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Effective Maintenace of Pulp and Paper Units

Need for effective maintenance arises for optimum production from the installed plant and machinery. A recovery boiler is under constant process of wear and tear. A routine inspection and repair schedule has to be made. Of particular importance are the furnace Bailey Blocks, furnace wall tube fins and studs, the refractory lining, soot blower wall blocks and nozzles, smelt spout, access doors, other cleaning ports, air port nozzles etc. During annual shut boiler descaling is to be done, all boiler mountings to be tested and other auxiliaries to be inspected and repaired. A record of tube corrosion is to be kept.

Effective maintenance is a phrase that is often mentioned but in many cases seldom practiced to full advantage. A production unit is only of the value when producing according to its designed capacity. When it is idle it is not producing the saleable product, whatever the reason of the shut down may be. The Company's profits are based on the sale of its produce. An idle machine cuts deeply into profits. Hence it is essential to reduce the down time of the machinery to the maximum possible extent, and that can only be achieved through right selection of machines, careful operation and effective maintenance.

The authors have endeavoured in this article to discuss effective maintenace of the machinery with special reference to recovery boiler which is detailed herewith. The Author's experiences are mainly based on the JMW Boiler installed in Star Paper Mills. The daily production of this unit is about 110/115 tonnes and based mainly on soft wood and hard wood. The chief product being kraft paper. White writing and printing paper is also made to the tune of about 30 tonnes per day.

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Effective maintenance of Recovery Boiler is necessary during normal operation. A forced stoppage may result in complete shut of the entire mill of operation.

Furnace

In every routine shut a systematic checking is necessary. Repair of the smelt furnace is foremost. Bailey blocks are placed for preventing corrosion of the furnace wall tubes by the hot smelt. Inspection of the smelt furnace bailey blocks, specially the spout block is necessary. During removal of the damaged block such a force must not be used that the nearest block will be damaged or will loose contact with the wall tube. Bared tubes are to be cleaned from existing layers of block cement and then the tubes are to be polished with emery cloth. The machined surface of the blocks are to be coated with a thin layer of block cement and then the blocks are to be fixed in correct position. It is to be checked that the space between the tube and the surface of the block does not exceed 0.2 mm without block cement. When the furnace is warm the block fixing nuts are to be retightened. The primary Airport nozzles generally get burnt out. These are to be replaeed. For flat studded wall furnace the burnt out studs are to be refixed and then refractory lining done. The external tube surface needs a very thorough cleaning for heat transfer and passage of the flue gas. Dislodging of the deposits are to be done very carefully lest they damage the tubes by the impact. Repair of furnace hearth has always been one of the major maintenance items of the Recovery units. Inspection of the soot blower nozzles is very important specially those located

in high temperature region. Burnt out nozzle tube will neither dislodge the deposits nor keep the flue gas passage clean.

Depending upon the nature of boiler feed water make up and the chemical dozing that is being done, there will be some sort of scales inside the steam drum, mud drum, internal surfaces, inside headers and tubes, drum internals etc. of the boiler. The inspection of the drum internals should be very carefully made. One should look for signs of the possibility of steam leaks past the drying sections of the drum internals. These leaks may be caused by deterioration of gasket material between the bolted sections following long periods of operation. In repairing of these gaskets care should be taken so that no void or gap is left where the steam could by-pass the drum internals before entering the super-heater. These scales can be removed by an inhibited acid wash. Inhibited acids are available for this purpose which acts on the scales but does not harshly affect the boiler steel. Inhibited acid is circulated through a pump to the top of boiler and back into the storage tank at ambient temperature and concentration of 3 to 4% for about 8 to 10 hours. The concentration of acid depends upon the quantum of scale formation. The quantum of scale formation is evaluated approximately by examining the thickness of scale at certain points. The return acid is also tested for its residual strength. After this acid wash the boiler is thoroughly washed with a neutralizer that is solution of sodium carbonate of strength 1 to 2% preferably with warm water.

