

Modified Binders (developed In-house) for Boiler Pressure Parts Hot Reheater & Cold Reheater Coils to prevent failure and misalignment during operation

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Abstract— In Boiler, tube failures in Reheater section is very common, one of the best practices done in Maithon Power Limited for Failure of the boiler water-wall tube is presented in this work. In order to examine the causes of failure, various techniques were used and one of the reason for tube failures in Reheater section were happening due to overheating and attachment weld failures of Male-Female type connector binders. To eliminate this failure, we have developed Binders that does not necessitates welding between boiler tubes and Binder components. We have also provided additional binder especially in lower section of HRH and CRH coil to eliminate over heating due to misalignment of coil tubes. Misalignment of tubes causes Tube overheating and leads to Tube failures.

Index Terms— Boiler, Reheater, Tube failure, Binders, CRH, HRH

1 INTRODUCTION

Maithon Power Limited includes 2 Units of 525 MW

each with total capacity of 1050MW. MPL have 525 MW subcritical boiler technology in India, which is environment friendly, efficiently and first Green field project of private pub.

For Uninterrupted power supply continued functioning of its equipment and components is a big challenge for power plant. In Coal-based power plants, proper functioning of boiler tubes, super heater, heat exchanger, turbine, etc., is important for maintaining the power supply. Even a single component failure can lead to the shutdown of the entire power generation system. Failure of boiler tubes is one of the main reasons for the shutdown of power plant.

2 CONTEXT:

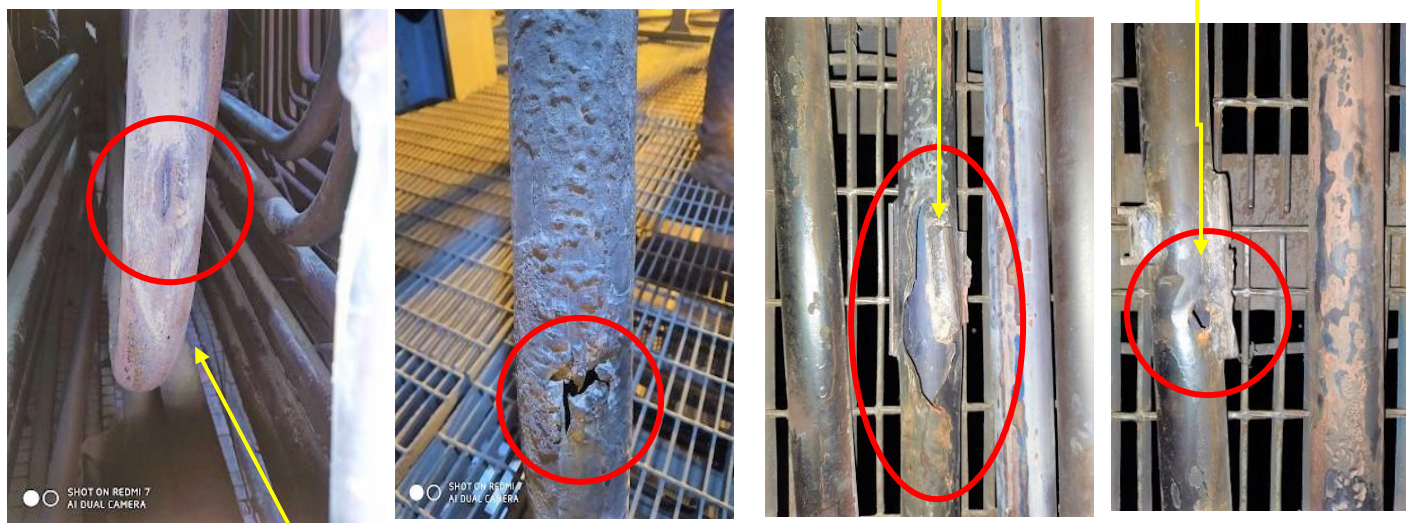
In MPL, 525 MW Boiler, tube failures in Reheater section were happening mainly due to two reasons:

- Attachment weld failures of Male-Female type connector binders,
- Overheating

The Attachment weld failures was happening due to lateral expansion of reheater coils, but the original binder only compensates the vertical expansion resulting stress developed at weld joint which causes failure of tube at the point of weld.

