Date – 21.04.2022

WI/MAINT/29,

**SOP for replacement of Economizer coil, Superheater coil and water wall panel**

# Work instruction for Economizer replacement.

Objective Boiler economizer pressure parts replacement work

Responsibility Engineer in charge and workmen at job

PPEs to be used Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Fumes, CO gas leakage air pollution

Noise generation noise pollution

Steel Scrap Resource Depletion

Water Spillage Land contamination

Hazards Identified

Mechanical Hazard Slip, fall and trap

Physical hazard Temperature

Health hazard CO/Oxygen gas

Human behavior Poor housekeeping, Non use of PPEs, Alcoholism, Height phobia

SAFETY PRECAUTION

1. For carrying out work inside boiler
2. Ensure all sources of energy are isolated
   1. BF gas: Individual boiler U-seal to be filled and LOTO to the drain line shall be ensured. Boiler Flow control valve and shutoff valve to be closed and LOTO shall be applied.
   2. COFG: COFG damper to be closed and locked with welding
   3. Steam Line: MSSV and Bypass Valve to be closed and LOTO to be provided
   4. Feed Water: Boiler feed water inlet valve near common platform and Eco inlet to be closed and LOTO to be provided
3. In case any scaffolding required, scaffolding shall be certified by competent person
4. 24-volt DC supply should be used for providing illumination when working inside boiler
5. Cotton/Leather hand gloves, nose mask, white/black goggles should be used

Proper checking of Welding machine, gas cutting set, grinding, cut off, flexible grinding machine, etc.,

1. While one person is working inside, one person should always be there outside continuously to communicate and monitor to inside person.
2. Breathing apparatus should be kept at the location.
3. Special care should be taken regarding CO poisoning. CO gas should be pre checked using Multigas detector before the person entering and starting his work and check the oxygen level at working zone excess or deficient to be checked at regular interval. Boiler Individual U-seal to be overflown every 3-4 hours to ensure proper water sealing
4. Presence of any flammable gases to be checked.
5. Before starting of gas cutting or welding work bottom areas must be free from fire catching media or covered or clean area.
6. For carrying out work outside boiler
   1. Ensure all sources of energy are isolated
   2. BF gas: Individual boiler U-seal to be filled and LOTO to the drain line shall be ensured. Boiler Flow control valve and shutoff valve to be closed and LOTO shall be applied.
   3. COFG: COFG damper to be closed and locked with welding
   4. Steam Line: MSSV and Bypass Valve to be closed and LOTO to be provided
   5. Feed Water: Boiler feed water inlet valve near common platform and Eco inlet to be closed and LOTO to be provided
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PRECHECKS

Before Starting work in Boiler ensure –

* Main ID fan must be in shutdown with LOTO.
* MSSV valve, GD Valve, U-seal must be filled overflow and control valve shutdown with LOTO. Double isolation to be ensured in system.
* Boiler inside temperature should be 25 to 45 degree Celsius.
* CO Level should be 0 ppm
* Attendant must ensure proper illumination, if illumination not found ok, he must inform concern electrical person to provide additional hand lamp for inside.
* The workmen (Entrant) who is trained and certified by SBU head and having valid confined space gate pass should perform the activity and he can be replaced(in emergency) only by certified entrant .
* A standby (attendant) who is trained and certified by SBU head and having valid confined space gate pass should perform the activity and he can be replaced (in emergency) only by certified attendant .
* Standby person who shall be positioned outside the confined space , must have no other duties other than monitoring people and conditions inside the confined space and coordinating with rescue personnel (he must have contact number of rescue team members) if required.
* Standby (Attendant) person has to log down the In/Out entry of all entrants and ensure that entrant should be come out within 30 minutes from confined space for normal jobs.
* Check Internal atmosphere of the space for sufficient oxygen content (19.5% to 23.5 %) flammable gases and vapours, and the potential for toxic air contaminants by the use of multi gas detector, if required use pump with extension before entering into Boiler. If there is any deviation, do not enter into Boiler.
* Check for the presence of Chemical asphyxiates such as Carbon monoxide (CO gas detector).It should be 0 PPM
* Check inside temperature and it should be is in the tolerable range (25 deg C to 45 Deg C). If the temperature is not within limits then appropriate ventilation to be used to normalize the temp.
* Check for suitability of equipment that is used at the confined space.
* The sign-in and sign-out of all persons entering into Boiler should be recorded.
* Use 24V DC supply illumination to avoid electrocution/electric shock.
* Body Stretcher to be in place outside the confined space where work is carried out.