Checking the extent of tube corrosion : Furnace water wall tube corrosion rate goes up to ·01 to ·03″ per year, in the vicinity of primary airports are reported in some high pressure units. Wastage of water wall tubes in recovery furnace at elevated steam temperature is an industry wide problem. Findings indicate that the region on the lower furnace from the smelt bed to a point a foot or two above the primary Airport is a zone of high heat input. It is in this zone that the extent of rate of subsequent tube wastage is the greatest. Also the lower loops of the Superheater elements must be checked for thinness of tubes. Damaged tubes need to be replaced. The method available for non destructive test of the tube wall thickness is the ultrasonic measurement. The principle of this test—A transducer vibrating at ultrasonic frequency is placed in contact with one side of the tube under test. Waves travel through the material in a narrow beam and are reflected by the opposit surface. At certain frequencies when the transmitted and reflected waves are in phase, there will be a relatively large increase in the amplitude of the waves in the material. These are called 'Resonance conditions' occuring at the fundamental frequency which is inversely proportional to twice the thickness and directly proportional to the velocity of the ultra sound in the material and also at harmonics (integral multiples) of the fundamental frequency. Since the velocity is a known constant the fundamental frequency required to produce resonance is an accurate and reliable measure of the unknown thickness.

Black Liquor System: The maintenance problem encountered with the black liquor handling system depends upon the type of black liquor. In the case of sulphate liquor as in our case we have found that replacement of M. S. piping with S. S. piping has reduced the leakages to a great extent. Corrosion and erosion of the main dissolving tank has also been noticed. But in our case we have not faced such problem so far. However, we do take care of mending the bottom of dissolver in annual shut.

Smelt Spout: Particular care has to be taken of the smelt spout where the cooling water available is having temporary hardness due to the presence of calcium bicarbonate. We are having a

closed circuit recooling arrangement/a cooling tower for the spout water. Make up water is treated water from softening plant. Quantity required for make up is very small. Spout leakage if any has to be checked during every routine shut of the plant.

During annual shut all the blow down valves stop and check valves are to be hydraulically tested and replaced if necessary. All safety valves are to be tested. These should open at the desired pressure and also reset accurately. The resetting to be so adjusted that the blow down is approximately 7%. Furnace Access door to be checked and repairs/replacements done. So also cleaning doors, Air lancing ports, wall blocks for soot blowers to be repaired/replaced.

Chimney: During the annual shut condition of the chimney has to be inspected. We noticed after about 10 Years of operation that our 100′ high Chinney was getting damaged from the top, though the inside was having cement/sand lining. Suggested repair was 'guniting' of the entire chimney from outside. A net work with M. S. rods along the entire surface of the chimney was done from the base and then sand cement slurry was sprayed layer by layer right from the base to the top. All this was done during full load operation of the plant. It is said that the chimney will stand even if the original M.S. cells get completely wasted due to corrssion.

Economiser

Feed water and recirculation sections of the economiser are made of extended surface C. I. tubes and cleaning is done by circulation of steel shots. We observed that the bottom hopper was getting worn out too early due to the impact of steel shots. 1″ M.S. flats along the entire conical portion of the hopper was welded with 6″ spacking. Steel shots and sulphate layer of 1″ was thus created which acts as a cushion for the impact. Now the hopper cone is not getting damaged.

Electrostatic Precipitator

This is a suitable and effective means for collection of suspended chemicals from the flue gas of the recovery furnace. Experience has shown that if the operating condition i.e. the temperature of the gas steam is maintained it gives no maintenance problem. However the rapping or vibrator mechanisms require routine maintenance.

Conclusion

This article has covered only few of the many maintenance problems which are encountered in the Recovery Boiler Unit. Other auxiliary equipments such as fans, pumps, agitators, black liquor spray nozzles, instruments etc. have not been discussed. In the end it is stressed that effective maintenance if properly followed pays dividend in the increased production and avoidance of forced stoppages.