The Overheating was happening due the misalignment of coil tubes. The original binder was not designed to realign the misaligned tubes. This causes overheating of tube resulting failure of tubes and forced unit outage. MPL had

faced many force outages of boiler due to the above both reasons, which causes considerable financial loss and reduced customer satisfaction.



Reheater failed tubes due to overheating

Reheater failed tubes due to stress at weld

3. DEVELOPMENT AND EVOLUTION OF THE IDEA:

To eliminate the reheat failure root cause analysis and brainstorming sessions were done. After brainstorming it was decided to redesign both CRH and HRH coil binders. Many inhouse design were developed and feasibility study were done for fabrication as well as installation at site. Trial designs were tested on old RH Coils to check the feasibility of erection and the desired outcome. The best suitable design was selected. After fabrication of the modified binders, installation had been done in HRH & CRH coils during annual overhauling.

4 TECHNOLOGY:

Due to narrow gap in reheat coil tube OEM has provided Male-Female type connector which has been welded on the tubes. It is designed to compensate only vertical movement and restrict the lateral movement. But to high ash/soot deposition on tubes the vertical movement got restricted and hence reheat tubes get stressed at weld point of connector.

Sometime due to high heat excessive vertical movement than the designed movement resulting dislodged of male-female connector and reheat coil loop tubes became misaligned from coil.

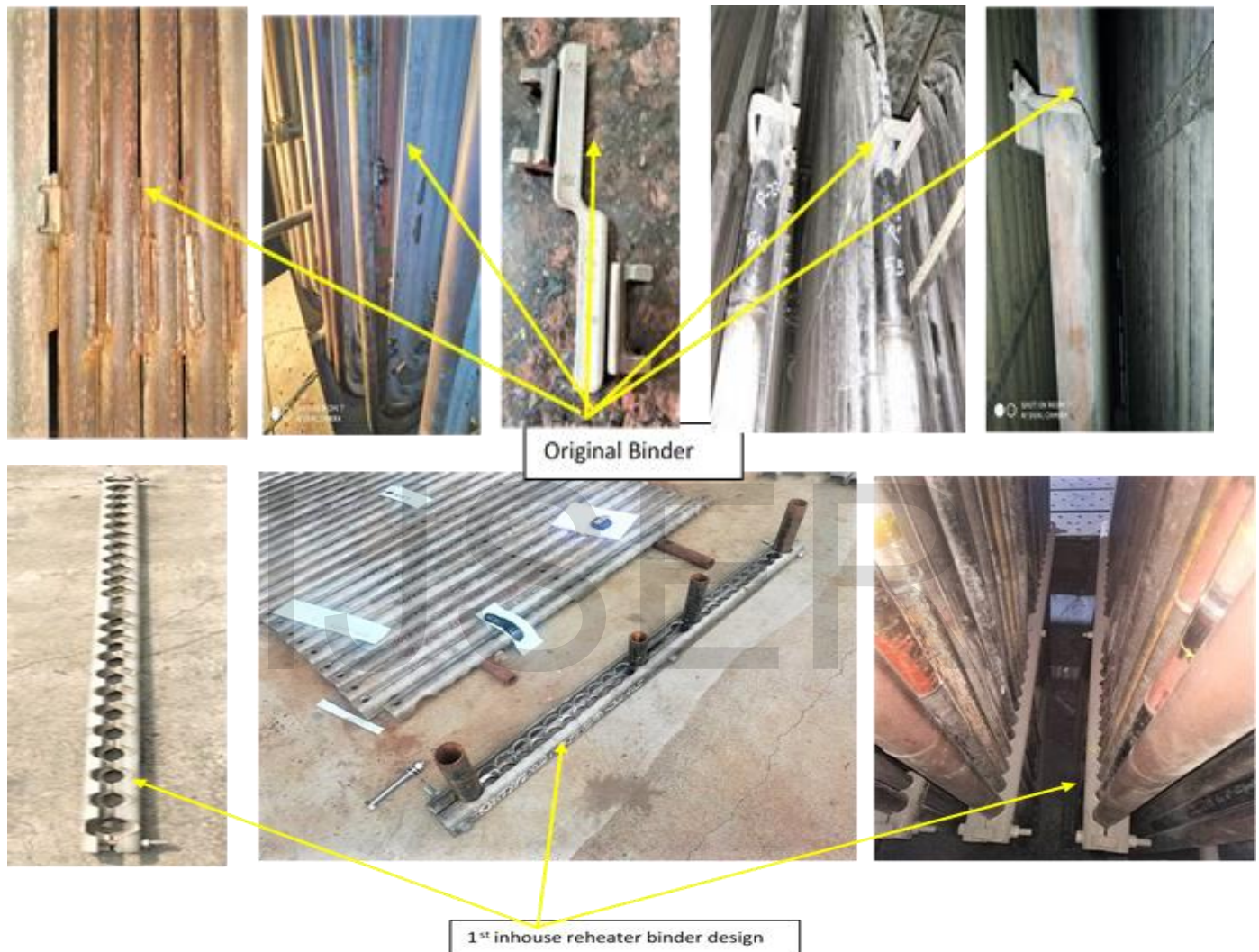
The following technology are used to design the reheat binders to eliminate the old coil binder problem.

