A review of problems in manufacturing and assembly of "SOOT BLOWER"

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ABSTRACT: The word "SOOT" refer to black, carbonaceous fine particles that are formed during the combustion of coal, wood, oil etc. Soot form deposits on the walls of combustors, chimneys and pipes that convey the flue gas. Soot blowing technology started with manual cleaning with hand lancing and hand blowing, evolved slowly into online soot-blowing using retractable soot blowers. The accumulation of fireside deposits on heat transfer tubes surface is a persistent problem in boilers. The severity of the problem depends mainly on the amount and the melting behaviour of fly ash particles entrained in the flue gas, and the efficacy of the deposit cleaning system that the individual boiler employs. If left unattended, deposits may form a thick insulation coating on the tube surface, significantly reducing the boiler thermal performance and steam production capacity. In severe cases, the deposits may completely plug the flue gas passes, leading to costly unscheduled boiler shutdowns for cleaning.

Keywords: Soot Blower, Canopy, Lance tube, Nozzle.

INTRODUCTION:

Sootblowing is used to control the level of ash and slag deposits on the boiler heat transfer sections. On-line cleaning of localized areas is done by sootblowers using high-pressure steam or air. Wall blowers (IRs) and water cannons are used to remove slag from furnace water walls, while retractable blowers (RK-SL) are used to clean the convective pass of the boiler (including the air preheater). Furnace cleaning increases radiation heat transfer to water walls and reduces the furnace exit gas temperature (FEGT). This decreases the amount of heat that is available to the convective pass. Therefore, over-cleaning of furnace walls can result in low steam temperatures (below design level) with resulting heat rate penalties and increased moisture levels and erosion damage in last stages of the low-pressure turbine. Reduced reheat steam temperature also results in lower turbine and unit power output. All coals contain mineral matter in coal ash. Furnace slagging occurs as molten or sticky fly ash particles get in contact with furnace walls or other radiant surfaces and form deposits due to the quenching effect of the tube wall. Slag deposits reduce heat transfer to furnace walls, and increase the amount of heat available to the convection pass. This results in higher furnace exit gas temperature (FEGT) and, for subcritical boilers, in higher steam temperature, desuperheating spray flows and NOx emissions. Deposition of ash on tubes or heat transfer surfaces in the convective pass reduces heat transfer in that part of the boiler. The convective pass fouling results in a decrease in steam temperature and desuperheating spray flows, and in an increase in flue gas temperature at the boiler exit, as less heat is transferred to the working fluid

OBJECTIVE AND DETAIL METHODOLOGY OF STUDY:

- To study the problems in manufacturing and assembly of "SOOT BLOWER" for carrying out the improvements for smooth & efficient working.
- Checking the Inputs of the Soot Blower i.e. GA Drawings & Technical data sheet.
- Check the deviation with reference to the Customer's requirement.
- To analysis the root cause for the problem and take a corrective and preventive action for improve the same.
- Finding the suitable solution by analysing the positive & negative Impacts.
- Applying the study results & meets the Customer's requirement.

CONTRIBUTION FROM THE STUDY:

The contribution from the study is to provide the better quality & performance to avoid any discrepancies with the customer requirement & meet the Client satisfaction.

LIST OF ACTIVITIES CARRIED OUT:

- List out the problems noticed out during the manufacturing and assembly.

- Highlighting the problems.
- Checking the GA Drawings & technical Data Sheet with reference to the site requirement for correct evaluation.
- Analyses the problems & find out the appropriate solution.
- Make proper relevant documents available to execute the project.

LABS / PLACES / TOOLS / EQUIPMENTS:

- Auto Cad Drawings.
- Hydro test report of Poppet valve.
- Radiography test of welding of lance tubes.

Types of Soot Blower:

- Long retractable Soot blower: This is a helical type soot blower whose lance tube travels from 5-14 meter inside the boiler. This is mostly used in super heater zone.
- Short retractable soot blower: This is a helical type soot blower whose lance tube travels from 0.3-8 meter inside the boiler. This is mostly used in Reheater zone.
- Rotary soot blower: This is a rotary type soot blower which consists of blowing tube instead of lance tube. This is mostly used in Eco or Air Preheater zone.
- Wall Deslagger: This is also a helical type soot blower whose travelling distance is 150 mm- 300 mm. This is used in water walls area.

