A Few Case Studies Of Total Energy Saving Adopted In JK Paper Ltd. - Unit : CPM, Gujarat

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ABSTRACT

WHY ENERGY MANAGEMENT?

India is a Developing nation. Its per capita Energy Consumption is very low. To achieve Economic Growth, we need to and have to use more and more energy to increase the pace of development.

We need to increase the manufacturing of quality goods in Volume. It is estimated that Industrial energy use in developing countries constitutes about 45-50 % of the total commercial energy consumption. Much of this energy is converted from imported oil, the price of which has increased tremendously so much so that most of developing countries spent more than 50 % of their foreign exchange earnings. Notwithstanding these fiscal constraints, developing countries need to expand its industrial base if it has to generate the resources to improve the quality of life of its people. The expansion of industrial base does require additional energy inputs which become more & more difficult in the present scenario. Generation of power needs resources.

Resources available on earth are of Diminishing Nature. It is getting depleted very fast with time as usage is increasing exponentially. There are some resources, which are Renewable e.g. Solar Power, Wind Power and Geothermal Power.

In this competitive world, cost competitiveness is very essential for survival of every individual. To establish any work / motive or task, energy in one or other form is an essential component.

Introduction

- Energy is an essential requirement for overall development of the nation. Pulp & Paper Industry in India has complex structure of old and new plants having diversified technology with varying raw materials and producing different grades of paper. This significantly affects the energy requirement of the mills and therefore results in wide variation in energy consumption pattern.
- J K Paper Ltd, Unit : CPM at Fort Songadh is an integrated Pulp and Paper Mill in Western India with installed capacity 55000 TPA Paper and 60000 TPA Packaging Board.
- Product- Writing Printing Papers Utilizing Bamboo and Hardwood as raw materials and Premium quality Coated Packaging Board.
- Unit originally installed in 1966, which was acquired by JK Organization in 1992 and rehabilitated in 1993-94.
- Unit is ISO 9001, ISO-14001 and OHSAS 18001 certified, TPM Consistent Commitment Award winner, manufacturing W and P papers e.g. SS Maplitho, Copier, Ledger, Parchment, MICR Cheque Paper and Coated Packaging Board etc.

J K Paper Ltd., Unit : CPM, P.O. Central Pulp Mills, Fort Songadh, Dist. Tapi (Gujarat)

Energy Conservation Policy

We are committed to reduce the energy consumption and cost by :

- Optimization of Plant and equipment efficiency
- Elimination and prevention of all types of losses such as Water, Power, Steam, Coal, Compressed air.
- Maximizing condensate recovery and use process heat recovery, waste minimization.
- Increasing the cogeneration of power.
- Improved Utilisation of natural resources leading to environmental benefits.
- Energy conservation through total employees involvement.

Utilites

- Boilers- Coal Fired of Capacities 18, 27 TPH (Both standby), 50 TPH at 42 kg/cm^2 & 410 º C and 70 TPH CFBC at 80 kg/cm^2 & 510 ° C.
- TG Sets 2 x 3 MW (Both standby) & 2 x 12 MW running in cogeneration as double extraction cum condensing operation.
- Water Supply Raw water is pumped from Ukai Dam Canal situated at 3 kms away. After treatment, Mill Water is supplied for process and to DM Plant. Excess white water from Paper Machines is clarified for fiber recovery and recycled. Treated Effluent water is also recycled for Chips washing, Floor washing & Sprinkling for dust control.
- Compressed Air For Plant Controls. Centralized operation system has been adopted
- Soda Recovery Waste Heat Boiler 335 TSD, Firing generated Steam at 42 kg/cm2, 410 º C burning Black Liquor from Pulping and Recovery of cooking chemicals for Recycling.

Strategy Followed

- Daily checks on Power, Steam, Water consumptions and condensate return from Plant sections; Analysis of variation done same day with corrective steps.
- Replacement of old and inefficient equipments consuming more energy like pumps, motors etc as per required duty.
- Enhancing Plant equipment availability.
- Upgrading technology and automation controls (DCS) for consistent quality and optimized

resource and Energy Conservation-specific consumptions.

- Adopting "TPM" steps to maintain data and improvements thereto.
- Internal and external energy audits done quarterly and yearly to sustain achievements under EC.