- Binders allow unrestricted vertical movement of reheat tubes in either direction without allowing any lateral movement.

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6 MITIGATION

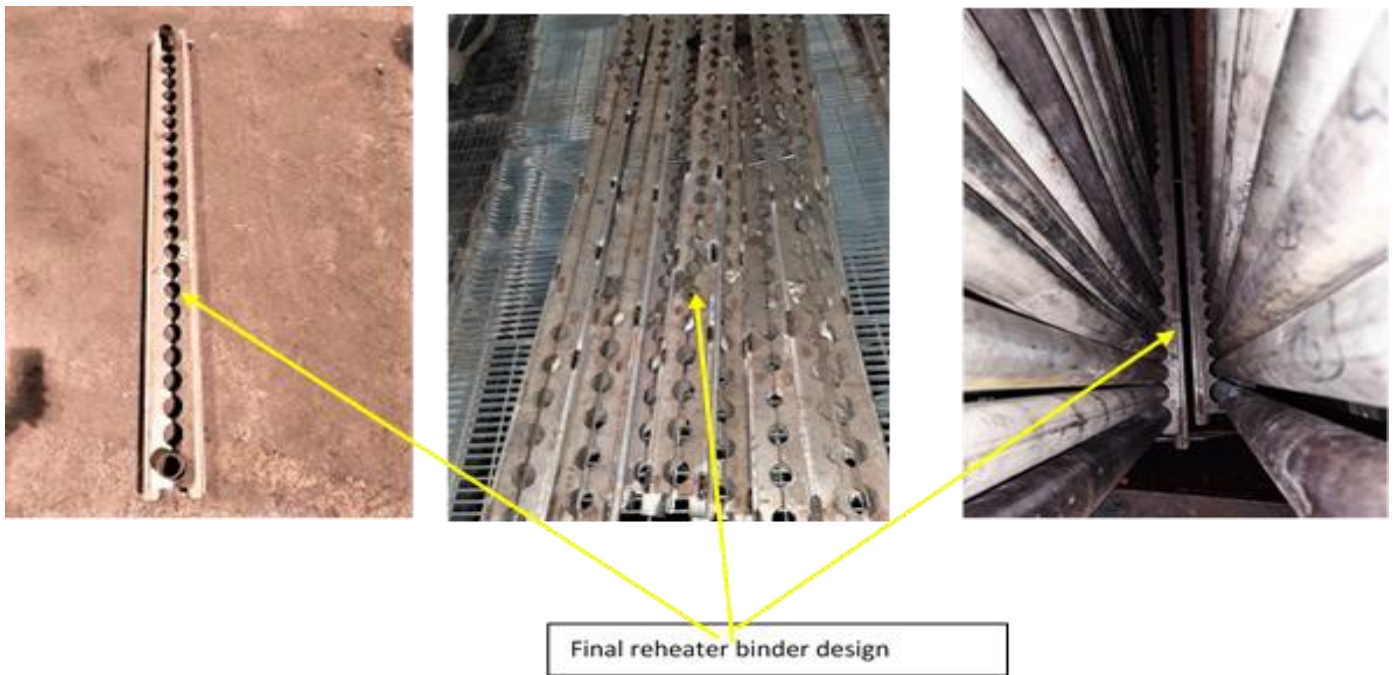
- New developed binders have provision of unrestricted vertical movement of tube in either direction and hence tubes in align condition during all operational situation.
- New developed binders are designed in such a way that it is not welded at any point of the tubes for their installation resulting no stress developed on tubes during all operational condition.



