

**SHAMS POWER COMPANY**  
**ENGINEERING DIVISION**  
**INSPECTION & CORROSION SECTION**  
**SHAMS 1**

**LOCATION : R1HAC12-BC010**  
**KKS : R1HAC12-BC010**  
**GRADE & CLASSIFICATION : 2**

**CERTIFICATE OF INSPECTION**

The equipment detailed below was examined in accordance with the SHAMS code of practice for plant inspection,

**ITEM : Pre- heater (SGG-2)**

**LOCATION : SHAMS Plant**

**TYPE OF INSPECTION : Major**

**DATE OF INSPECTION : March, 2020**

**PLACE OF INSPECTION : IN-SITU**

**DATE OF LAST INSPECTION : N/A**

**REPORT :**

**1.0. SUMMARY**

The above Pre-heater (SGG-2) was taken off line, isolated, opened, vented & cleaned for major external & internal inspections.

**2.0. SUBJECT**

2.1. This is a horizontal carbon steel shell with carbon steel tube bundle.

Item	Shell Side	Tube side
Design pressure	25 bar	120 bar
Design temperature	398C	398 C
Operation pressure	-	-
Operation temperature	-	-
Hydro test pressure	-	-
Fluid	HTF	Water
Material	A 516 Gr 70	A556 –B2
Tube Number		1096 U
Tube diameter		5/8 inch
Tube thickness	25 mm	1.473 mm
Tube length		10904 mm

.....  
The above equipment is/ ~~is not~~ considered suitable for further service under the present operating conditions

**NEXT MAJOR INSPECTION DUE : March 2024**

**INSPECTED: Osman Ismail**

**ENDORSEMENT: 48 MONTHS**

**REVIEWED: Ali Al Masabai**

### **3.0 History**

This Pre-heater - (SGG-2) was commissioned in 2013. Periodical inspection records since Oct.'2014 are available.

### **4.0. Scope of Inspection**

- 4.1 Visual Inspection
- 4.2 Remote field Eddy Current
- 4.3 Ultrasonic Thickness survey
- 4.4 Dye- penetrant
- 5.4 Borescope inspection

### **5.0. CONDITIONS FOUND**

#### **5.1. External (Shell side)**

- 5.1.1 All painting and insulation found intact without any evidence of painting peel off or blistering and no evidence of any damage for insulation or insulation cover aluminum sheet.
- 5.1.2 All ladders, stairways and handrails found in satisfactory condition.
- 5.1.3 All concrete support found in satisfactory condition without evidence of cracking or spalling.
- 5.1.4 All external piping insulation found in satisfactory condition.
- 5.1.5 All earthing lugs found in satisfactory condition.

#### **5.2. Internal (Tube side)**

- 5.2.1 All tubes as could see internal surfaces found satisfactory condition without evidence of corrosion, apart from a considerable amounts of deposits which have cleaned by high pressure hydro jetting.
- 5.2.2 All tube to tube sheet welds found in satisfactory condition.
- 5.2.3 Diaphragm was cut out for tube inspection access and welded back successfully.

### **6.0 NDT**

#### **6.1 Ultrasonic thickness survey**

Ultrasonic thickness measurement was carried out on accessible locations of channel found satisfactory. See attached thickness measurement report.

#### **6.2 Dye – Penetrant test**

Dye – Penetrant test was carried out on tube to tube sheet welds and new welds of diaphragm all found satisfactory. See attached thickness measurement report.

### 6.3 Remote field Eddy Current test (RFT)

Eddy current test was carried out on 116 tubes as sample, results was satisfactory as indicated in below table. More details in the attached RFT report.

<b>Classifications</b>	<b>Total</b>
No Defects Detected	116
0.1% - 10% Volume Loss	0
10%- 20% Volume Loss	0
20%- 30% Volume Loss	0
30%- 40% Volume Loss	0
40.0%- 50% Volume Loss	0
50.0 +Volume Loss	0
Restricted	0
Obstructed	0
Plugged	0

### 6.4 borescope Inspection

It was done internally from tube side end and externally of tubes from shell side end. It revealed a considerable amount of deposit inside tubes, while outside was satisfactory. After hydro jetting deposits was less but not removed completely, (see attached videos and photos)

### 6.7 Chemical Analysis

Chemical analysis was carried out through third party called GEO –CHEM MIDDLE EAST, results was normal except manganese oxide was little bit high , (chemical analysis report attached).

## **7.0. Recommendations**

Pre-heater – (SSG-2) to be open for inspection after four years as per SHAMS code of practice.

