



TUBE EXAMINATION REPORT

I.R.I.S

on

NB66141

Torrey Tank Battery

California Recsources Corporation

Ventura California

August 17 2019

Project Number

#07023182

Report Prepared By: *Michael J. Moore*
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Report Reviewed By: _____

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TUBE EXAMINATION REPORT

Client:	California Recsources Corporation	Site:	Torrey Tank Battery
Equipment No.:	NB66141	Inspection Technique:	I.R.I.S
Equipment Name:	Air Cooler Fin Fan	Unit Name:	
Inspector:	Michael Moore	Date:	August 17 2019
Total Tubes:	58	Number Inspected:	58
Tube Size:	.750" x 0.065" x 14" ft (Gage) 16	Tube Material:	SA-214

Tube Layout: Tested from: **Stationary Tube Sheet**

Tubes numbered from Left to Right (Tubes). Top to Bottom (Rows), unless other wise noted. Only the single deepest flaw for every tube will be noted on the report unless otherwise requested prior to the inspection. Any tube found to have less than 5 percent wall loss will be categorized as NDD.

During an IRIS examination the Percent wall loss column is estimated based on the remaining wall found, and then subtracted from the original nominal wall. It is considered for customer information only.

Inspection Summary:

An IRIS inspection was requested by the C.R.C Inspection Department on NB66141 Bundle Air Cooler Fin Fan to assess it's current servcability condition. According to the client's information provided, the tubes are 0.0750" x 0.065" SA-214 Carbon Steel and upon visual inspection these seem to be the correct tube material so the exchanger was tested as such. The exchanger was hydroblasted and was adequately cleaned although some small areas were found to still contain some scale or deposits in a few of the tubes tested.

The tubes were tested with IRIS which is usually well suited for these types of tubes as long as the tubes are adequately cleaned. (See technique page)

All of the tubes tested show no wall loss at this time of inspection.

Through common operating procedures and requirements, the lowest wall reading found in any given tube is what is reported whether it is a pit, thinning, OD fretting or any other damage mechanism, if known it is commonly relayed as such. The tube integrity, no matter what the damage mechanism is could be at risk. Common practice is to plug wall loss of 50% or greater.

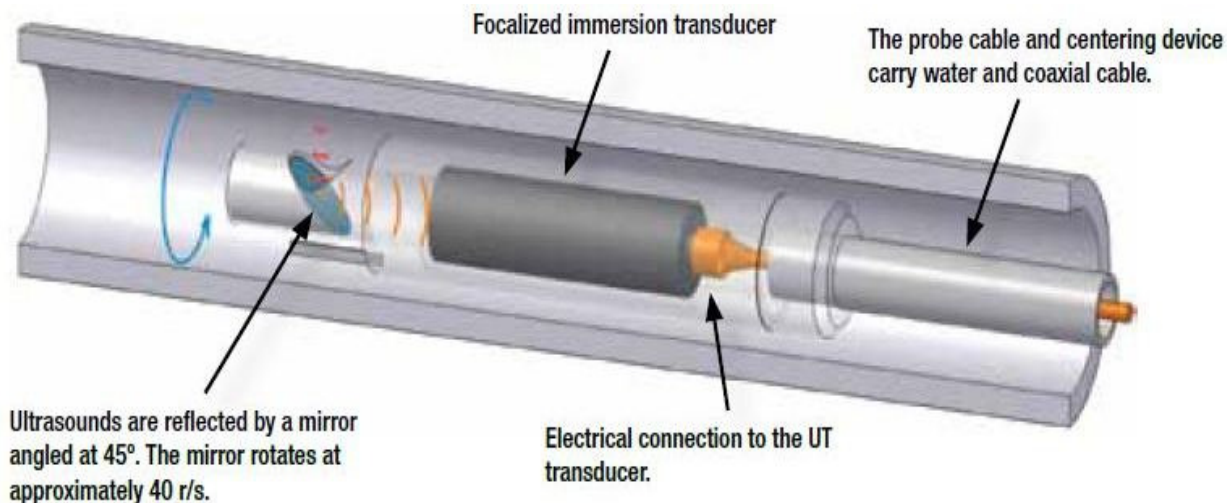
Notes:

- See attached data sheets for results of individual tubes inspected.
- Tube wall from U-1 for will be used for the percent wall loss.