7 Cost:

Initial binder (Old binder) material and installation cost for one set was Rs. 1,10,000. New developed binder material and installation cost for one set is Rs. 55,000. Hence 50% material and installation cost has been reduced by development of new binders.

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8 USAGE OF QUALITY TOOLS AND ANALYTICS:

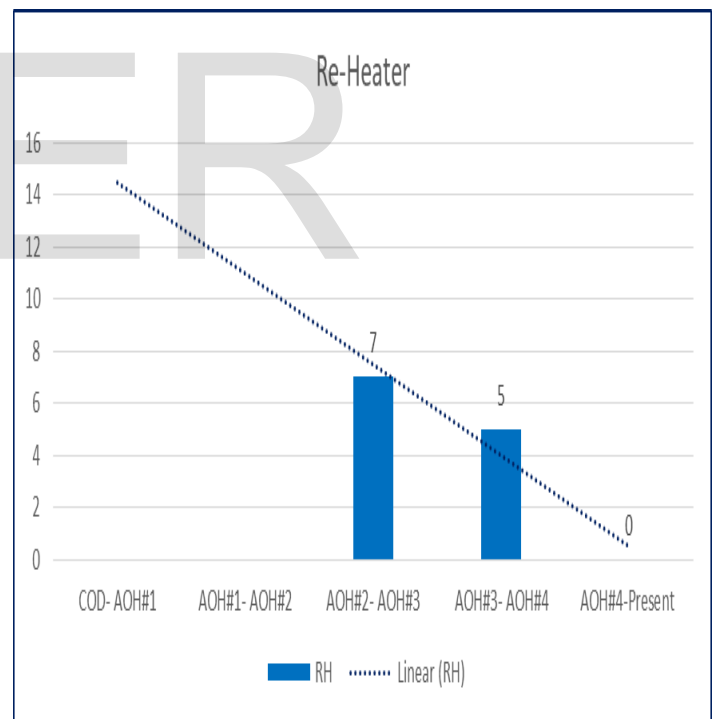
Quality tools used for developing the solution was brainstorming and method of elimination.

9 CRITICAL SUCCESS FACTOR

- Initial binders' performance had been observed during unit outage/ annual overhauling.
- Regular brainstorming session were conducted to evaluate design of binders which will overcome the conventional binder problem.
- New binder performance evaluation after implementation.
- After implementation of binders, boiler tube leakage in reheater area has been reduced to zero from five.

10. HOW LONG THIS PRACTICE HAS BEEN INPLACE, WITH MULTIPLE ROUNDS OF IMPROVEMENT OVER THE YEARS

Binder development has been taken two years with one round of improvement.



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