

CASE STUDY – ACOUSTIC PULSE REFLECTOMETRY



FPSO (Ghana)

Boiler & Suction Cooler Tube Inspection

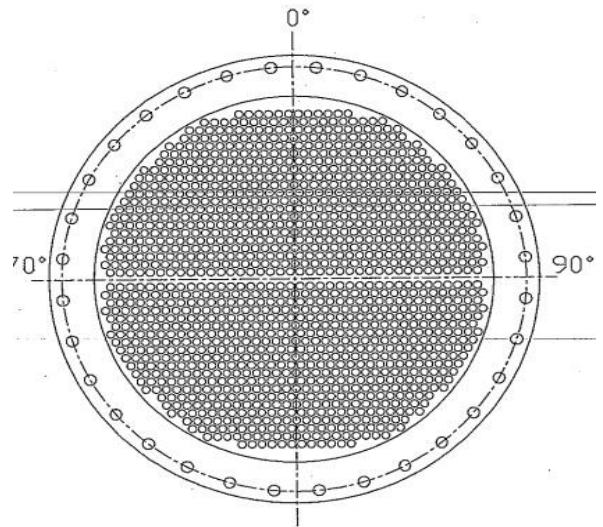




Job Overview

Arise Global performed an Acoustic Pulse Reflectometry (APR) non-invasive inspection on an auxiliary boiler & 3rd stage suction cooler tubes at a FPSO in Ghana consisting of 672 and 795 tubes respectively. The primary reasons for selecting an Acoustic Pulse Reflectometry inspection were based on the following:

- ✚ Non-Invasive & Easy access: Acoustic waves could propagate in any configuration using air as a medium
- ✚ Accuracy & Speed: Defect type, its size and location could be reported precisely & 100% inspection in limited time frame.



The auxiliary boiler which we had inspected was 20 years old and has 2 times the capacity of top side (main) boiler. Riser tubes/ Generating tubes as well downcomer tubes were inspected by us within few hours and reports furnished instantly. Conventional technologies couldn't inspect such tubes easily because of the tube ID variations at beginning & throughout the tube. Similarly, suction cooler tubes were also inspected within 3 hours and report furnished on same day evening.

Summary of Inspection Results

Tube Size	Riser Tube(50.8mm) OD: Downcomer (139.8mm) OD: Cooler Tube (19.05mm)	
Tube Thickness	Riser Tube (4.5mm); Downcomer (6.6mm); Cooler Tube (2.5mm)	
Tube Length	7m (Avg. length of a boiler tube);4.3m (Total Length of a cooler tube)	
Tube Shape	Special configuration (Boiler Tube); Straight (Suction Cooler Tube)	
# of Tubes	672 (Boiler Tubes); 795 (Suction Cooler Tubes)	
Defects Found	Boiler Tube	Suction Cooler Tube
	Pits >80% : 2	Pits 40-60% : 4
	Pits 60-80% : 9	Pits <40% : 55
	Pits 40-60% : 27	Erosion<40%:2
Pits<40% : 53		
Inspection Time	6 hours (100% Boiler Tubes); 3 hours (100% Suction Cooler Tubes)	

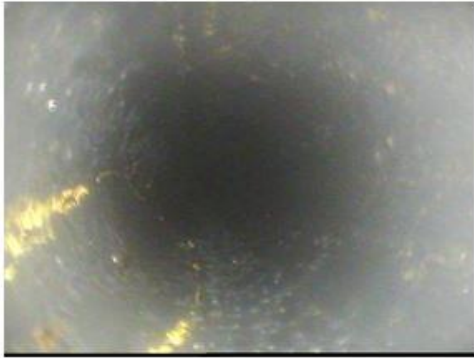
Outcome

- All tubes with pitting >60% were plugged.
- Operating efficiency of boiler reached its maximum after 1-month downtime and decided to have periodic inspection to monitor the defect rate.

