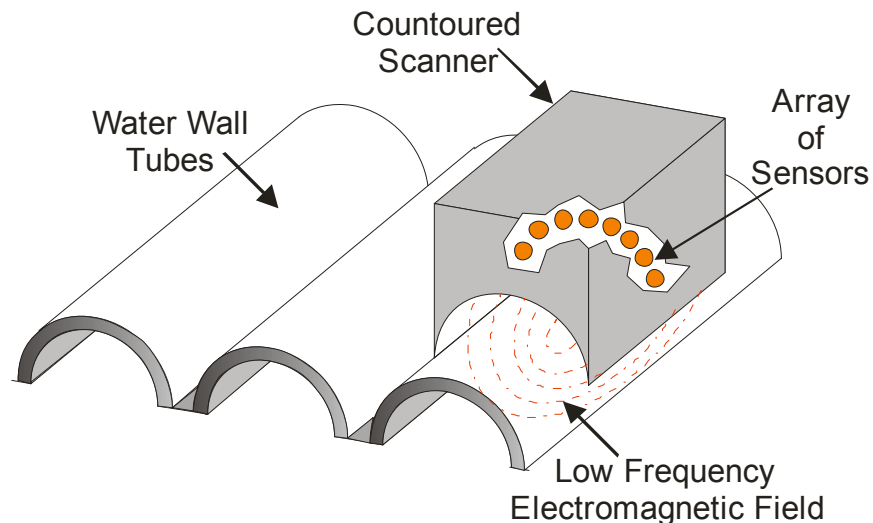


## LOW FREQUENCY ELECTROMAGNETIC TECHNIQUE BASED TS 2000 SYSTEM FOR INSPECTION OF BOILER WATER WALL TUBES

Over the years ultrasonic thickness measurement and visual inspection were the techniques used for condition monitoring of Boiler Water Wall Tubes, which never gave the complete picture of the corrosion pattern taking place causing Boiler tube leakages during operation.

Thorough scanning of each and every tube is now possible using TS 2000 system, which consists of contoured manual scanner along with custom made software for online detection of the flaws. 100% scanning of Water Wall Tubes can be done to detect flaws from both ID and OD side.

The scanning is based on **Low Frequency Electromagnetic Technique**. A low frequency electromagnetic field is injected into the tube material using an external horseshoe shaped electromagnet. A flaw distorts the magnetic flux lines, which is sensed by sensors. The extent of defect is measured by observing the change in phase and/or amplitude. The flaws detected by LFET during the scanning can be further verified using ultrasonic testing.



**Figure 1**

Low frequency (<30 Hz) is used on carbon steel tubes because of high magnetic permeability and conductivity of carbon steel, which greatly resist the penetration of higher frequencies in the metal. With low frequencies the penetration is more uniform throughout the wall thickness and defects on both the top and bottom sides of the plate can be seen.

**TS 2000 System:**

A multichannel (8 channels) innovative O.D. scanning system for testing of tubes to detect and quantify I.D. / O.D. defects in ferrous and nonferrous materials. Different sizes of scanners contoured to test tubes are used in conjunction with