1. Total tubes tested:	58
2. Tubes reported as "Too Dirty to Inspect":	0
3. Tubes reported as "0% - 9% Wall Loss":	0
4. Tubes reported as "10%-19% Wall Loss":	0
5. Tubes reported as "20%-29% Wall Loss":	0
6. Tubes reported as "30%-39% Wall Loss":	0
7. Tubes reported as "40%-49% Wall Loss":	0
8. Tubes reported as "50%-59% Wall Loss":	0
9. Tubes reported as "60%-69% Wall Loss":	0
10. Tubes reported as ">70% Wall Loss":	0
11. Tubes reported as no defect noted "NDD":	58
12. Tubes reported as "Plugged":	0
13. Tubes reported as "Obstructed":	0

Internal Rotary Inspection System is an ultrasonic immersion pulse echo technique to detect pitting and wall thinning in tubes. IRIS testing (UT) relies on a transducer which converts electronic energy into mechanical energy (in form of sound waves), to generate an ultrasonic pulse oriented parallel to the axis of the tube (flooded with water beforehand). Ultrasound waves are reflected by a mirror inclined at 45 degrees, and due to this, the waves strike perpendicularly on the tube's inner surface. Part of this beam is relected back by inner surface and part is transmitted through tube wall and reflected by the outer diameter of the tube. Knowing the ultrasonic velocity of the tube material, APPLUS RTD can assess the wall thickness using the time-of-flight diffrence between the two surfaces. For mesurement of complete inner surface of the tube, the mirror is mounted on a water turbine that rotates at a speed of approximately 2000 RPM. Water circulation is rotating the mirror, ensuring the whole tube is inspected. Since the beam makes a spiral movement, for complete coverage the probe has to be pulled slowly. Each pulse is marked on a horizontal scan line on the user interface screen.

IRIS is particularly versatile, as it is suitable for ferrous and non-ferrous materials and allows detection of corrosion, pitting and thinning on a wide range of tube diameters and wall thicknesses.



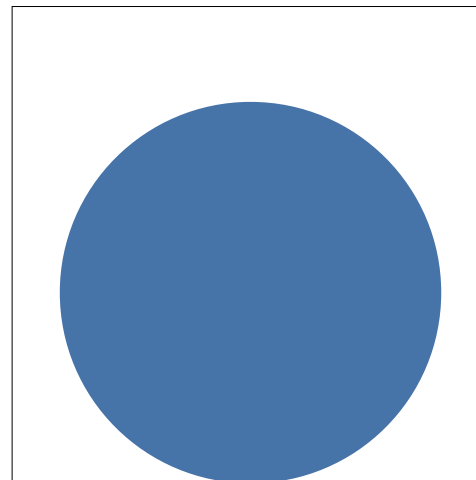
Equipment used Unit:	<i>Panamerican Ultima</i>	Inspection surface:	<i>ID</i>
Serial number:	<i>14523</i>	Inspection Technique:	<i>I.R.I.S</i>
Probes Used:	<i>Small Turbine</i>	SCANNING SENSITIVITY:	<i>2" Per Sec</i>
Frequency Used:	<i>10Mhz</i>	Angle used:	<i>0 Deg</i>
Probe Size:	<i>3/8" Diameter</i>	Calibration Reference SN #	<i>N / A</i>