Technical specification of long retractable Soot Blower under study:

- Model No.- Modular RK-SL
- Pressure for SB Valve (kg/cm²) (Max. & Min.)- 29.5 & 15.5
- Temperature of steam (°C) (Max.)- 450
- Lance Tube- T91
- Nozzle- SS321
- Residing time of Soot Blower within the furnace (for each Soot Blower) i.e. Operating Time- 610 Sec
- Angle of blow (steam exit angle from nozzle head)- 360 degree
- Total weight of each Soot Blower- 1600 KG
- Travel length-13730 mm
- Travelling Speed (mm/sec)- 45
- Motor Power (Kw) – 1.1 Kw

Controlling of Track Beam Canopy alignment:

- Track beam is the structure of the soot blower's body on which different assemblies (like blower carriage, valve and valve operating mechanism) of soot blower are mounted. It is directly fixed with the wall of boiler from front side and is hanged with the help of I bolt and rope arrangement from rear side.
- The side wall of the track beams are made of 4 mm sheet called panel. Panels are in shape of L and are mounted with the help of bracket canopy which is a casting.
- Total length of the soot blower is 16 meter. The assembly of 16 meter frame size is a five part activity. Five type of panels of different lengths both left and right hand side panels are combined together to make a frame.
- The structure of frame is held together by fasteners huck bolt.
- During assembling, as this is a huge frame and due to weight of approx. 2 ton we observe a major problem of sagging in the assembly of track beam.

Controlling of Track Beam Canopy alignment:

- When full assembly of soot blower is completed and kept freely hang on the stand. Soot blower tilts from mid and sagging is observed visually.
- Pre-Stress locator is used to overcome this sagging problem. Pre-stress locator is nothing but it is a screw of M12 x 100 having a round of dia. 20 x 5 mm welded on one side of screw. The side of screw having welded plate is kept in upward direction to support the panel.
- A big fixture is made of two parallel fixed I beams having length about 17 Meter. The panels are get fixed over these I beams on both the sides. The panels are kept over the screw or locator which is already fitted in the I-beam maintaining a different height at different lengths.
- The panels are kept over the locator in such a way that panels aligned at a height from the middle of assembly as given below.
- The length and distance of pre-stress locator is given in below table.

Length of panel (in mm)	4086	3529	3602	2496	1926

Pre-Stress locator height (in mm)	20	46	46	60	60	48	48	26	26	20

- The purpose to set the panels of track beam in such a way is to maintain a pre stress in the assembly of track beam before keeping it on a free stand.
- When the track beam assembly is kept free on the stand then due to its weight the sagging which was a problem initially is balanced by the pre stress position of the track beam.
- So to place a pre stress locator is like a preventive action which is taken at the initial stage of assembly to overcome the sagging problem.

T91 Lance Tubes specialize welding:

Lance tube is a blowing element of the soot blower which blows the steam into the boiler by moving inside in it. It is a long pie having flange at one end. The tube is made of five segments welded together- four pipes and one nozzle head. Nozzle head has two holes which are diametrically opposite. The purpose of using nozzles is to increase the speed at the expense of pressure so that blowing media strikes the affected area with impact. Flange is welded to fasten the lance tube with the lance hub of the blower carriage using studs and gasket (to prevent leakage). Major problems are found in welding of lance tube as below;

- Straightness of lance tubes.
- Extra penetration of welding found due to which radiography test failed.
- Welding defect chances are more.
- Inadequate purging gas supply at the welding joint due to lengthy tube.

T91 Lance Tubes specialize welding solution:-

a) Straightness of lance tubes:

Due to a long length of lance tube, a frequent problem of straightness found in the tubes. Power press of 100 metric ton is used to straighten the tubes of different diameter. Fixtures are made of different diameter as per requirement. A fixture of diameter 115 mm is made for this particular model of long retractable soot blower in which the lance tube of dia. 114.3mm is kept. First of all marking is done over the tube by checking the straightness visually by fixing the tube over a lathe machine for checking the run out.
The marking portion is then kept under the press to straight the tube wherever required.

b) Extra penetration of welding found due to which radiography test failed:

To overcome this problem, Old welders are replaced by WPS (Welding procedure specification) qualified welder. The welder is witnessed in front of some external inspection agency like Lloyd to check out the welder's skill. Welder done welding in front of external inspection agency. Agency approved that welder for further welding process.
All the welding is then done with that approved welder. Radiography test is carried out to check the welding joints. Radiography test found satisfactory after checking on each and every joint of lance tube.

c) Inadequate purging gas supply at the joint due to lengthy tube.

The rubber pipe of argon gas supply is bent when put inside the lance tube. To sort out this problem, the rubber pipe of air supply is already inserted in a small diameter pipe which is slightly more than rubber pipe diameter. The pipe is then inserted inside the tube by measuring the distance of welding joint at a location where the welding is to be carried out. The inadequate supply of the gas is fulfilled in this way.

Conclusion-

Our study involves the major problems faced during the manufacturing and assembly of soot blower's analysis of factors pertaining to failure of soot blower and design improvement which effect the performance of soot blower.

- No Sagging problem found in further assembly.
- Welding of lance tube improved to very much extent and chances of welding defect reduced.

After the whole study, the assembly line becomes more smooth and efficient. The manufacturing and assembly of soot blower becomes smooth & no further study is envisaged.

REFRENCES

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