESS

CML	Nom. Thk	Current Reading	Short Term Corr Rate	Long Term Corr Rate	Remaining Life	Comments
						See Attached UT Report.

### PHOTOS



LSD



Nameplate



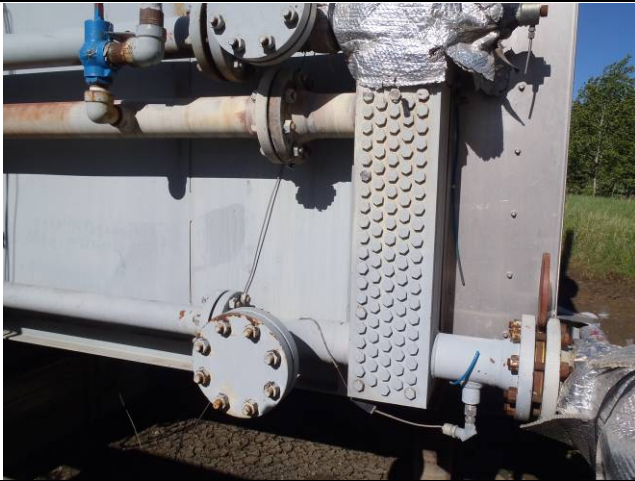
A Number Stamp



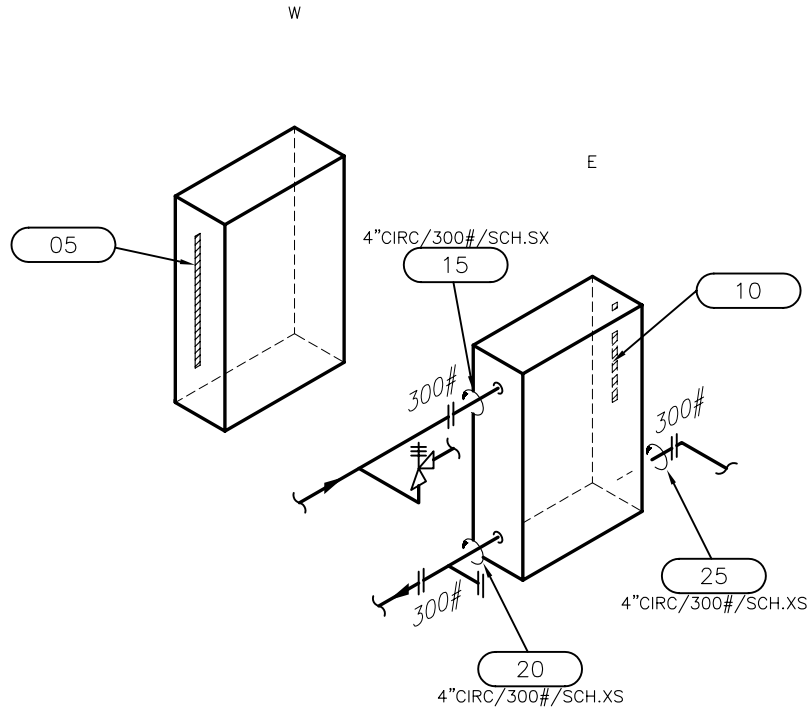
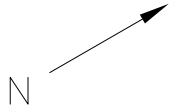
Overview

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Overview (2)



P.E. No.: 62048715 Code/Div.: ASME VIII DIV.1  
 SASK. ⑤ N/S PARA: N/S  
 B.C.: N/S C. Stamp: U  
 Serial No.: 944411.4 Yr. Blt.: 1994  
 P.R.N. Ⓐ 2988254 Manway: NO  
 C.R.N.: K-2766.2  
 Manufacturer: AIR-X-CHANGERS

Size: 8" X 6" X 31" Radiography: N/S  
 Service: SWEET Insulated: NO  
 PWHT: NO N.B. No.: 24491

### Design & Materials Data

#### HEAD:

Material: N/S Nom.: N/S C.A.: N/S  
 Material: \_\_\_\_\_ Nom.: \_\_\_\_\_ C.A.: \_\_\_\_\_

