Energy Conservation and Solid Waste Handling Methods Adopted in the Mysore Paper Mills Ltd., Bhadravati

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INTRODUCTION

As a part of the on-going Indo-Dutch Co-operation in various technologies of both social and economic significance, an Indo-Dutch project on "Cleaner Production Technologies in Pulp and Paper Mills" or " Cleaner 3P" as it has been christened has been launched in Mysore Paper Mills. The cleaner 3P programme is not one issue oriented like investment in forestry, boiler, or in waste treatment but it is a comprehensive project on cleaner production. Two of the important areas identified in this project are:

- Energy savings both electrical energy as well as thermal energy.
- Handling of waste materials with special reference to various uses of fly ash, etc.

The broad details of these aspects of the project were outlined in the report titled "Cleaner Production in Pulp and Paper Sector in India" prepared by Institute of Applied Environmental Economics" (TME), of Netherlands. They are:

- Introduction and implementation of new capacitors in power distribution in order to increase the power factor.
- Implementation of various supplementary measures to improve the steam distribution at MPM.
- Upgrading of pneumatic conveyor at ESP to avoid fly ash losses.
- Facilities for the use of different fuels in MPM in the boilers.

In this present paper, we give the results of the activities carried out in this direction in Mysore Paper Mill under Indo-Dutch Project.

CAPACITORS IN THE POWER DISTRIBUTION SYSTEM

The total electrical running load of MPM is 36 MW. The captive set and the purchased power grid are paralleled. The ratio of captive and purchased power drawn is 80-20 during Sugar Season and 70:30 during non-sugar season.

The average power factor of the system is 0.82. But Electricity Board stipulates a minimum power factor of 0.85. Hence, to improve the power factor of power drawn from State Board to 0.85, the captive sets are run at a lower Pf. This prevents higher loading of captive sets. Hence, further increase in captive generation is not possible. Captive generation cost is cheaper by about 80 paise/unit.

The low system power factor is due to non-compensation of High Tension Induction reactors (3.3 KV) loads, whereas the LT loads are (415 V) are sufficiently compensated. The HT/LT loads are divided in the ratio of 60:40. The HT capacitor earlier provided across each individual motor failed, due to over voltage occuring in the system due to Harmonics. These Harmonics are as a result of heavy fluctuating loads of Newsprint Machine. A detailed study was conducted by Central Power Research Institute, Bangalore, to investigate the effect of Harmonics in the total system. As a sufficiently high over voltage was observed the capacitor had to be designed for a higher voltage of 4.2 KV and also a harmonic reactor to be provided across each capacitor bank. And it was decided to provide a group capacitor instead of individual motor compensation. MPM is in the process

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of ordering these capacitors and reactors. The additional 8000 Kvar that is going to be provided besides reducing the overall demand, releases about 10% of captive set power i.e., about 3 MW extra generation is possible. The requirement in voltage level will allow better operation of TG and prevent quite an amount of motor burn outs which is occurring now.

The increase in current due to overall reduction of MVA will prevent over heating of cables, etc., that are occurring in some of the Transformers.

After installation of these capacitors, the power factor will improve to 0.9.

UPGRADING OF STEAM DISTRIBUTION

Mysore paper mills has a battery of four coal fired boilers and a chemical recovery boiler generating steam at 63 kg/cm^2 and 450^{0}C temperature. Steam is fed to two 12.5 MW, one 16 MW capacity steam turbo generators. Process steam is supplied through extraction from the turbine at 12 kg/cm^2 and 5 kg/cm^2 to various departments. For this purpose high pressure, medium pressure and low pressure steam lines are laid in the mill. Loss of steam is resulting due to damaged insulation of steam lines, leaking steam traps etc., Further steam line system is disturbed at anchors and support points due to condensate accumulation in the steam lines.

Hence the project is taken up the revamp the damaged insulation of the steam lines, provide effective condensate removal steam trap system, and to carry out the stress analysis of the steam line to take up the revamping of steam line anchoring so that energy can be properly conserved.

