



State of the Art Products and Services  
for Non-Destructive Testing

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## Case Study

### Tubular Inspection using Direct Current (DC) Saturation Eddy Current Technique (MAGWAVE)

Inspection of **Exchanger** was carried out using **Direct Current (DC) Saturation Eddy Current Technique (Magwave)** to measure the Pitting/Corrosion of Exchanger Tubes.

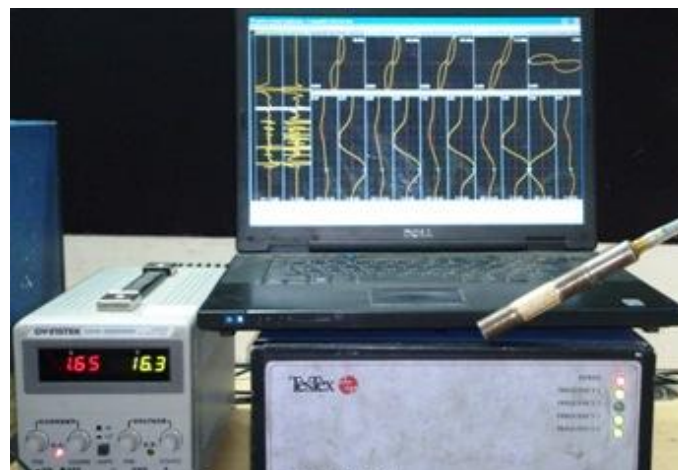
The Inspection was carried out on June 2013.

#### TECHNICAL DETAILS:

<b>Unit Name</b>	<b>Exchanger</b>
<b>Material</b>	<b>Duplex</b>
<b>Tube Dimension (in mm)</b>	<b>25.4 x 2.77 x 8375</b>
<b>Total # of Tubes</b>	<b>574</b>
<b>Plugged</b>	<b>-</b>
<b>No. of Tube Inspected</b>	<b>574</b>

#### ELECTRONICS:

The TX-4400-system is an all-digital microprocessor-controlled instrument. It contains all necessary electronics for collection of data using the MAGWAVE method. An external DC power supply unit is also used in conjunction with the TX-4400.

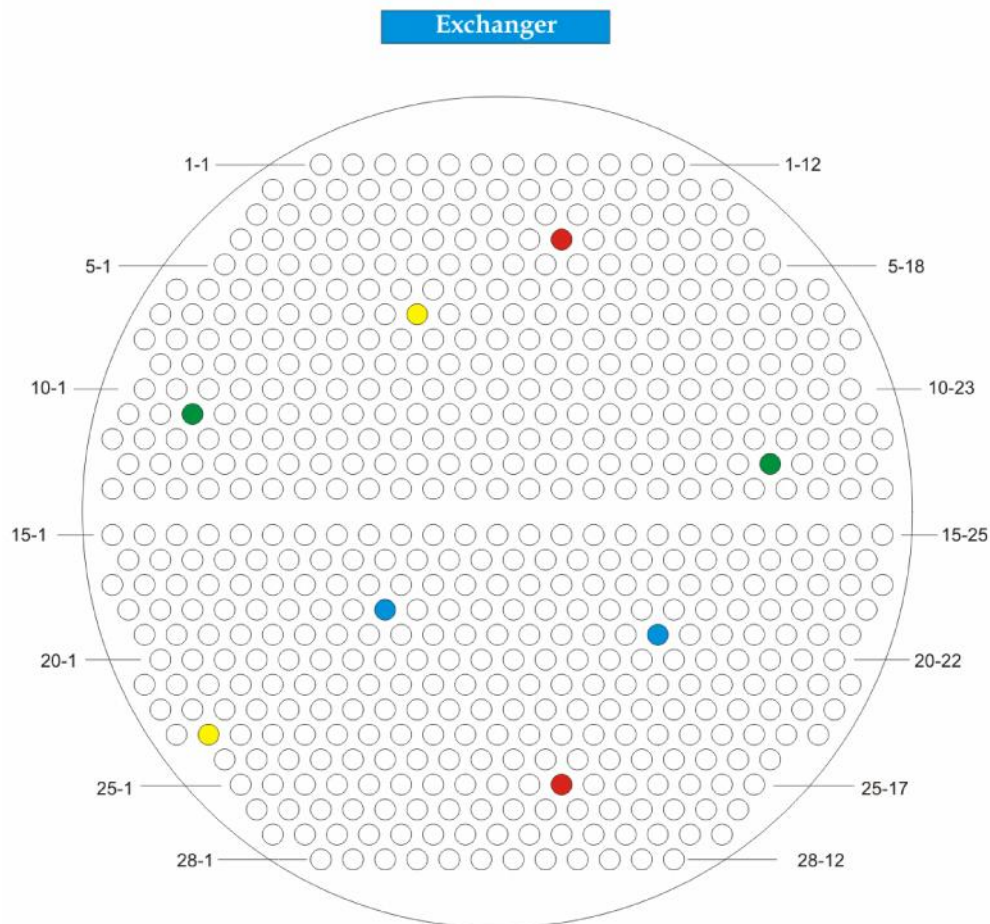


## SOFTWARE:

The TX-4400 system also contains all software for data acquisition. The data software consists of two separate modules. The data acquisition module collects the tube data at a given sample rate. The menu driven, user-oriented program provides for real-time display of phase, amplitude, and probe position in the tube. The data acquisition module also handles the row number, tube number, probe speed, and other bookkeeping details.