Now we are explaining few case studies of Energy Savings adopted at Packaging Board Plant at J K Paper Ltd, Unit : CPM.

Steam and Condensate section steam saving

General Description of the system:

Brief Layout of Steam and Condensate System

The system is designed to be flexible and operate over a range of pressure settings to accommodate the different grades being manufactured. We are using dryer siphon type "Stationary Siphon" for removal of condensate and non-condensate gases.

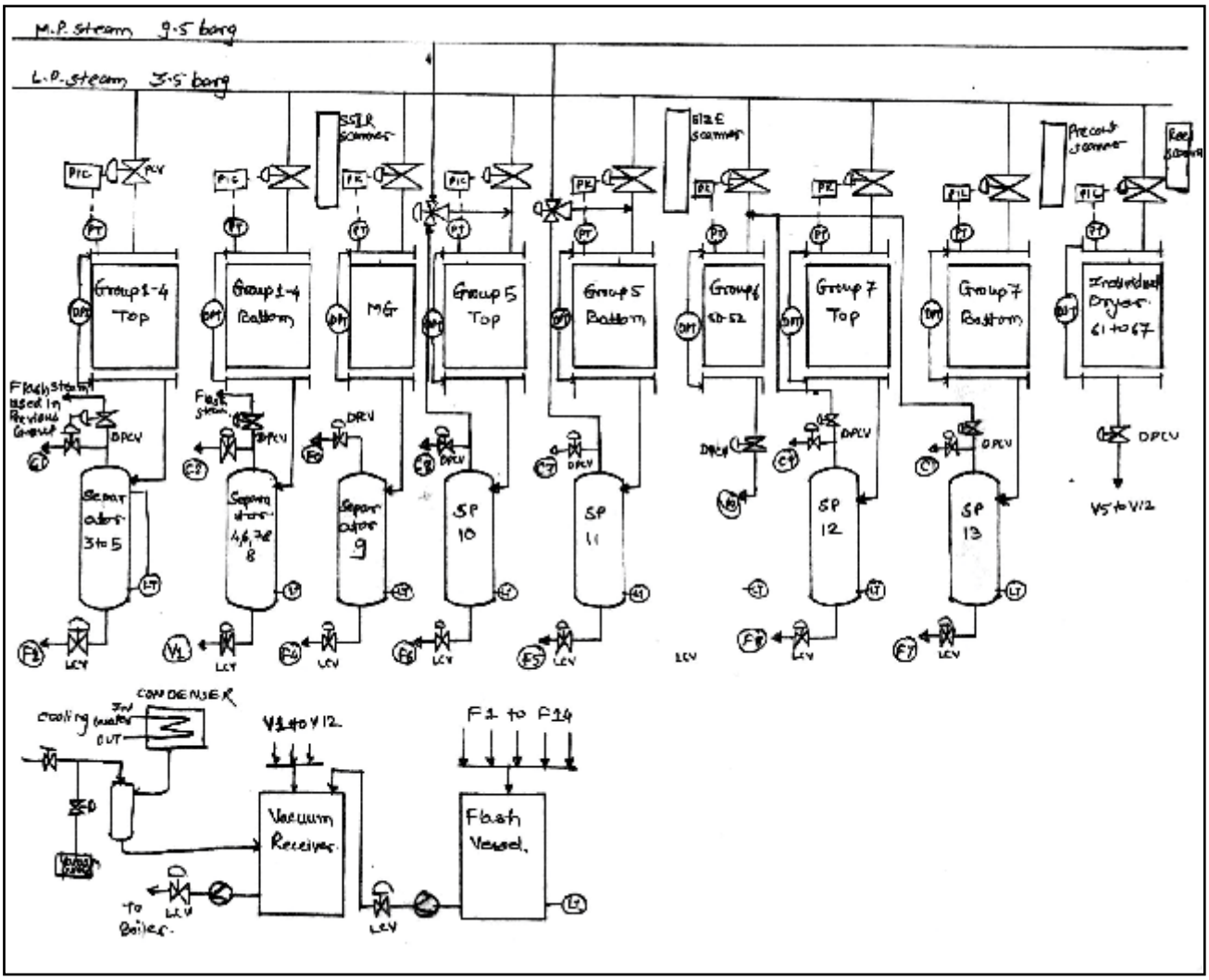
All siphons operate on the principle of "Different Pressure". This means that there is a difference in pressure between the inlet to the cylinder and the outlet and this pressure difference pushes out the condensate from the dryers and also allows some steam to flow from the dryer, which helps to evacuate the condensate and remove any air and non-condensable gases from the dryer. The steam that escapes from the cylinders is called Blow through steam. All drying is split between top and bottom row dryers to control machine glaze, sheet curl and product quality.