- a. Electronic box
- b. Laptop computer loaded with softwares



TS-2000 Electronic Box

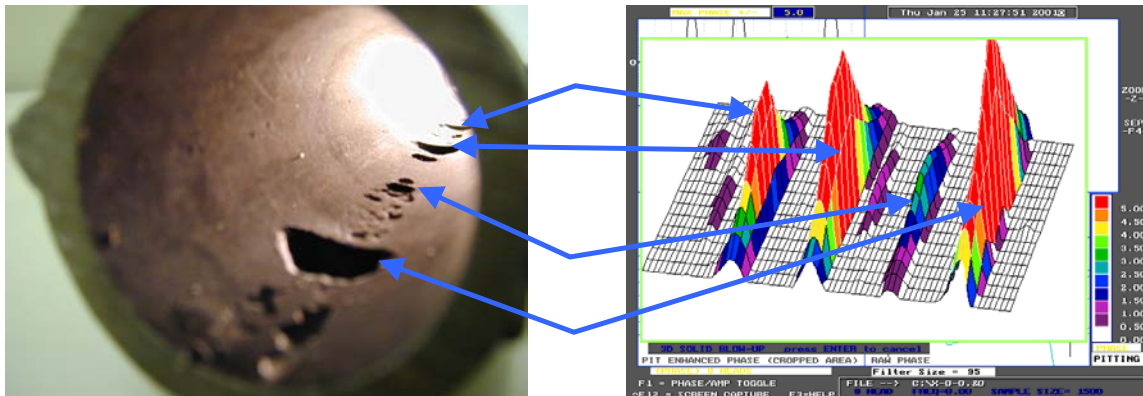


Contoured Hand Scanners

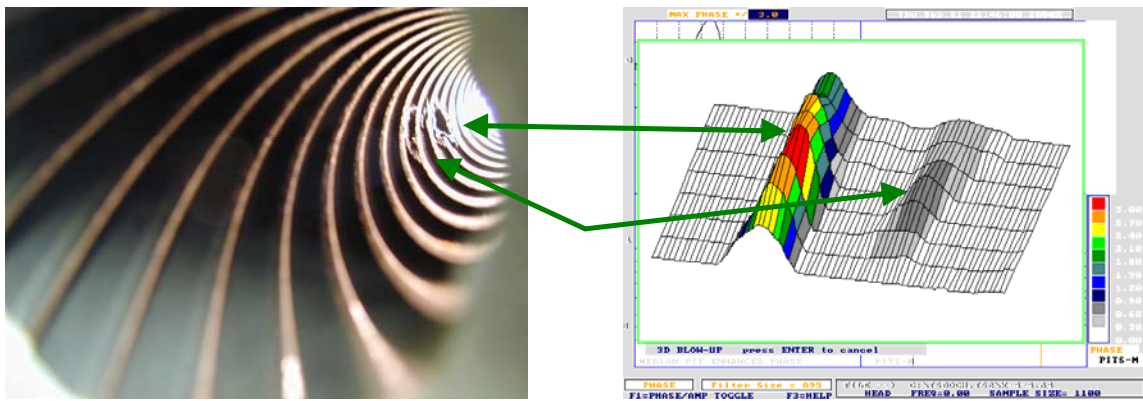


*OD Scanning of Water Wall Tubes at various sections of the Boiler*

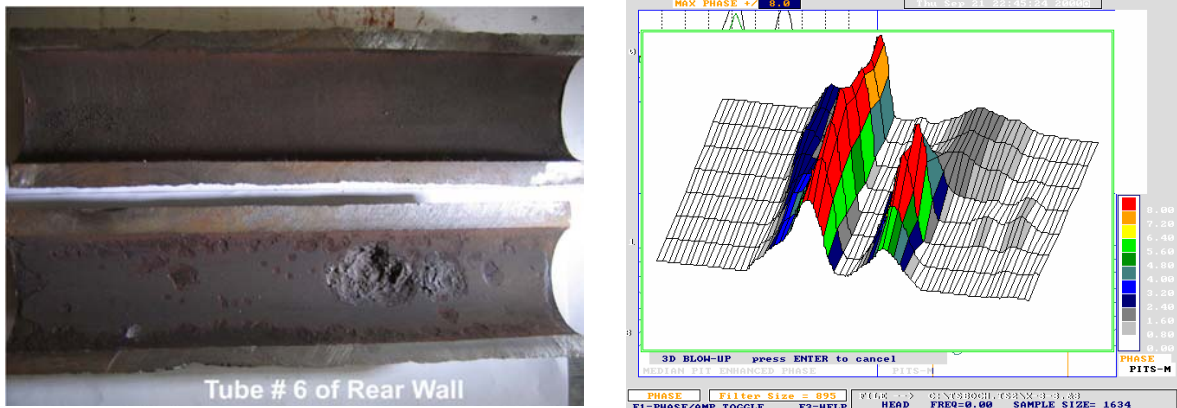
