NDE2002 predict. assure. improve.
National Seminar of ISNT
Chennai, 5. – 7. 12. 2002
www.nde2002.org

DEVELOPMENT OF ULTRASONIC TESTING OF FABRICATED SUPPORT TRUNNION WELD FOR AIR PRE-HEATER

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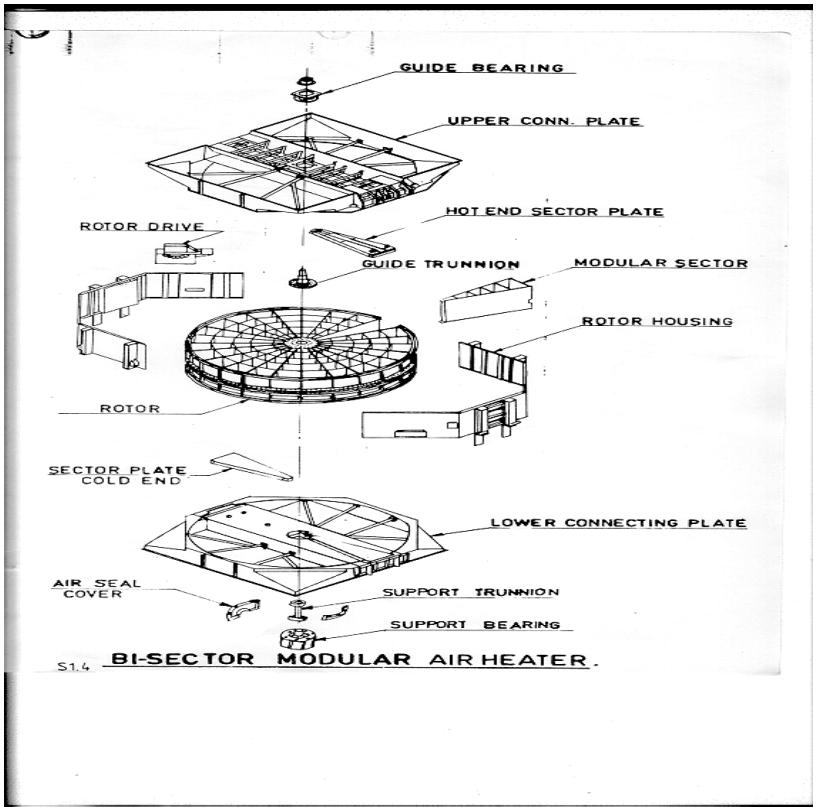
ABSTRACT

" Air Pre Heater is a heat recovery equipment used in Thermal power plants. It has a Rotor filled with heating elements having a weight of 250 Tons. The whole weight of the rotor is supported by the support trunnion. Previously the support trunnion was a heavy forging, involving huge foreign exchange and long lead time. To overcome these, fabrication of the part had been resorted to. Since the component carries a huge load the weldments are very critical and required stringent evaluation.
In the absence of international code/specification to meet this specific application requirements separate NDE procedures are required to be established to ensure specified examination sensitivity. This paper describe the application of ultrasonic testing method to establish soundness of the weld."