#### SHELL

Material: N/S Nom.: N/S C.A.: N/S  
 Material: \_\_\_\_\_ Nom.: \_\_\_\_\_ C.A.: \_\_\_\_\_

#### BOOT

Head Mat'l.: \_\_\_\_\_ Nom.: \_\_\_\_\_ C.A.: \_\_\_\_\_  
 Shell Mat'l.: \_\_\_\_\_ Nom.: \_\_\_\_\_ C.A.: \_\_\_\_\_

#### CHANNEL

Material: \_\_\_\_\_ Nom.: \_\_\_\_\_ C.A.: \_\_\_\_\_

MAWP Shell Side: 655 PSI @ Temp.: 300°F/-20°F  
 MAWP Tube Side: \_\_\_\_\_ @ Temp.: \_\_\_\_\_

Comments: \_\_\_\_\_

CLIENT	HUSKY ENERGY	
FACILITY	SASK – TANGLEFLAGS FIELD	
	LSD 04-18-051-25W3M	
ITEM	COOLER	
BY: S.H.A.	DATE: 2012/05	DWG.#: 003

## Husky Energy

Unit: T-064

FACILITY:	TANGLEFLAGS FIELD	MANUFACTURER:	AIR X-CHANGERS
LSD:	04-18-051-25W3	DESIGN PRESSURE:	4516 kPa / 655 psi
ITEM DESC.:	COOLER	DESIGN TEMP.:	149 C / 300 F
EQUIP / OIP#:	62048715	VESSEL CORROSION ALLOWANCE:	
PROV. REG. #:	A2988254	TOTAL CAUTION / ACTION TML:	1
SERIAL #:	944411.4		
CRN.:	K-2766.2		

### Item # 003

#### TML No.: 5 W COOLER T-B

DATE BUILT: 01/1994

AVERAGE THICKNESS MEASURED: 16.63 mm.

MATERIAL:

MINIMUM THICKNESS MEASURED: 16.63 mm.

Pts.	Nom. Thick. mm.	CA + Steel Mfg.Tol. mm.	Nom. -CA -Toll. mm.	B/L Survey Thick. mm.	Prev. Survey Thick. mm.	Last Survey Thick. mm.	Short Term CR mm/yr	Long Term CR mm/yr	Rem. Half Life yr	Future UT Reading mm-yyyy	Action/Caution Required Item
						06/2012					
5.01	0.00	0.00	0.00	N/A	N/A	16.63	0.0000	0.0000	N/A	.	NO

#### TML No.: 10 E COOLER T-B

DATE BUILT: 01/1994

AVERAGE THICKNESS MEASURED: 17.00 mm.

MATERIAL:

MINIMUM THICKNESS MEASURED: 17.00 mm.

Pts.	Nom. Thick. mm.	CA + Steel Mfg.Tol. mm.	Nom. -CA -Toll. mm.	B/L Survey Thick. mm.	Prev. Survey Thick. mm.	Last Survey Thick. mm.	Short Term CR mm/yr	Long Term CR mm/yr	Rem. Half Life yr	Future UT Reading mm-yyyy	Action/Caution Required Item
						06/2012					
10.01	0.00	0.00	0.00	N/A	N/A	17.00	0.0000	0.0000	N/A	.	NO

#### TML No.: 15 4" CIRC 300# NOZ

DATE BUILT: 01/1994

AVERAGE THICKNESS MEASURED: 8.58 mm.

MATERIAL:

MINIMUM THICKNESS MEASURED: 8.58 mm.

Pts.	Nom. Thick. mm.	CA + Steel Mfg.Tol. mm.	Nom. -CA -Toll. mm.	B/L Survey Thick. mm.	Prev. Survey Thick. mm.	Last Survey Thick. mm.	Short Term CR mm/yr	Long Term CR mm/yr	Rem. Half Life yr	Future UT Reading mm-yyyy	Action/Caution Required Item
				01/1994		06/2012					
15.01	8.56	0.00	8.56	8.56	N/A	8.58	0.0000	0.0000	3.34	.	CAUTION *

If Baseline (B/L) Survey Thickness Measurement was not taken at the time of Manufacture, then Nominal Thickness is used as Baseline Thickness.