**Typical Defects:**



**Caustic Gouging**



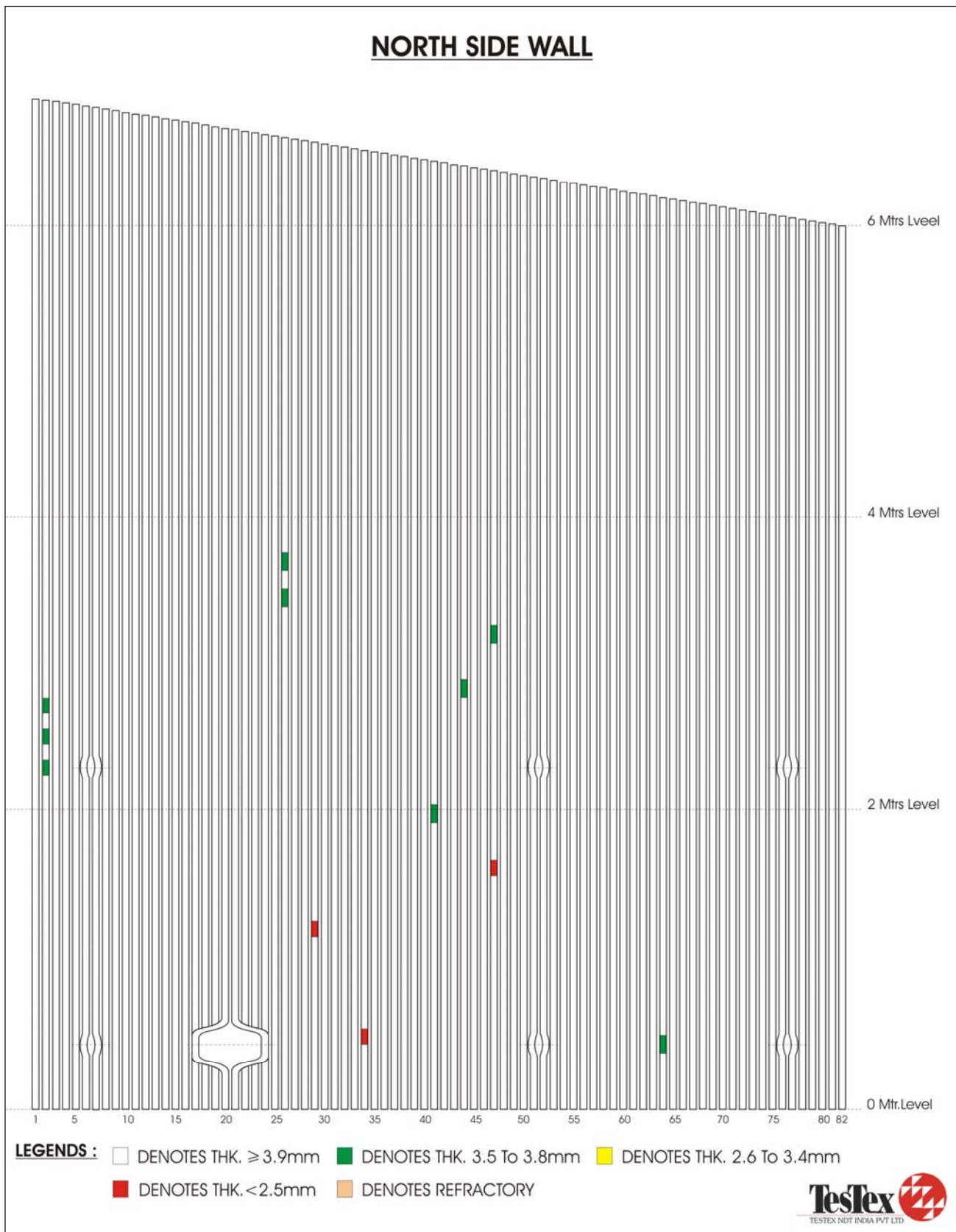
**Localized Pitting in Rifled Tubes**



**Hydrogen Damage**

## Reporting

Below are few drawings representing Inspection Summary of Boiler Water Wall Tube



Individual Tube Drawing indicating Location of the defect for repair work