Introduction

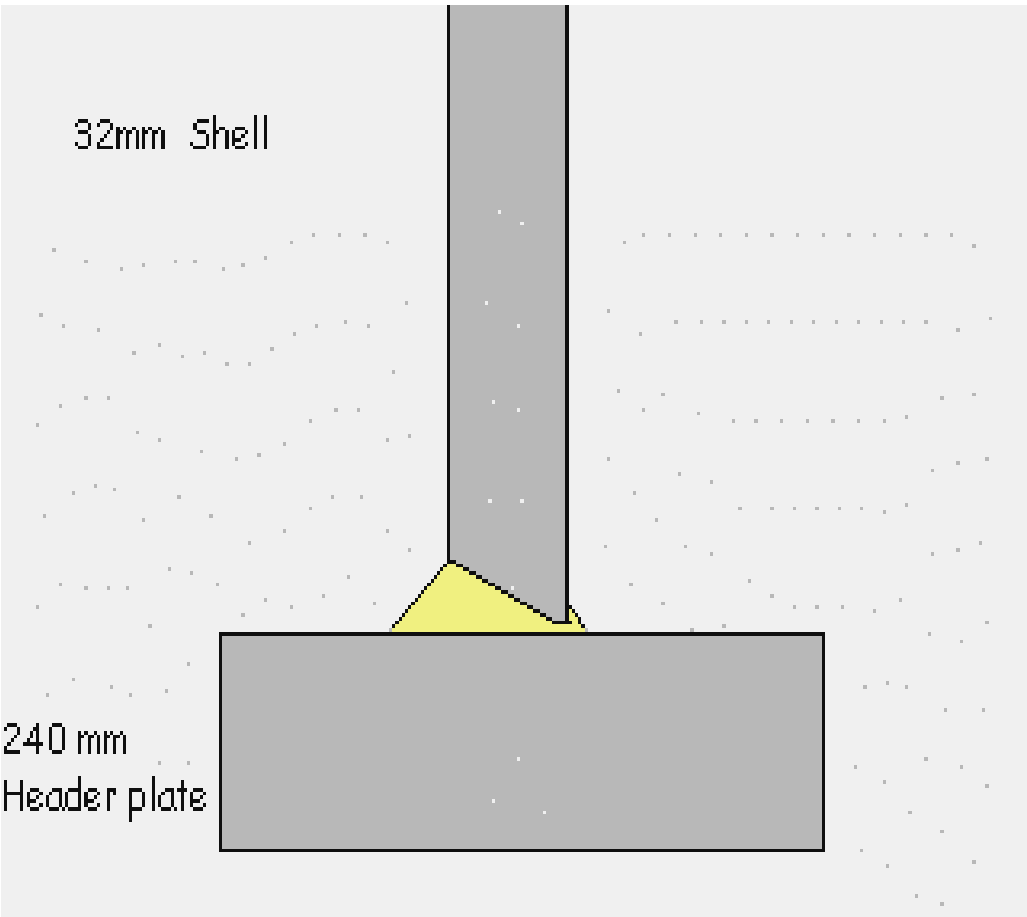
An Air pre-heater is a heat exchanger used to heat air which is used for burning fuel and drying coal and to improve the efficiency of Thermal power plants by recovering heat from flue gases.



The support trunnion carries the load of Air pre-heater rotor modules filled with heating elements weighing nearly 250 Tonnes.

Since the support trunnion is fabricated with a shell made of 32mm plate and welded to a header plate of 240mm thick and the weld between these two is very critical one, it is absolutely necessary to ensure the quality of the weld.

The weld configuration is shown in the sketch



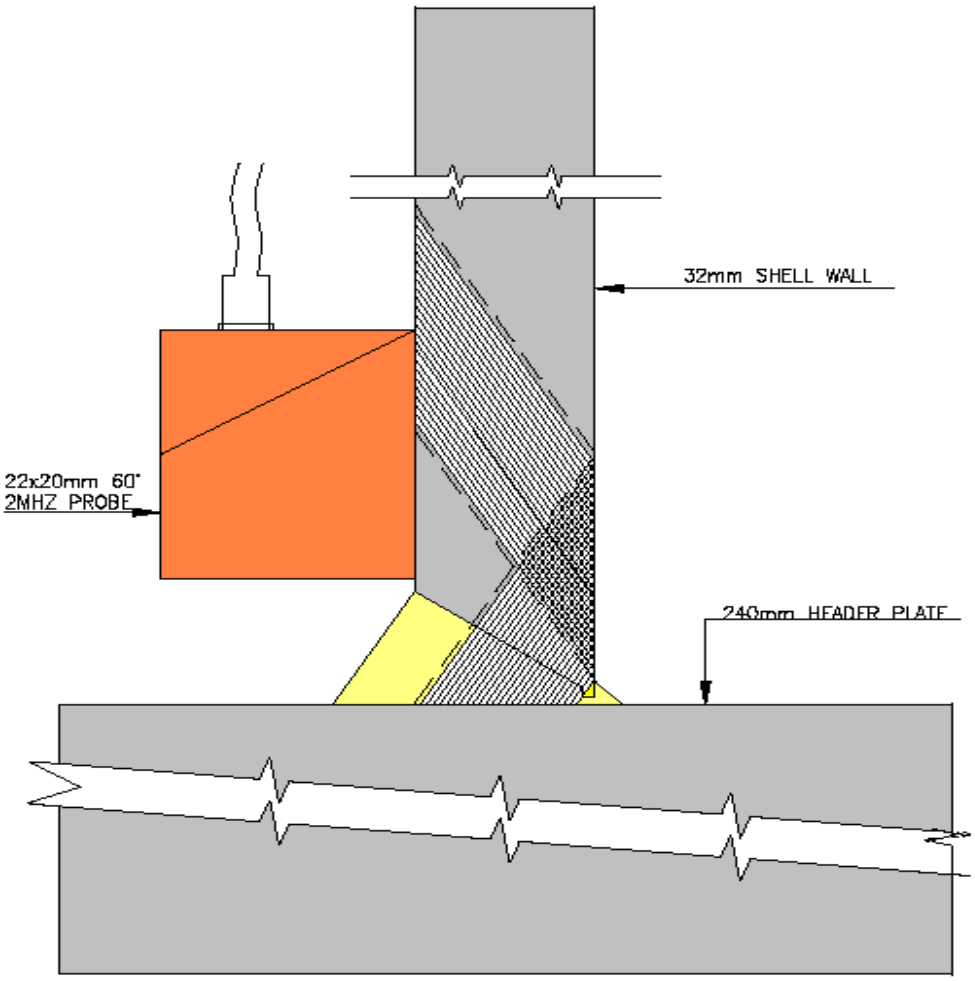
Theoretical consideration of Ultrasonic testing procedure of the weld.