Minimum Thickness is calculated

Design Minimum Thickness = Nom. Thick. - CA - Manufacturing Steel Tolerance.

Manufacturing Tolerance of pipe and forged fittings is + or -12.5% (May or may not apply dependent upon the Client's Owner-User Integrity Management System).

Manufacturing Tolerance of plate is + or - 0.25mm (0.010") (May or may not apply dependent upon the Client's Owner-User Integrity Management System).

(\*) and GREEN Represent 25% of the last thickness readings, which have the shortest remaining half life.

BLUE (Caution TML Point) - if Corrosion Rate exceed a 0.250mm / 0.009 in. per yr. or Half Life is less than 15 years.

RED (Action TML Point) - If Remaining Half Life is 0 and Last Survey Thickness is below Nominal-CA-Tolerance Thickness.

CA - Corrosion Allowance, CR - Corrosion Rate (Brown if CR &gt;= 0.500mm or 0.019in/yr.).

Calculated T-Min. Thickness - Using UPipe Mathematics.

## Husky Energy

Unit: T-064

FACILITY:	TANGLEFLAGS FIELD	MANUFACTURER:	AIR X-CHANGERS
LSD:	04-18-051-25W3	DESIGN PRESSURE:	4516 kPa / 655 psi
ITEM DESC.:	COOLER	DESIGN TEMP.:	149 C / 300 F
EQUIP / OIP#:	62048715	VESSEL CORROSION ALLOWANCE:	
PROV. REG. #:	A2988254	TOTAL CAUTION / ACTION TML:	1
SERIAL #:	944411.4		
CRN.:	K-2766.2		

### Item # 003

**TML No.: 20 4"CIRC 300# NOZ**

DATE BUILT: 01/1994

AVERAGE THICKNESS MEASURED: 8.86 mm.

MATERIAL:

MINIMUM THICKNESS MEASURED: 8.86 mm.

Pts.	Nom. Thick. mm.	CA + Steel Mfg.Tol. mm.	Nom. -CA -Toll. mm.	B/L Survey Thick. mm.	Prev. Survey Thick. mm.	Last Survey Thick. mm.	Short Term CR mm/yr	Long Term CR mm/yr	Rem. Half Life yr	Future UT Reading mm-yyyymm.	Action/Caution Required Item
				01/1994		06/2012					
20.01	8.56	0.00	8.56	8.56	N/A	8.86	0.0000	0.0000	50.00	.	NO

**TML No.: 25 4"CIRC 300# NOZ**

DATE BUILT: 01/1994

AVERAGE THICKNESS MEASURED: 8.73 mm.

MATERIAL:

MINIMUM THICKNESS MEASURED: 8.73 mm.

Pts.	Nom. Thick. mm.	CA + Steel Mfg.Tol. mm.	Nom. -CA -Toll. mm.	B/L Survey Thick. mm.	Prev. Survey Thick. mm.	Last Survey Thick. mm.	Short Term CR mm/yr	Long Term CR mm/yr	Rem. Half Life yr	Future UT Reading mm-yyyymm.	Action/Caution Required Item
				01/1994		06/2012					
25.01	8.56	0.00	8.56	8.56	N/A	8.73	0.0000	0.0000	28.34	.	NO

If Baseline (B/L) Survey Thickness Measurement was not taken at the time of Manufacture, then Nominal Thickness is used as Baseline Thickness.

Minimum Thickness is calculated

Design Minimum Thickness = Nom. Thick. - CA - Manufacturing Steel Tolerance.

Manufacturing Tolerance of pipe and forged fittings is + or -12.5% (May or may not apply dependent upon the Client's Owner-User Integrity Management System).