The data analysis and display module contains the calibration curves for wall thinning, volumetric losses, pits, vibration/fret wear, and correlates the calibration standard information with the actual plant data for flaw sizing and evaluation. It has routines for digital filtering, averaging techniques, background evaluation, curve fitting, and other useful signal processing techniques.

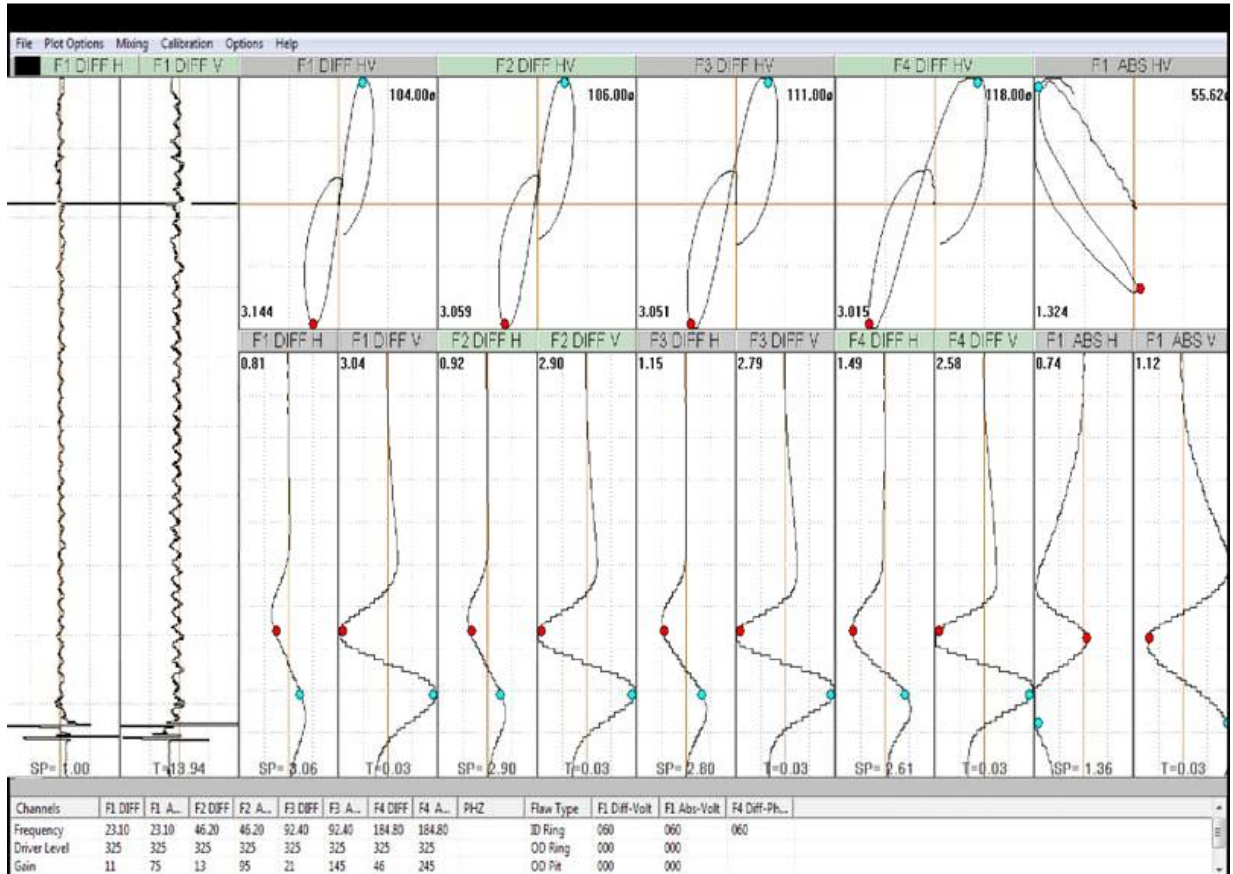
### Color Coded Exchanger layout (Inspected in 2014)



**Denotes:**

- |                       |                        |                    |
|-----------------------|------------------------|--------------------|
| ○ 0 to 20% Wall Loss  | ● 31 to 40 % Wall Loss | ● > 50 % Wall Loss |
| ● 21 to 30% Wall Loss | ● 41 to 50 % Wall Loss |                    |

## Sample Waveform of Defective Tube



### Discussions:

Tubes were offered for routine inspection during shutdown period as no inspection technique was used to know the condition of the tubes in the past. Exchanger was having leakage history because of which few of the tubes were already replaced in the past. Client was interested in knowing the pitting/corrosion of the tubes to avoid any failures during running operations. Magwave was the chosen technique as it can give information on general health of the tubes.

### Conclusions:

On Inspection it was observed that many tubes in the Exchanger were undergoing corrosion activity as shown in the diagram above and need further plugging. Client pulled out one tube and verified the results by split opening the tubes. When the results matched further plugging decision was taken.

By deploying above Advance NDT Technique, Plant Operators can identify the tubes which are undergoing any type of wall reduction due to corrosion / erosion etc. At this point of time client can also decide if he needs to go for further investigation (selective or complete) using any other NDT technique and prepare himself for the same.