The system is split in to following section.

1) Pre dryer section.
2) MG dryer.
3) After MG dryer section.
4) After Size Press dryer section.
5) Coating Section.

1) The pre dryer section is split into 6 steam groups, 3 top dryer groups and 3 bottom dryer groups. Each group has individual pressure and differential pressure control system to allow the correct drying gradient to be set to achieve the target moisture going to the MG dryer.

We are using SSIR scanner for measure and control Top Layer surface moisture before entering to MG dryer. Moisture control loop works in cascade mode, it control pressure of Top dryer group and using ratio logic set value for control pressure of bottom dryer group of pre dryer section. Condensate draining via steam separators, where the condensate and blow through steam are separated. The condensate being collected and drained to a condensate collection system and the blow through steam being cascaded for re-use in the drying cylinders.



2) The MG dryer is an individually pressure controlled cylinder and drains via a steam trap assembly to the condensate collection system.
3) After MG dryer section is also split into Top and Bottom dryer groups with each group having individual pressure and differential pressure control system. We are using Microwave type sensor for measure and control complete board moisture before entering to size press. Moisture control loop works in cascade mode, it controls top group pressure as pre moisture set point and bottom group in Ratio mode.
4) After size press (10th Group Dryer) section is split into Top and Bottom. This group of pressure control as per surface moisture require before Pre Coat. We are using IR type for measure surface moisture and board base parameter before entering to Pre Coat.
5) In coating section we are using Gas IR system for drying the board after coating and 3nos. drying cylinders with individually pressure control systems to the condensate collecting system.

The condensate draining to the condensate collections system and the blow through steam being re-circulated via thermo-compressors to feed the group inlet steam headers.

A flush system is provided to reclaim excess condensate energy as flash steam from high pressure steam usages for re-use in group 1 drying cylinders.

A vacuum system comprising of water cooled steam condenser, vacuum tank and vacuum pump gives a low pressure "Sink" to receive all exhaust steam and condensate from the system and stabilise all condensate for pumping back to the boiler house.

We implemented following case study to reduce steam consumption per ton of board.

Case Study 1: Proper Removal of Condensate from system:

To get proper drainage, we started to control the vacuum level. Earlier, we used to run in a constant high level of vacuum, which invites steam more than required to condenser. By controlling vacuum in proper level, we are able to remove the condensate from the initial dryers having very low pressure (sometimes under vacuum) without getting excess amount of steam to condenser. We developed logic in DCS i.e. select lowest pressure value from group 1to8 then minus its differential pressure process value from its group pressure. To remove proper condensate, we require providing set value more negative than the system lowest pressure, so we are again minus 0.05 bar from lowest pressure and differential pressure value. This loop works in cascade mode and controls bleed valve.