## **8.0 Inspection Grade and Interval**

In accordance with the latest revision of SHAMS Code of Practice, this Pre-Heater – (SGG-2) was endorsed for 48 months under class 2, for next Major Inspection.

**FREQUENCY : 48 MONTHS.**  
**ENDORSEMENT : 48 MONTHS,**  
**GRADE : 2**  
**Next Major Insp. due : March, 2024**

## Photos



Tubes (3 plugged) , welds and internal surfaces of ( channel & pass partition)



Tubes outside surfaces and baffles condition inside shell

Form No.: IN-QSF-36 Rev. 05E Dtd.: 20-10-2018



**ULTRASONIC THICKNESS GAUGING REPORT**

Client:	SHAMS POWER COMPANY		
Date:	18.03.2020	Report No.:	AD / 487
Project:	SHAMS OUTAGE MARCH 2020	Job No. :	N/A
Location:	MADINAT ZAYED	Drawing No.:	N/A
Item ID:	PRE HEATER-2	Material:	CS
Ref/ Procedure No:	INSPEC/UTG/001 Rev.10	Ref. Standard:	ASME SEC V
UTG Equipment Model/ Manufacturer:	USM 35 X DAC / GE	Serial No.:	7292a
Calibration Block No. :	STEP WEDGE, IIW V2 BLOCK	EQPT Calibration Certificate & Due Date:	INS/UT/CAL-043/19/AUH
Probe Type/ Size/Frequency:	WK TR 0° PROBE/ 10mm DIA / 5 MHz	Couplant Brand Name & Type:	POLYCELL + WATER
Connecting Cable Type & Length:	LEMO TO MICRODOT & 2 MTR	Special Attachment/ Equipment/ Block:	STEP WEDGE BLOCK (SL NO : AZB270)
Test Temperature:	AMBIENT	Surface Condition:	AS CLEANED
Inspection Date:	18.03.2020	Page:	1 of 2
Description:			

# ULTRASONIC THICKNESS GAUGING WAS CARRIED OUT ON THE FOLLOWING PRE HEATER-2 (R1HAC12 BC010)

LOCATION	ORIENTATION	MEASURED THICKNESS (mm)
1	12 O'CLOCK	100.01
1	3 O'CLOCK	99.99
1	6 O'CLOCK	100.20
1	9 O'CLOCK	100.10

**REPORT FORMAT APPLICABLE ONLY FOR AUH & FUJ FACILITY**

LEVEL II TECHNICIAN		CLIENT REPRESENTATIVE		AI / TPI
Name :	SIVANESAN	Name :		
Sign :		Sign :		
Date :	18.03.2020	Date :		
				
<small>Dubai Branch Sharjah Branch Abu Dhabi Branch Fujairah Branch Oman Branch Registered Office</small>		<small>Tel : 04 3241955 Tel : 06 5361300 Tel : 02 6225820 Tel : 09 2238754 Tel : 00968 2440 2201 Fax: 04 3241957 Fax: 06 5361175 Fax: 02 6225830 Fax: 09 2238754 Fax: 00968 2448 5855 Email: Inspecdhcoor@intertek.com Email: Inspecdhcoor@intertek.com Email: Inspecdhcoor@intertek.com Email: Inspecdhcoor@intertek.com Email: Inspecdhcoor@intertek.com</small>		

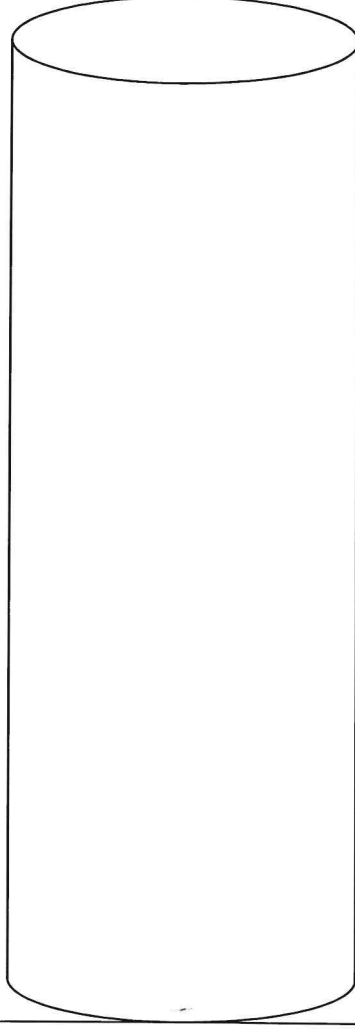
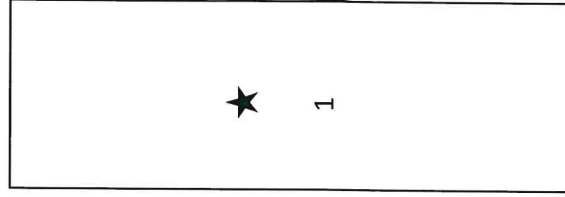
Please see terms & conditions. This report is valid only if signed and stamped ( Numbered Stamp ) by Level II / Level III.