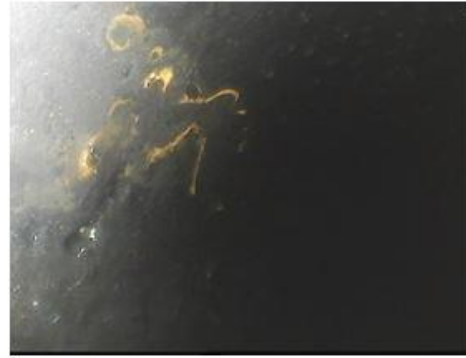


Defect Examples

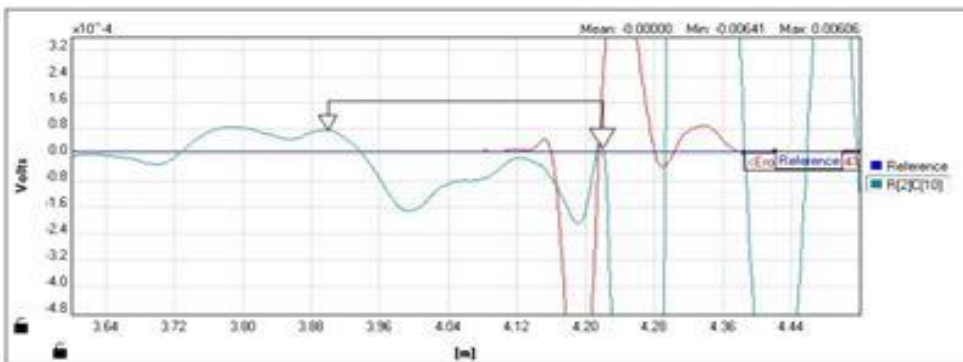
Erosion



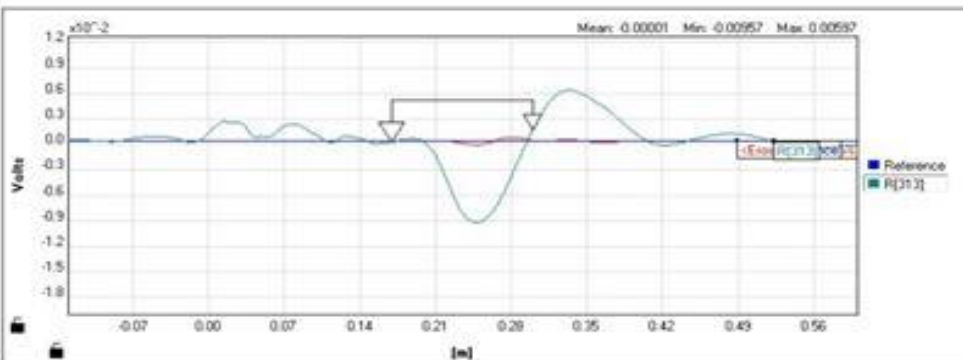
Pitting



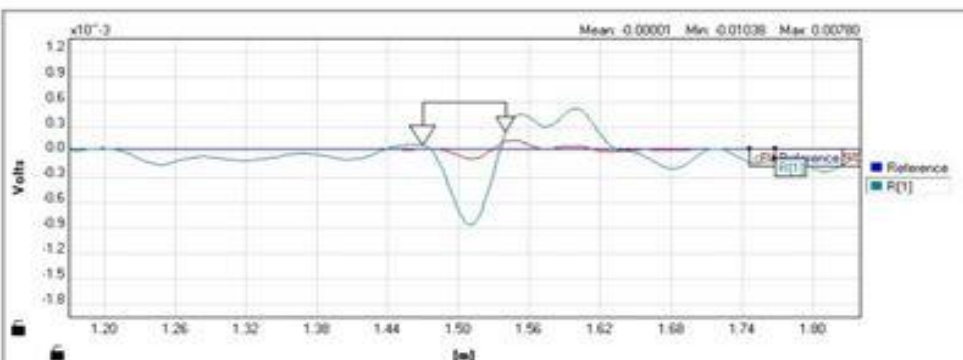
APR Defect Identification



>> Erosion



>> Pitting



>> Pitting