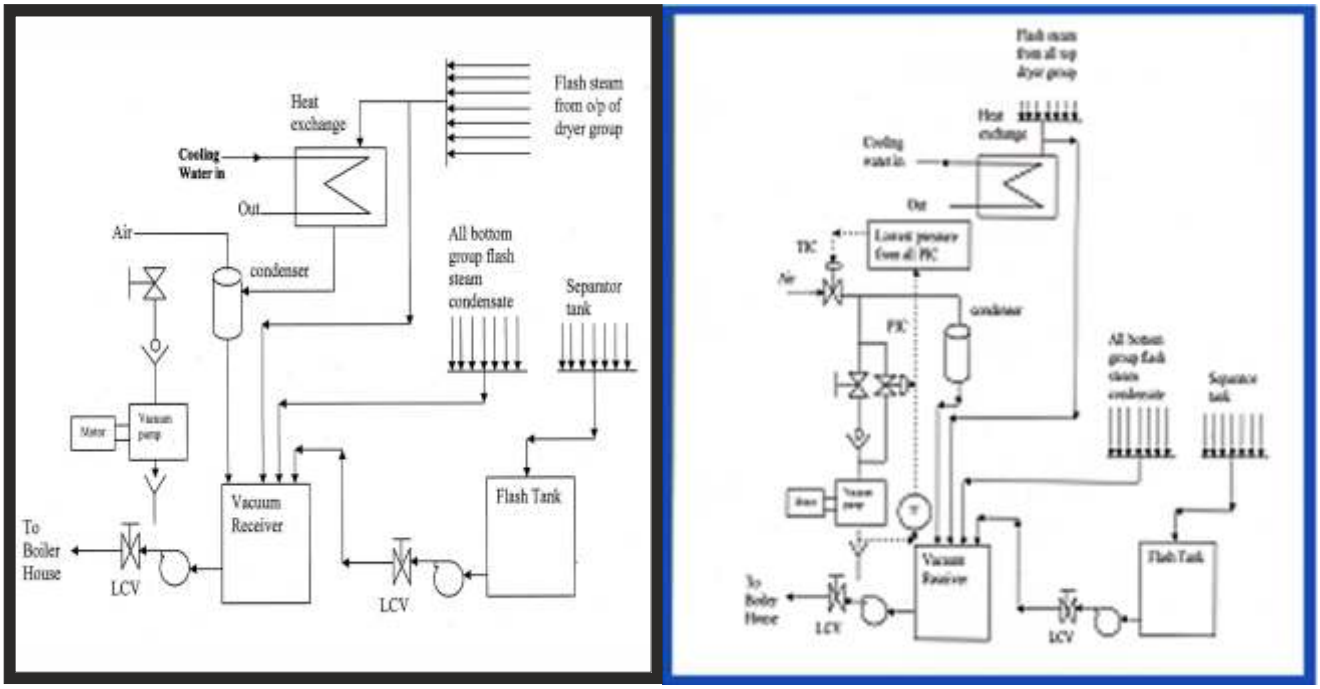
Case Study 2: Removal of non condensable gases in air :

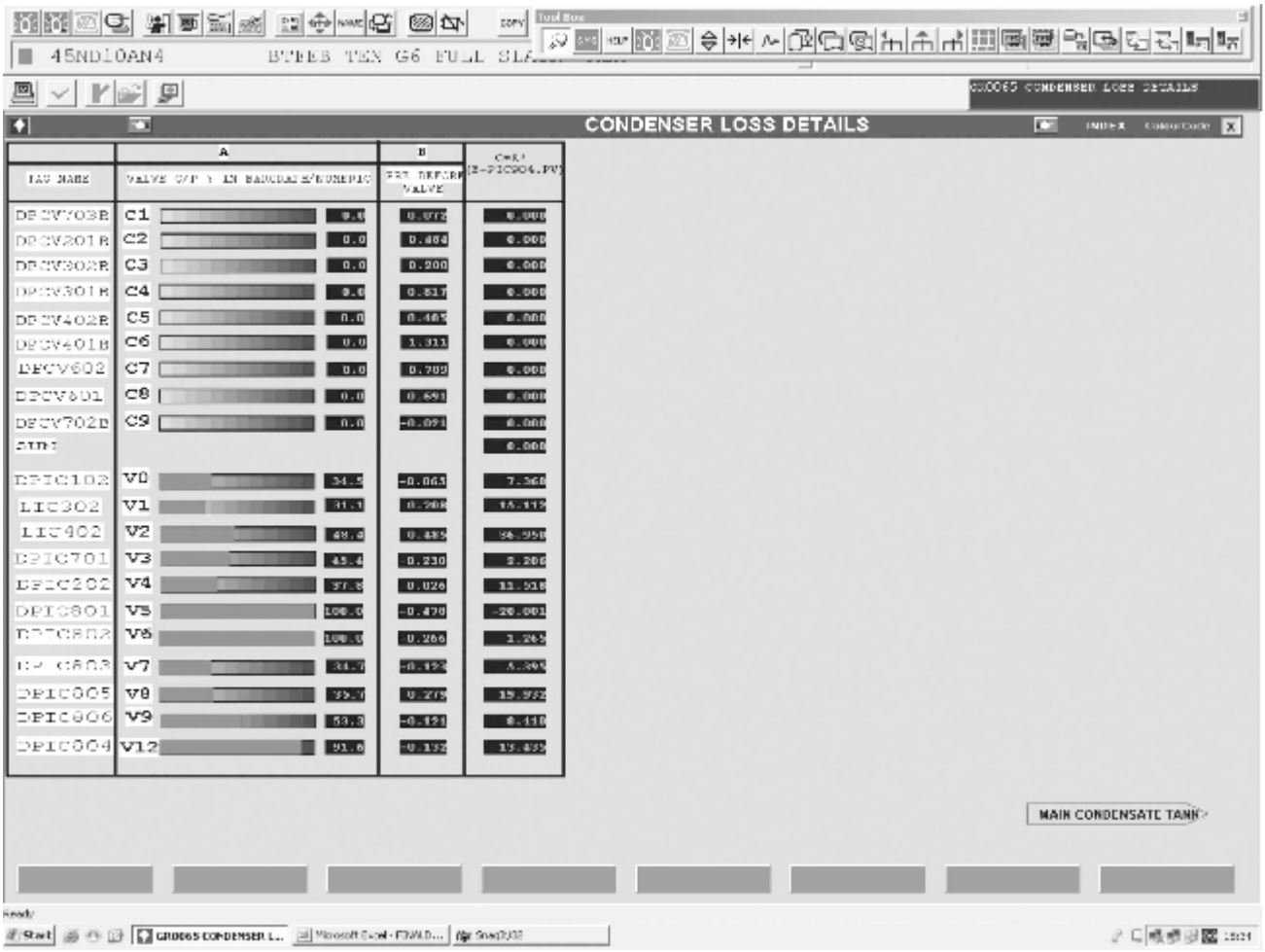
We have a vacuum pump connected to condenser for removal of non condensable gases like air. But for any reason, if condenser is overloaded (more steam entry or less steam entry), some steam is removed by vacuum pump, and its sealing water temperature rises. We are monitoring the same, and in case of such incident, we reduce the vacuum level through bleeding. To control this loop in cascade mode, we installed temperature transmitter in vacuum pump drain line and one control valve in parallel of manual valve in suction line. This practically helps condenser to work efficiently, and produce maximum return condensate to boiler. The health of vacuum pump is also taken care of through this action.