BAGASSE FIRING SYSTEM FOR COAL FIRED BOILERS

In ISOPLUS programme an integrated environment management finalised along with Dutch experts during October 1993. fuel recovery various activity was included under energy conservation. The aim of the activity was to use waste material as fuel for energy generation. ETP sludge contains approximately 80% of water and substantial amounts of fibers. When in a dry form, it has good calorific value and can be used as secondary fuel in multi fuel FBC boilers. It decreases the use of more polluting purchased fuel.

Power plant up-gradation work was taken up by MPM under Overseas Economic Co-operation Fund extended by Government of Japan. Under this Project one number 90 tph multi fuel circulating fluidized bed combustion boiler was installed along with 16 mw Steam turbo generator. In this boiler extensive system for burning ETP sludge is installed and the same is being carried out.

MPM is having a captive sugar mill to cater to its requirement of bagasse as raw material for making paper. Bagasse is generated in the sugar mill after crushing the sugar cane. In the process some quantity of excess bagasse is generated every year over and above the requirement of bagasse required for making paper. As our bagasse pulping plant capacity can not be increased, this excess bagasse is sold to outside firms and this is not economically attractive. It was also tried to burn bagasse in coal fired boilers in place of coal as fuel. This was not possible due to problems in the fuel feeding and handling system provided for the coal fired boilers. Coal fired boilers are provided with screw conveyors system to feed pith to the coal fired boiler. These screw conveyors are not suitable to handle bagasse due to it's fibrous nature. Hence it is taken up to install suitable bagasse handling and feeding system for the coal fired boilers under fuel recovery various activity. This system will be replacing the existing screw conveyor system provided for handling pith.

The new system comprises of flight/slot conveyor which feeds the bagasse to all the three coal fired boilers. From the flight/slot conveyor bagasse is fed into the boiler through drum feeder/vane feeders mechanically and pneumatically. The new system will be suitable for handling pith generated from bagasse also. Pith is separated from the bagasse as the same cannot be used to make pulp. Pith generated is also used as fuel in coal fired boilers.

SOLID WASTE MATERIAL HANDLING MEASURES,

UPGRADING THE PNEUMATIC FLY ASH CONVEYING SYSTEM OF COAL FIRED BOILERS

Three numbers stoker fired coal fired boilers of capacity each 60 tph (stoker fired type) generating Steam at 63 kg/cm^2 pressure and 450^{0}C temperature were in operation in MPM for steam and power requirements. In the formulation mission carried out by Dutch experts in 1993, it was decided to install multi fuel Fluidized Bed Combustion Boiler in place

of these stoker fired boiler to increase the firing efficiency. Each FBC boiler was to be equipped with separate electrostatic precipitator to reduce Hazardous emissions. These activities aims were to reduce specific coal requirements by 16%, and to reduce emission levels of pollutants.

The coal Fired boilers were capable of generating steam and it was possible to convert these Boilers in to fluidized bed combustion type at a substantial reduced expenditure. Hence these boilers were converted in to FBC type by entrusting the job to M/ s Thermax Babcock & Wilcox, Pune at an expenditure of Rs. 1600 Lakhs.

Boiler thermal efficiency increased from 55-60% to 75-80%. Trouble free operation of boiler was ensured which greatly helped MPM to increase its Paper production and power generation. Boilers were provided with separate ESPs to handle the increased fly ash generation. The emission from the boilers was reduced from 1500-2000 mg/nM^3 to less than 250 mg/ nM^3.

Recently, we have gone in for a circulating fluidised bed combustion (CFBC) boiler with compact separator by which the boiler efficiency has increased to 82% plus.

The next aim was to upgrade The pneumatic fly ash handling system of FBC coal fired boilers by eliminating, the mechanical imperfections and to create a larger storage silo for fly ash. Efficient waste disposal, good housekeeping are the links of this activity with The cleaner 3P programme.

