MODULAR REPLACEMENT OF ECONOMISER BANK IN 500 MW BOILER, SSTPS, NTPC 2012-13

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In a coal fired Thermal Power Plant, major cause of forced outage is Boiler Tube failure. In this category failure due to Fly Ash erosion in 2nd Pass (Economizer) is substantial. Hence the need to focus on how to avoid BTL in Economizer. Modular replacement of Economizer after certain years, depending on plants experience, is a feasible solution to reduce overall BTL and increase availability.
It has been our experience that rate of erosion due to Fly Ash in Boiler 2nd pass is much higher in 500MW Boiler as compared to 200MW boiler, due to higher flue gas velocity at Eco inlet. In CAVT it was found to be in the range of 21-22mtr/sec. The PLF of STAGE-1 (**5X200 MW**) is higher than STAGE-2 (2X500 MW)**
To avoid failure in economizer, thorough inspection is needed which is not possible to be done in situ. As the gap between 2 eco coils is very less and creation of additional gap for inspection is not feasible. Coils needs to be lowered for inspection which involves cutting of all hangers of lowering pair of coil and connection tubes with inlet header. Thus in an overhaul of 30th days, we are able to do inspection of approx 20 hangers and rest of the tubes of coils are not able to be inspected leading to unreliability in the system.
In SSTPS, it was found that Maximum loss due to BTL is in the area of Economizer in stage 2 units and to take care of erosion in coils, it was decided to replace complete Economizer bank.
Pre shutdown work : 10 DAYS BEFORE UNIT SD

1. New coil inspection for any physical defect.
   • Although coils were new but 53 hangers were found having defects like bowing, cut mark due to rubbing during transportation, unloading & loading.
   • Rectification of coils involves the process like straightening of coils with the help of hydraulic jacks, cutting & welding of tubes.
2. Sponge ball testing of coil to check thruness of the coil circuit.

3. Shifting of coil from stack yard to boiler ZERO meters using 02 nos. Hydra & 01 no. trailer

4. Insulation removal of boiler rear side from 43 meter to 52 meter. The work started in U#6 after unit S/D, almost 3 days have been taken in this activity, after that buckstay removal and other activity got started. So in U#7 this activity was started 5 days before of unit S/D, saving the time 3 days.

5. Shifting of coil from stack yard to boiler ZERO meters using 02 nos. Hydra & 01 no. trailer
6. Erection of another manual trolley. (in design only one was available).

7. Trail & commissioning of both eco coil handling electric hoist.

8. Both above activity took 04 days before unit S/D.
Shut Down Work:

1. BUCKSTAY REMOVAL (completed 3rd day after S/D)
   - Cutting of locks of attachments of buck stay between 43 meter to 52 meter.
   - Removal of two buck stay along with vertical supports of buck stay.
   - Fouling bracings were removed at 43 metre.
2. Sealing of economizer hopper.

3. Internal washing of boiler.

(completed on 3rd day after S/D)
4. **Preparation for removing coils.** (started on 3rd day & finished on 5th day)

- Cutting of rear SCW tubes for making opening from 43 meter to 52 meter. 02 nos. opening were made in the centre of the wall for removal and insertion of coils.

- Travelling beam erection inside of boiler at 48 meter for movement of coil from right to left and from front to rear.

- Cutting of hanger tubes and Economizer connection.
5. Removal of coils from the boiler (activity started on 4th day & completed on 10th day.

- Removal of old coils from boiler with the help of manual trolley.
- Then shifting to zero meters with the help of electric hoist and winch machine.
- 5 T Winch machine were installed both left & right side of boiler.
- Removal of coils were carried out from both ends left & right through both opening.
6. **Inspection and Repair of SCW** (activity started on 9th day & completed on 13th day.

- Erection of scaffolding from 43 meter to 48 meter all around the wall using cuplock scaffolding in three tier for inspection of SCW.
- Inspection of SCW were completed.
- Tubes were replaced based on thickness survey of tubes.
- Other local repair of tubes like weld overlaying & protecting shields were provided.
7. Preparation for new coil insertion. (activity started on 9th day).

- Edge preparation of stubs in inlet & outlet headers. (9th day to 13th day)
- Removal of scaffolding. (on 13th day)
- **Shifting of coil from zero meter to 43 meter.** (11th day)
- Cassette baffle fitting in the coil.
- Again inspection & sponge ball testing of coils.
8. **New coil inserting.** (started on 13\textsuperscript{th} day completed on 24\textsuperscript{th} day)

- Coils were inserted from both ends using the both opening in SCW & both manual trolley.
- Firstly top coil was inserted & its hangers were welded with top header stub taking care of horizontal & vertical alignment of coil with the help of sprit level and plum, then bottom coil was inserted and welded to top coil.
8. **New coil inserting contd.**
- In the above manner all the coils were inserted except 05 coils in the middle.
- Removal of travelling beam from inside the boiler.
- Inserting of remaining 05 nos. of coils.
9. Welding of hanger tube & connection joint completed on 33rd day.

- All the hangers were welded taking care of horizontal & vertical alignment.
- Connection joint of coil with bottom header were carried out taking care of vertical alignment of coils.
- All the joints were carried out.
- 100% radiography of welded joints have been done.
- Hydraulic test of boiler. Carried out on 36th day
- Restoration of buckstay & insulation completed on 38th day.
- Unit synchronized on 40th day.
Safety aspect

This was a massive job and large number of workers were on job round the clock. Ensuring safety of all workers and our people was very important and the job could be completed without any accident or injury to any person. This was made possible by ensuring use of PPEs, deployment of a safety Officer on round the clock basis and with active involvement of NTPC Safety Team, which every day took round of the area and pointed any lapse or negligence. Special care and coordination was also required as work in LTSH area just above Economiser was also going on simultaneously during Overhaul.
Problems faced in motorized lifting hoist after few days which were attended by the technician of the hoist manufacturer. Technician was called in advance. Few planetary gears of the forward backward movement were found broken and were replaced from trolley in other unit. It will be a good idea to keep at least 1 gear box available as spare assembly. Without availability of these hoists shifting of coil from ground to platform and to boiler will come to a complete halt.
<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Material cost</td>
<td>21 crore</td>
</tr>
<tr>
<td>Service cost</td>
<td>7 crore</td>
</tr>
<tr>
<td>Total cost</td>
<td>28 crore</td>
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CONCLUSION

In place of piece meal replacement of tubes in economizer involving large number of joints, it is preferable to go for modular replacement of complete Economizer Bank on need basis every 12-15 years. This will not only enhance the reliability of boiler but will also allow other areas to be inspected in more focused way during an Overhaul. In a normal overhaul, approx. two third weld joints are required in Economiser only and maximum resources are deployed there. With proper planning, the job can be completed during 35-40 days which is the period for Capital Overhaul and no additional time shall be required.
THANK YOU