**Physical isolation/blanking to be provided to carry any activity inside the boiler or BFG gas line system by isolating complete BF gas sources from Pig iron Plant.**

**LTI - On 06/02/2022 at 12:00 PM 3 Anish Scaffolding workmen Mr. Manu Nag, Mr. Kunjay Naik, Mr. Lambodhar Naik, Mr. Sri ram (supervisor) who were engaged in scaffold erection as a part of boiler 1 tube replacement job became victim of gas leak. While, Mr. Manu Nag and Mr. Kunjay Naik resumed duty post observation at dispensary. Mr. Lambodhar Naik was referred to GMC Bambolim for further medical care where he was kept under observation for 24 Hrs and he joined duties next day**

**Procedure for Activities**

1. **Replacement of Economizer Coil**
   1. Eco bottom bank casing towards FRS station to be cut in parts and shift to the designated place
   2. Make arrangement using chain block of capacity 1 Ton for holding economizer individual coil
   3. Put individual economizer coil load on chain block and lock the chain block
   4. After ensuring load on chain block, that particular coil to be cut from header along with support frame.
   5. The coil dismantled to be slide out and to be placed at designated place using crane
   6. Total 20 nos. individual coils to be dismantled as above
   7. After removal of all coils, surface preparation to be carried.
   8. Each individual new coil to be shifted using crane and loaded on chain block.
   9. Slide the coil inside boiler and fitting to be done with header
   10. Welding of the new coil and support frame to be carried
   11. After replacement of all coils, casing plate to be welded back
2. **Replacement of waterwall panel, Hanger Coils, PSH and SSH**
3. **Dismantling of Water wall panel, hanger coils, PSH and SSH**
   1. Evaporator hopper refractory to be removed and side wall of hopper to be dismantled.
   2. Hooks to be welded at front water panels for lifting panel using chain block
   3. Water wall Panel to be loaded on chain block.
   4. Gas cutting from top of the panel to carried out first and then bottom to be cut
   5. After cutting the panel, same shall be lowered using chain block and to be shifted at designated place
   6. After dismantling of front panel, scaffholding to be provided as per requirement to remove hanger
   7. Hanger coil to be loaded on chain block and cutting to be carried out
   8. Hanger tubes to be lowered using chain block and removed at designated place
   9. After removal hanger tubes, scaffholding to be extended to remove PSH
   10. Individual PSH coil to be loaded on chain block and cutting of the coils to be started
   11. PSH individual coil to be lowered using chain block and removed at designated place
   12. After removal PSH coils, scaffholding to be extended to remove SSH
   13. After removal PSH, scaffholding to be extended to remove SSH
   14. Individual SSH coil to be loaded on chain block and cutting of the coils to be started
   15. SSH individual coil to be lowered using chain block and removed at designated place
   16. Hooks to be welded at Rear water panels for lifting panel using chain block
   17. Water wall Panel to be loaded on chain block.
   18. Gas cutting from top of the panel to carried out first and then bottom to be cut
   19. After cutting the panel, same shall be lowered using chain block and to be shifted at designated place
4. **Erection of Water wall panel, Hanger coil, PSH and SSH**
5. Surface preparation to be carried out for water wall rear panel tube top and bottom one by one.
6. Lift the water wall rear part panel by using chain block and align with existing tubes and welding to be carried out
7. After erection of rear water wall panel, SSH individual coil to be lifted using chain block and to be welded with existing tubes
8. After completion of SSH coil, scaffholding to removed as per requirement to erect PSH
9. PSH coils to be lifted and welded to existing tubes
10. After completion of PSH, Scaffholding to removed for erection of hanger tubes
11. Hanger tubes to be lifted using chain block aligned with existing tubes. After alignment welding to be carried
12. After completion of hanger tubes scaffholding in evaporator section to be removed
13. Front water wall panel to be lifted in parts and aligned with exiting panel. Welding to be carried out after alignment.

# Safety precaution for crane positioning at site.

* Crane capacity to be selected to be within limit of critical lift.
* Crane to be placed minimum 2-meter distance away from MCD – bus bar conductor.
* For Boiler 1, crane must be positioned towards roadside.

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**Corrective action and preventive action on above LTI**

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| Sl no. | Recommendations | Responsibility |
| 1 | SOP to be revised stating that whenever jobs in pressure parts (BFG line, steam line, water line, etc) are taken up positive isolation such as blanking/ provision of Goggle valve should be done | Nitin Gaikwad, Deepak Kudalkar  & Anand Ghadigaonkar |
| 2 | Steam purging system should be installed at PP | Deepak Kudalkar |
| 3 | Pressure transmitter should be installed at strategic location so as to determine the line pressure of BFG entering PP | Vengatesan |
| 4 | Explore the possibility of providing Purging vent valve provision should be provided | Deepak Kudalkar |
| 5 | U seal and drip pots inner parts may be checked at desired intervals by dismantling by preparing schedule | Nitin Gaikwad & Deepak Kudalkar |
| 6 | In gas prone areas whenever job is carried out at multiple levels at least one portable CO monitor should be present with people working on each level | Nitin Gaikwad & Deepak Kudalkar |
| 7 | Explore the possibility of changing the Boiler U seal design at PP if required | Deepak Kudalkar & Nitin Gaikwad |
| 8 | More online CO sensors should be fitted at strategic locations | Vengatesan |
| 9 | Portable self powered CO monitors to be procured that has audio/visual alarm with a wireless communication to control room, | Vengatesan |