I.R.I.S Testing Data Summary

Customer:		California Recsources Corporation		Unit:			
Service Name:		Air Cooler Fin Fan		Equip. No.:	NB66141	Date:	August 17 2019
No.:	Bundle Type:	Material Type:	O.D.	Length:	Wall Thickness:		Gauge:
1.0	Freight Pass Exchange	SA-214	.750"	14"	0.065"		16
2.0	0	0	0.000	0.0	0.000		0
3.0	0	0	0.000	0.0	0.000		0
No.	No. Tubes:	No. Inspected:	% of bundle Inspected.:	Plugged:	Obstructed	No. Ind.	Test End:
1.0	58	58	100.0%	0	0	58	Stationary Tube Sheet
2.0	0	0	0.0%	0	0	0	
3.0	0	0	0.0%	0	0	0	
Totals	58	58	100.0%		0	0	
No.	Type Indication:		No. Tubes:	% Tubes Insp.:	Comments:		
1.0	Light Corrosion		58	100.0%	0% - 9%		
1.0	General Corrosion		0	0.0%	10%-19%		
1.0	Minor Isolated Corrosion		0	0.0%	20%-29%		
1.0	Moderate Isolated Corrosion		0	0.0%	30%-39%		
1.0	Moderate Isolated Corrosion		0	0.0%	40%-49%		
1.0	Severe Isolated Corrosion		0	0.0%	50%-59%		
1.0	Severe Isolated Corrosion		0	0.0%	60%-69%		
1.0	Severe Isolated Corrosion		0	0.0%	>=70%		
Totals			58	100.0%	Total Mileage Inspected		#VALUE!

Exchanger Totals

■ Total Tubes ■ No. Insp. ■ No Relevant Ind. ■ 10%-19%
■ 20%-29% ■ 30%-39% ■ 40%-49% ■ 50%-59%
■ 60%-69% ■ 70%-100% ■ Mechanical Plug ■ Obstructed Tubes



■ NDD / OK
■ 10%-19% Defect Depth
■ 20%-29% Defect Depth
■ 30%-39% Defect Depth
■ 40%-49% Defect Depth
■ 50%-59% Defect Depth
■ 60%-69% Defect Depth
■ >=70% Defect Depth
■ Plugged

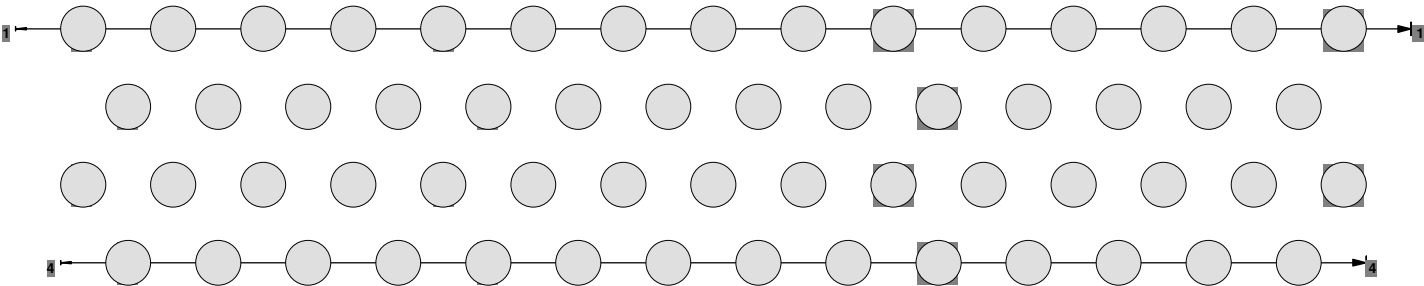
Name Plate Side Top

Torrey Tank Battery

Air Cooler Fin Fan

NB66141

Tested from: Stationary Tube Sheet
Report REV:



LEGEND KEY

DESCRIPTION	SYMBOL	QTY	DESCRIPTION	SYMBOL	QTY	DESCRIPTION	SYMBOL	QTY
TUBE COUNT		58(100%)	20-29.9%		0(0%)	70-79.9%		0(0%)
TOTAL TESTED		58(100.00%)	30-39.9%		0(0%)	80-89.9%		0(0%)
NDD		58(100.00%)	40-49.9%		0(0%)	90%-THRU WALL		0(0%)
0-9.9%		0(0%)	50-59.9%		0(0%)	OBS-NO DATA		0(0%)
10-19.9%		0(0%)	60-69.9%		0(0%)	PLUGGED		0(0%)

Tested with: I.R.I.S

APPLUS RTD	(832) 295-5000
CUSTOMER: California Recsources Corporation	QTY: 58
PLANT: Ventura California	MAT'L: SA-214
UNIT: Torrey Tank Battery	SIZE: .750" x 0.065"
DATE: August 17 2019	TECH: Adam Shideler