The three coal fired boilers are provided with Electro static precipitators for control of air pollution. ESP is of three fields for collection of fly ash from the flue gas. All the three fields are provided with independent hoppers for collecting the fly ash.At present the fly ash is conveyed to storage silo through pneumatic conveying system. Fly ash from the economiser hopper is not conveyed but manually unloaded and handled manually.

Present fly ash system is posing problem for the men and equipment in the boiler area due to manual unloading of economiser fly ash and frequent problems in the ESP fly ash handling system. As a common pipeline is provided for conveying the fly ash collected in all the three hoppers, any of the problem in any of the fields conveying component, whole of the ESP will have to be shut for repairs. This leads to dust escaping to the atmosphere and increase in dust concentration in the atmosphere. Apart from this sensitive equipment in the boiler area are getting affected due to this dust problem. Further due to lack of sufficient storage facility sometimes fly ash is dumped in the storage silo area creating air pollution and equipment problems.

Hence to avoid all the above problem up-gradation of existing fly ash system is taken up. The new system comprises of installation of new conveying system for economiser, new conveying system for ESP fields, laying of separate pipe lines for all the fly ash collecting vessels. One number 350 m^3 holding capacity fly ash silo with complete ash extraction and conditioning system are installed as a part of the up-gradation. Work has been completed and the system is in operation functioning satisfactorily.

REUSE OF FLY ASH

MPM has a captive power plant of 25 MW capacity which is recently being increased to 41 MW. The captive power plant is supplied with steam from a battery of three numbers coal fired boilers 60 TPH capacity and one 90 TPH CFBC Boiler and a chemical recovery boiler. 600 T during sugar season and about 1000 T of coal is used-in the coal fired boilers. Further to supplement the steam generation one number 90 TPH coal fired boiler is being installed.

About 250 to 300 T of fly ash is generated in the coal fired boiler per day which will have to be disposed. At present the fly ash generated is being dumped in the areas located around the mill. This has become environmental hazard and an eye sore. In the long run systematic and scientific way of disposing the fly ash in environmental friendly manner has become necessary. In this direction it was decided to invite the firms who can make the bricks out of fly ash to find a economical solution for disposal of fly ash. Memorandum of understanding has been entered with M/s VHL holdings private limited to set up the fly ash brick manufacturing plant. With this fly ash disposal in scientific and economic way is possible.

The manufacturing unit shall comprise of mixing and moulding machine having a capacity to produce up to 1500 blocks per shift. The quantity of brick estimated by VHL will be 50000 to 60000 blocks from 350 tonnes of fly ash which MPM expects to generate at peak production. Further production will reach 10000 blocks per day at the end of 12 months from the date of commencement of production and will

increase according to the demand generated, reaching full capacity of 50000 to 60000 bricks within 4-5 years.

MPM will be giving the land required on lease for 20 years with option for another 20 years renewal. Free water and subsidised electricity will be provided by MPM for the firm. Firm will be paying royalty to MPM at the rate of bricks produced.

DISPOSAL SITE. (SCIENTIFIC DISPOSAL OF FLY ASH)

At present the fly ash generated is being dumped in the areas located around the mill. This has become environmental hazard. In the long run systematic and scientific way of disposing the fly ash in environmental friendly manner has become necessary.

It is proposed to set up a disposal site for fly ash disposal. This is to obtain data on permeability of the subsoil and cover material and the effect of rainwater run-off. It is proposed to set up a full pilot test to obtain the necessary information and experience. For this purpose a limited area will be selected which is available around the mill. The main idea of the full scale pilot scheme is to set up a disposal site divided into small compartments of about 40 x 50M, each with a surface area of 2000 m^2 and a content of 5000m^3. The first pilot design consists of 6 compartments with a total content of approximately 30000m^3. For rain water collection a draining system and collection tank or pond with a hold up of about 4000m^3 will be laid. Suitable top covering to prevent rainwater infiltrating the fly ash should be decided. Analysis of water samples are to be carried out to find out the quality of rain water in the ponds. Test bore holes are to be drilled around the plot to ascertain the seepage of contaminated water in to the ground water. It is also required to improve the quality of the MPM laboratory with sophisticated analysing equipment.