For Complaints & Suggestions:  
Please email to: suggestions.inspec@intertek.com



**ULTRASONIC THICKNESS SCANNING DRAWING SHEET**

**PRE HEATER - 2**



**iNSPEC**  
**LEVEL II TECHNICIAN**  
Sign  
**Name :-** SIVANESAN & RAJESH KANNAN  
**Sign :-**   
**Date :-** 18.03.2020

★ **UTG LOCATION**

**LIQUID PENETRANT EXAMINATION REPORT**

Report No.:	AD / 53681	Date:	18.03.2020	Page:	1	Of	2
Client :	SHAMS POWER COMPANY	Job No. :	PROJECT :- SHAMS OUTAGE MARCH -2020				
Location :	MADINAT ZAYED	Item :	AS BELOW				
Material :	CS	Ref / Procedure No. :	INS/ASME/PT/001				
Thickness :	VARIOUS	Revision :	22				
Surface condition :	AS WELDED & CLEANED	Test Temp. :	AMBIENT (25°)				
Viewing condition :	DAY LIGHT (>1076 LUX)	Penetrant Type / Technique :	VISIBLE SOLVENT REMOVABLE				
Penetrant dwell time :	10 MIN	Dev. Time:	10 MIN				
Date of test :	18.03.2020	ACCP - Criteria :	ASME SEC VIII DIV-1				
Consumables Type & Batch	MAGNAFLUX - SPOTCHECK						

Penetrant Remover	Penetrant	Developer
SKC-S ( BATCH NO-180108) JAN 2021	SKL-SP2 ( BATCH NO-171201) DEC 2020	SKD-S2 ( BATCH NO-180102) JAN 2021

**Observation & Evaluation :**

# 100% DPT WAS CARRIED OUT ON THE FOLLOWING ITEM

# PRE HEATER-2 (R1HAC12BC010)

# PT WAS DONE ON TUBE END WELD JOINT (PARTIALY COMPLETED)

# NO RELEVANT INDICATION WAS OBSERVED DURING THE TIME OF INSPECTION.

# FOUND ACCEPTABLE AS PER THE SPECIFICATION.

ACCEPT REJECT

RESULT



REPORT FORMAT APPLICABLE ONLY FOR AUH &amp; FUJ FACILITY

LEVEL II TECHNICIAN		CLIENT REP		AI / TPI	
Name :	SIVANESAN & RAJESH KANNAN	Name :		Name :	
Sign :		Sign :		Sign :	
Date :	18.03.2020	Date :		Date :	
Dubai Branch	P.O. Box: 61, 1225, Dubai, U.A.E	Tel: 04 3241955	Fax: 04 3241957	Email: inspec.dxbcoor@intertek.com	INSPEC IS PART OF INTERTEK GROUP
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Fujairah Branch	P.O. Box: 2307, Fujairah, U.A.E	Tel: 09 2238754	Fax: 09 2238754	Email: inspec.fujcoor@intertek.com	
Oman Branch	P.O. Box: 193, P.C.: 131, Sultanate of Oman	Tel: 00968 2448 2391	Fax: 00968 2448 5855	Email: inspec.muscat@intertek.com	
Registered Office	33-37 Athol Street, Douglas, IM1, 1LB, Isle of Man. Company Number 010728V.				