The fusion of the weld with 32mm shell plate can be assured by scanning with 60^0 angle probe on both inside and out side of the shell and fusion with header side can be assured by scanning with 2MHZ normal probe. As the scanning area is very large using a bigger size probe of 20x22mm will reduce the scanning time and operator fatigue. Calibration of the equipment for angle probe scanning will be based on DAC curve drawn with standard cylindrical reflector and for normal probe with standard flat bottom hole reflector.

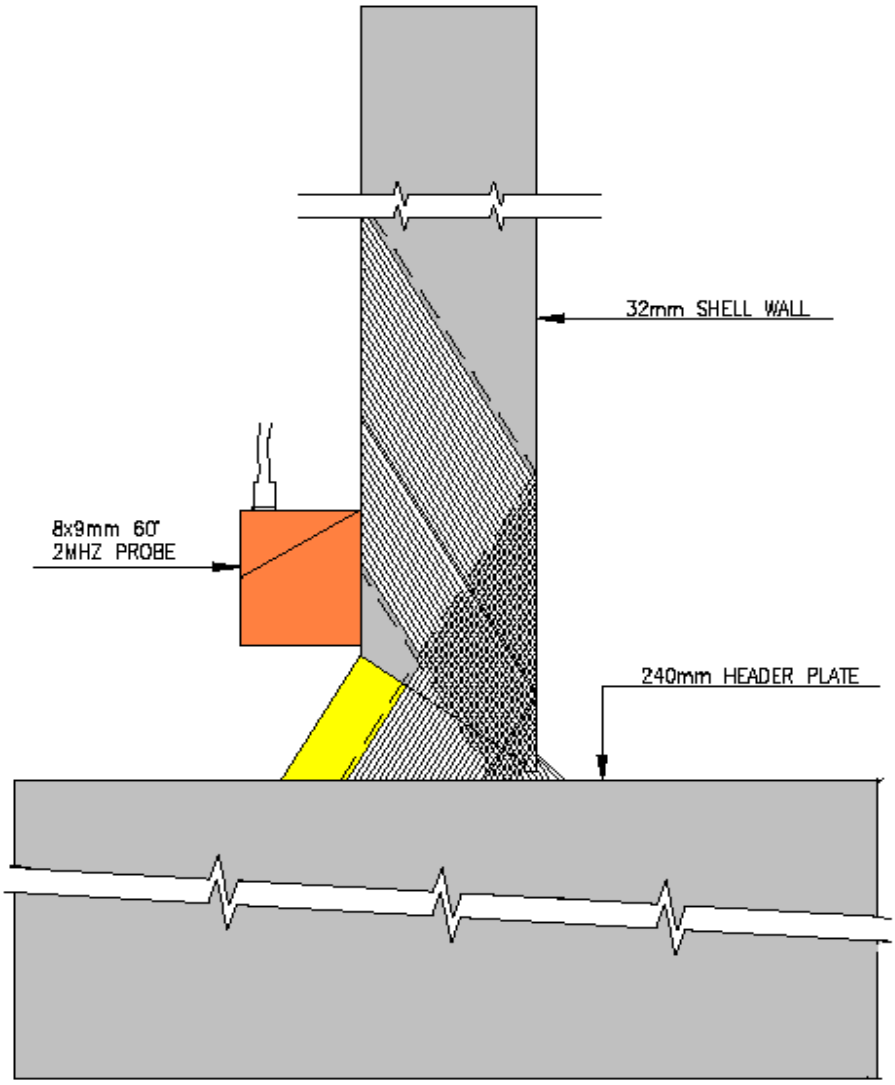
Actual testing of the weld.

(a) Since larger area has to be covered and to save time, 2MHZ 60^0 angle probe of size 22X20mm was selected for scanning from shell side. It was found that this size probe fails to scan the root fusion zone of the weld. Where as a 2MHZ 60^0 angle probe of size 8X9 mm has solved this problem.