TUBE EXAMINATION REPORT

Picture of Exchanger if available

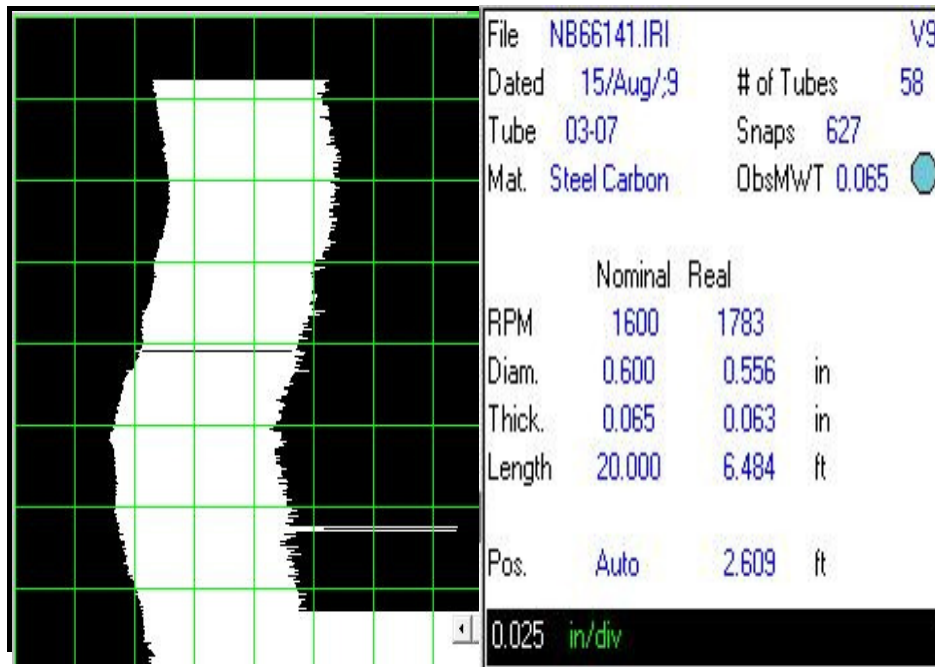
NB66141



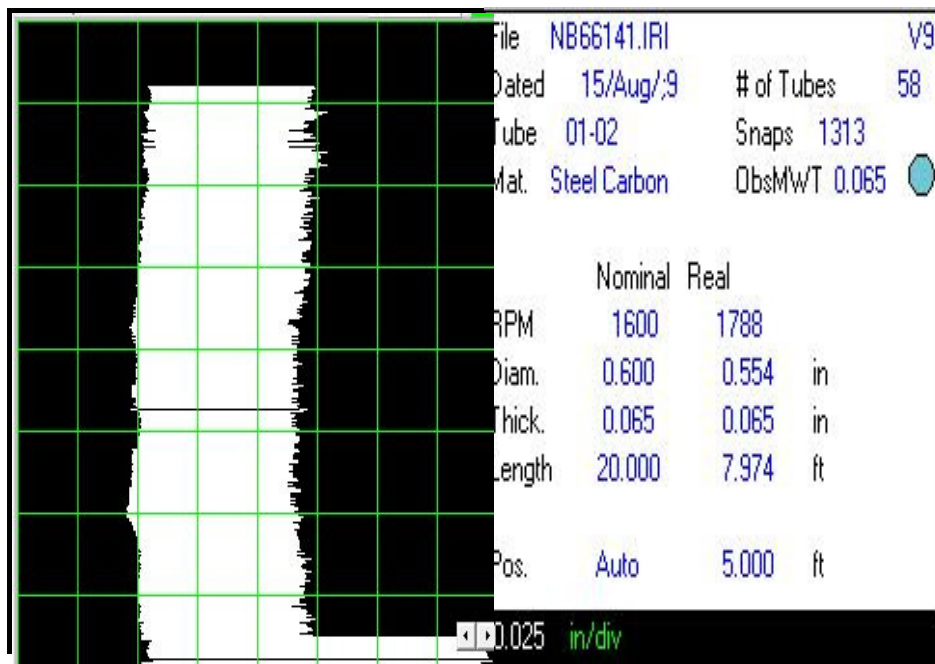
TUBE EXAMINATION REPORT

Data Images of findings

NB66141



Nominal 0.065" Wall Reading



Nominal 0.065" Wall Reading

ZONE	ROW	TUBE	PERCENT LOSS	CODE	ID	OD	LOCATION	REMAINING WALL	NOTES
	1	1	0%	G				0.065	No Detectable Degradation
	1	2	0%	G				0.065	No Detectable Degradation
	1	3	0%	G				0.065	No Detectable Degradation
	1	4	0%	G				0.065	No Detectable Degradation
	1	5	0%	G				0.065	No Detectable Degradation
	1	6	0%	G				0.065	No Detectable Degradation
	1	7	0%	G				0.065	No Detectable Degradation
	1	8	0%	G				0.065	No Detectable Degradation
	1	9	0%	G				0.065	No Detectable Degradation
	1	10	0%	G				0.065	No Detectable Degradation
	1	11	0%	G				0.065	No Detectable Degradation
	1	12	0%	G				0.065	No Detectable Degradation
	1	13	0%	G				0.065	No Detectable Degradation
	1	14	0%	G				0.065	No Detectable Degradation
	1	15	0%	G				0.065	No Detectable Degradation
	2	1	0%	G				0.065	No Detectable Degradation
	2	2	0%	G				0.065	No Detectable Degradation
	2	3	0%	G				0.065	No Detectable Degradation
	2	4	0%	G				0.065	No Detectable Degradation
	2	5	0%	G				0.065	No Detectable Degradation
	2	6	0%	G				0.065	No Detectable Degradation
	2	7	0%	G				0.065	No Detectable Degradation
	2	8	0%	G				0.065	No Detectable Degradation
	2	9	0%	G				0.065	No Detectable Degradation
	2	10	0%	G				0.065	No Detectable Degradation
	2	11	0%	G				0.065	No Detectable Degradation
	2	12	0%	G				0.065	No Detectable Degradation
	2	13	0%	G				0.065	No Detectable Degradation