Manufacturing Tolerance of plate is + or - 0.25mm (0.010") (May or may not apply dependent upon the Client's Owner-User Integrity Management System).

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RED (Action TML Point) - If Remaining Half Life is 0 and Last Survey Thickness is below Nominal-CA-Tolerance Thickness.

CA - Corrosion Allowance, CR - Corrosion Rate (Brown if CR >= 0.500mm or 0.019in/yr.).

Calculated T-Min. Thickness - Using UPipe Mathematics.



# ULTRASONIC EXAMINATION REPORT

**REPORT No.:** **UT - 1723-C - 00 - SHA**

Page: **1** of **1**

Client: **Husky Energy**

District: **Saskatchewan** LSD: **Various**

Facility: **Tangleflags Field**

Item(s) Examined: **Corrosion Surveys (as per client request) Indicated Through Job Sheet.**

Acceptance Criteria: **For Clients Review** Rev. / Date: **N/A**

Procedure No.: **UT-02** Rev. / Date: **Rev. 1, Oct 2011**

Technique No.: **02** Rev. / Date: **Rev. 1, Oct 2011**

ITS Job No.: **1723-C**

Date: **June 6, 2012**

Time: **13:00**

W.O. No.: **N/S**

P.O. No.: **N/S**

Cost Code: **Various**

AFE: **N/S**

Other: **N/S**

## Equipment Data:

PRN: (A) **N/S** Serial No.: **N/S** Equip. No.: **N/S** CRN: **N/S**

Material: **N/S** Thickness: **N/S** Other: **N/S**

## Surface Condition:

☒ Base Metal ☐ Machined ☐ Shot Blasted ☐ Wire Wheeled ☐ As Ground ☐ As Welded ☒ Painted ☐ Coated ☐ Other: \_\_\_\_\_

☐ < 0°C (32°F) ☒ 0°C (32°F) to 54°C (130°F) ☒ 55°C (131°F) to 100°C (212°F) ☐ > 100°C (212°F)

## Ultrasonic Equipment:

Instrument: **Olympus** Model: **LTC** Serial No.: **100182403** Cal. Due Date: **23-Feb-13**

Cal. Block: **Metric Step Wedge 2.5mm to 12.5mm** Serial No.: **24769** Couplant: **UTX**

Cal. Block: **N/A** Serial No.: **N/A**

Transducer Cable(s): Type: **Lemo to Micro** Length: **6'**

## Transducer:

Serial No.:	Angle (X°):	Frequency (MHz):	Size (mm):	Type		Primary Reference (db) (%FSH):	Scanning Sensitivity (db):	Transfer Value (db):	Range (mm):
				Single	Dual				
677916	0	5	6.35	<input type="checkbox"/>	<input checked="" type="checkbox"/>	58db 80% FSH	>6db. Maintain 80%FSH	N/A	50.8
735560	0	5	9.53	<input type="checkbox"/>	<input checked="" type="checkbox"/>	64db 80% FSH	>6db. Maintain 80%FSH	N/A	50.8
				<input type="checkbox"/>	<input type="checkbox"/>				
				<input type="checkbox"/>	<input type="checkbox"/>				

## Examination Details:


**SCOPE:** To perform ultrasonic corrosion survey on various equipment in the Saskatchewan area for Husky Energy looking for wall loss.

**RESULTS:** Ultrasonic thickness readings taken on vessels and piping attached to the vessels.

**CONCLUSION:** Thickness readings provided for clients review.

Client Representative: \_\_\_\_\_ Sign: \_\_\_\_\_ Date: \_\_\_\_\_

## Technician(s):

Sign: 

Print: **Scott Abbott**

1<sup>st</sup> Technician

Level: **2** CGSB **2** SNT **2** ACCP/ASNT

Certification No.: **11568**

**Brian Leclaire**

2<sup>nd</sup> Technician / Assistant

Level: **2** CGSB **2** SNT **2** ACCP/ASNT

Certification No.: \_\_\_\_\_

Report Review: 