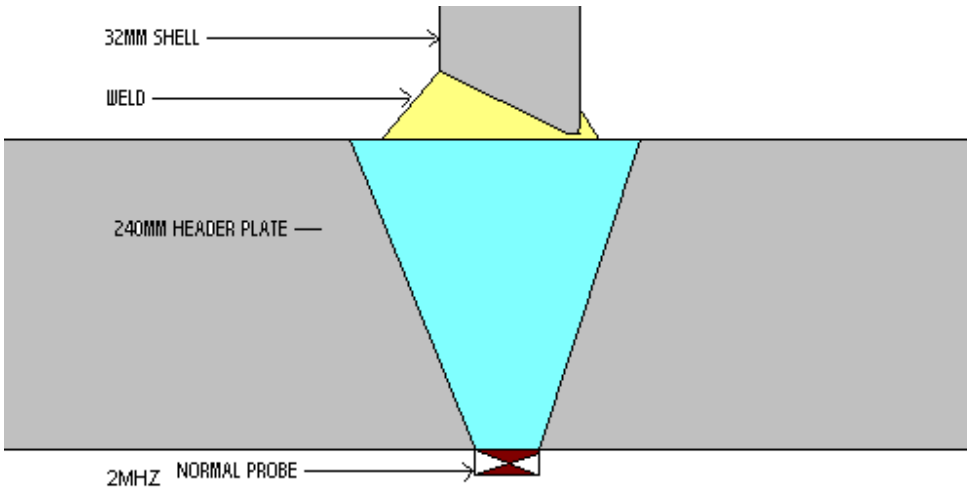
SCANNING WITH 22x20mm CRYSTAL SIZE 60° 2MHZ PROBE

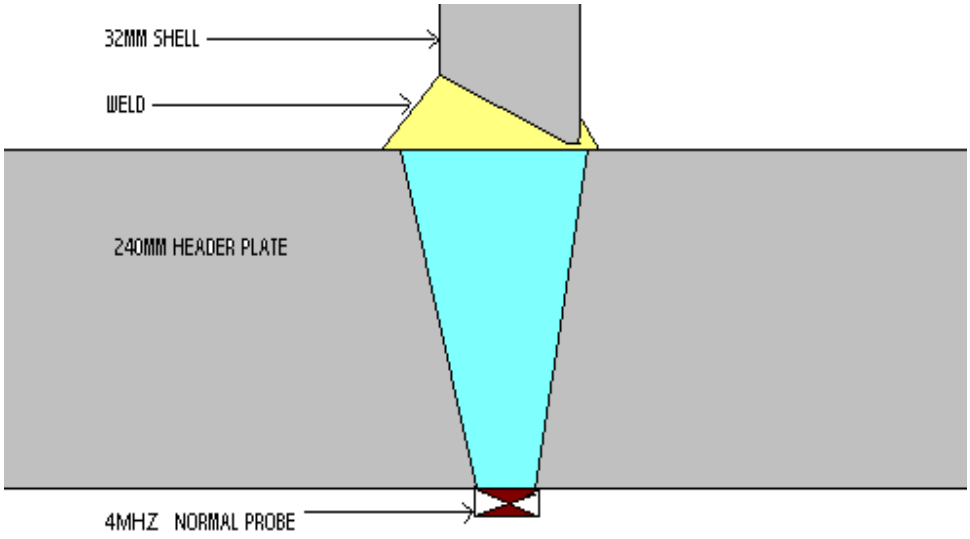


SCANNING WITH 8x9mm CRYSTAL SIZE 60° 2MHZ PROBE



(b) While testing with 24Ø Normal probe of 2MHZ a continuous indication at a depth equivalent to the thickness of the header was observed. While analyzing the reason for the continuous indication it is established that the indication is from backwall of header plate which is due to large beam divergence. Hence it is not possible to differentiate fussion type defect and backwall of header plate.This problem was solved by replacing 2MHZ probe with Normal probe of 4MHZ.





(c) Initially for angle beam scanning, both sides of the shell near the welding was scanned. After testing 15Nos, it was found that scanning from inside has not shown any new defects other than the defects seen from outside scanning of the shell. Hence it was decided that outside scanning is sufficient. Only in case of doubt , that particular area alone can be scanned from inside the shell, for confirmation. This results in reduction of cycle time and operator's fatigue.

(d) A Mock-up piece of the weld was made with known defect size of 3.2mm dia side drill holes, one at the root area and another one at 3/4th of the weld thickness. A perfect calibration and sensitivity is ensured by this calibration block.

Conclusion

After analyzing all the above points a detailed NDT procedure was prepared for reference to NDT personnel. With this procedure day today testing of support trunnion weld can be carried out by any qualified person without any difficulty.

Acknowledgement

The authors are thankful to the management of M/S BHEL, Ranipet for providing all the necessary facilities for carrying out this work and for granting permission to present this paper.

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