	2	14	0%	G				0.065	No Detectable Degradation
	3	1	0%	G				0.065	No Detectable Degradation
	3	2	0%	G				0.065	No Detectable Degradation
	3	3	0%	G				0.065	No Detectable Degradation
	3	4	0%	G				0.065	No Detectable Degradation
	3	5	0%	G				0.065	No Detectable Degradation
	3	6	0%	G				0.065	No Detectable Degradation
	3	7	0%	G				0.065	No Detectable Degradation
	3	8	0%	G				0.065	No Detectable Degradation
	3	9	0%	G				0.065	No Detectable Degradation
	3	10	0%	G				0.065	No Detectable Degradation
	3	11	0%	G				0.065	No Detectable Degradation

APPLUS RTD
(832) 295-5000

California Resources Corporation
Ventura California
Air Cooler Fin Fan-NB66141

TECH:
Adam Shideler
DATE: August 17 2019

ZONE	ROW	TUBE	PERCENT LOSS	CODE	ID	OD	LOCATION	REMAINING WALL	NOTES
	3	12	0%	G				0.065	No Detectable Degradation
	3	13	0%	G				0.065	No Detectable Degradation
	3	14	0%	G				0.065	No Detectable Degradation
	3	15	0%	G				0.065	No Detectable Degradation
	4	1	0%	G				0.065	No Detectable Degradation
	4	2	0%	G				0.065	No Detectable Degradation
	4	3	0%	G				0.065	No Detectable Degradation
	4	4	0%	G				0.065	No Detectable Degradation
	4	5	0%	G				0.065	No Detectable Degradation
	4	6	0%	G				0.065	No Detectable Degradation
	4	7	0%	G				0.065	No Detectable Degradation
	4	8	0%	G				0.065	No Detectable Degradation
	4	9	0%	G				0.065	No Detectable Degradation
	4	10	0%	G				0.065	No Detectable Degradation
	4	11	0%	G				0.065	No Detectable Degradation
	4	12	0%	G				0.065	No Detectable Degradation
	4	13	0%	G				0.065	No Detectable Degradation
	4	14	0%	G				0.065	No Detectable Degradation