 For Comments & Suggestions:  
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# **PRELIMINARY INSPECTION REPORT**

## **REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET) OF PREHEATER 2 R1HAC12- BC010**

**SUBMITTED  
TO  
SHAMS POWER COMPANY**



# **REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)**

## **PREHEATER 2 R1HAC12-BC010**

Client : SHAMS POWER COMPANY  
Location : Madinat  
Equipment : PREHEATER 2 R1HAC12-BC010  
NDT Technique : Remote Field Eddy Current Testing

Client:	SHAMS POWER COMPANY	Exchanger No:	PREHEATER 2 R1HAC12-BC010
Prepared By:	SRINIVAS	Date Of Work:	17 <sup>th</sup> & 21 <sup>st</sup> March 2020

Inspected by : SRINIVAS NDT Level-II	Reviewed by:  NDTLevel III
Date: 21 <sup>st</sup> March 2020	Date: 21 <sup>st</sup> March 2020

# **REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)**

## **PREHEATER 2 R1HAC12-BC010**

### **2.0 EXCHANGER DETAILS**

Serial No : PREHEATER2(R1HAC12-BC010)

Tube Material : SA 179 CARBON STEEL

Tube Configuration : U TUBE

Tube OD : 15.87 mm

Tube Wall Thickness : 1.47 mm

No of Tubes Inspected : 116

**3.0 INSPECTED BY** : SRINIVAS

### **4.0 SCOPE OF WORK**

To carry out RFET Inspection for PREHEATER 2 R1HAC12-BC010 to find out and analyze any wall loss,Pitting,Corrosion.

### **5.0 TUBE IDENTIFICATION**

In order to be able to identify and locate each tube, and there by create full traceability, the grid coordinates row and column were used. All measurement was calculated from the nominal wall thickness.

Scanning was carried out from the fixed end  
Rows were numbered from Top to Bottom  
Columns were numbered from Left to Right

### **6.0 DISCUSSION / RESULTS**

- Cleaning of the tubes is not good enough for RFET Inspection.
- No major indications found during the scanning
- All the tubes are in good condition


**Tubes were classified as follows:-**

<b>Classifications</b>	<b>Total</b>
No Defects Detected	116
0.1% - 10% Volume Loss	0
10%- 20% Volume Loss	0
20%- 30% Volume Loss	0
30%- 40% Volume Loss	0
40.0%- 50% Volume Loss	0
50.0 +Volume Loss	0
Restricted	0
Obstructed	0
Plugged	0

# REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)

## PREHEATER 2 R1HAC12-BC010

### 7.0 TUBE CONDITION DURING INSPECTION

	Good	Bare metal internal Surface finish
	Average	Minor dirt and/or deposits throughout tube length.
	Poor	Heavy scaling and/or deposits causing spurious indications on tube inspection results.
	Very Poor	Multiple restrictions caused by internal bore reduction. Tube inspection results limited at best.

### Tube Inspection Results

**NDD:- No Defect Detected**

**RST:- Restricted**

**OBS:-Obstructed**

**PLG:-Plugged**

**WLL:- WALL LOSS**

**COR:- CORROSION**

SL NO	Row	Col.	Code	Size
1	1	1	NDD	
2	1	2	NDD	
3	1	3	NDD	
4	1	4	NDD	
5	1	5	NDD	
6	1	6	NDD	
7	1	7	NDD	
8	1	8	NDD	
9	1	9	NDD	
10	1	10	NDD	
11	1	11	NDD	
12	1	12	NDD	
13	1	13	NDD	
14	1	14	NDD	
15	1	15	NDD	
16	1	16	NDD	
17	1	17	NDD	
18	1	18	NDD	

# REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)

## PREHEATER 2 R1HAC12-BC010

19	1	19	NDD
20	1	20	NDD
21	2	1	NDD
22	10	1	NDD
23	10	2	NDD
24	10	3	NDD
25	10	4	NDD
26	10	5	NDD
27	10	6	NDD
28	10	7	NDD
29	10	8	NDD
30	10	9	NDD
31	10	10	NDD
32	10	11	NDD
33	10	12	NDD
34	10	13	NDD
35	10	14	NDD
36	10	15	NDD
37	10	16	NDD
38	10	17	NDD
39	10	18	NDD
40	10	19	NDD
41	10	20	NDD
42	10	21	NDD
43	10	22	NDD
44	10	23	NDD
45	10	24	NDD
46	10	25	NDD
47	10	26	NDD
48	20	22	NDD
49	20	29	NDD
50	38	1	NDD
51	38	2	NDD
52	38	3	NDD
53	38	4	NDD
54	38	5	NDD
55	38	19	NDD

# REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)

## PREHEATER 2 R1HAC12-BC010

56	38	28	NDD
57	38	29	NDD
58	38	30	NDD
59	38	31	NDD
60	38	32	NDD
61	39	1	NDD
62	39	2	NDD
63	39	3	NDD
64	39	4	NDD
65	39	5	NDD
66	39	26	NDD
67	39	28	NDD
68	39	29	NDD
69	39	30	NDD
70	39	31	NDD
71	39	32	NDD
72	57	22	NDD
73	67	1	NDD
74	67	2	NDD
75	67	3	NDD
76	67	4	NDD
77	67	5	NDD
78	67	6	NDD
79	67	7	NDD
80	67	8	NDD
81	67	9	NDD
82	67	10	NDD
83	67	11	NDD
84	67	12	NDD
85	67	13	NDD
86	67	14	NDD
87	67	15	NDD
88	67	16	NDD
89	67	17	NDD
90	67	18	NDD
91	67	19	NDD
92	67	20	NDD



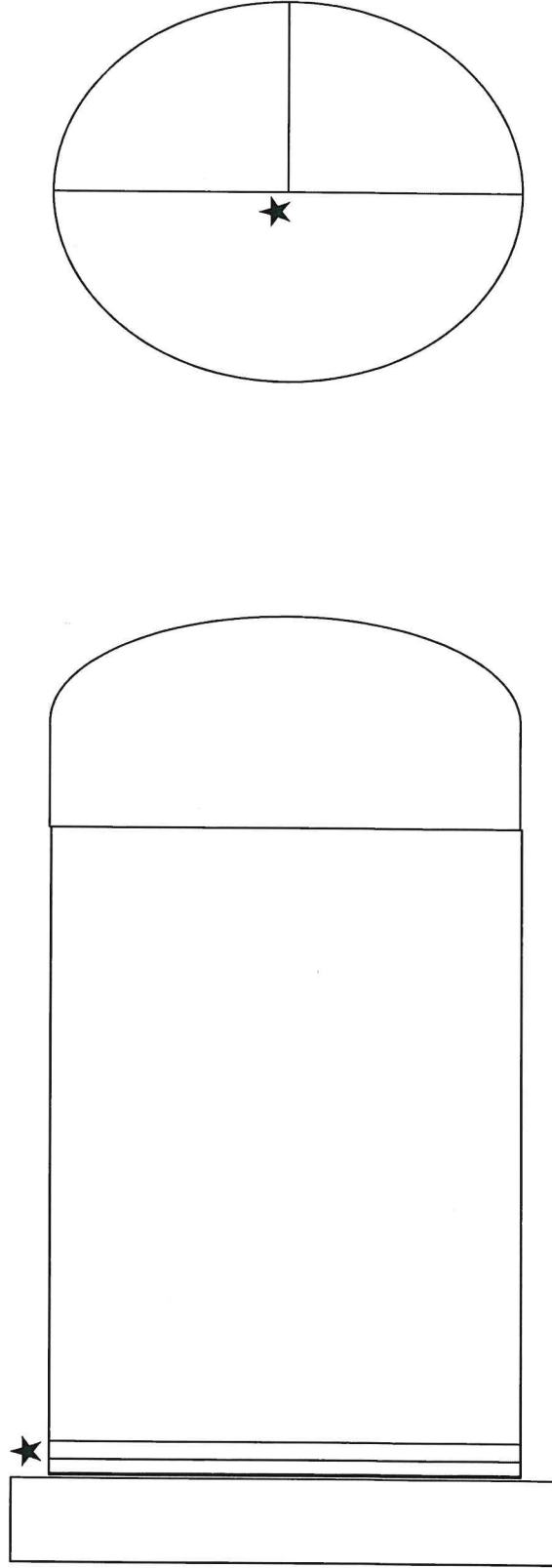
# **REMOTE FIELD EDDY CURENT INSPECTION REPORT (RFET)**

## **PREHEATER 2 R1HAC12-BC010**

93	67	21	NDD
94	67	22	NDD
95	67	23	NDD
96	67	25	NDD
97	67	26	NDD
98	76	1	NDD
99	76	2	NDD
100	76	3	NDD
101	76	4	NDD
102	76	5	NDD
103	76	6	NDD
104	76	7	NDD
105	76	8	NDD
106	76	9	NDD
107	76	10	NDD
108	76	11	NDD
109	76	12	NDD
110	76	13	NDD
111	76	14	NDD
112	76	15	NDD
113	76	16	NDD
114	76	17	NDD
115	76	18	NDD
116	76	19	NDD

**LIQUID PENETRANT EXAMINATION - DRAWING SHEET**

**PRE HEATER-2**



★ PT DONE LOCATION

LEVEL II TECHNICIAN

Name :- SIVANESAN & RAJESH KANNAN

Sign :-

Date :- 18/03/2020