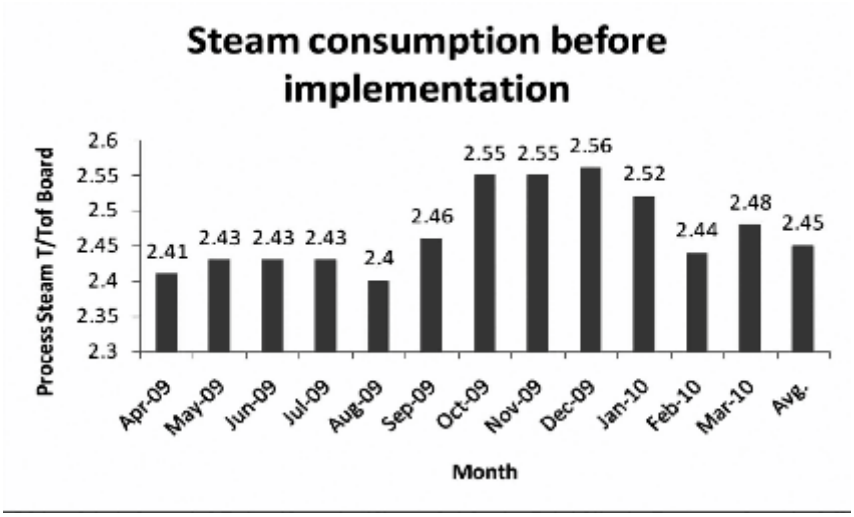
Case Study 3: Indication of Condensate loss detail:

If proper ratio set point of bottom group is not given by operator then our condensate will be more or problem in control the differential pressure. So troubleshoot this problem easily we have provided one page in main condensate page that shows condenser loss index high alarm. There are nine (09) valves which are connected to condenser for draining the unused steam. We made a special page to show the valve openings in % Numeric & Bar graph, along with the differential pressure across them, and generate a product which indicates the loss to condenser.

Before **Case Study 1 & 2** **After**







Operators are requested to make sure that the "Condenser Loss Index" (A1) to keep zero, by adjusting the steam set points. This helped a lot to reduce condenser loss through incorrect setting of steam pressure across the groups.

Steam saving = 2.45 - 2.29 = 0.16 Ton/Ton of Board

Total steam saving from April-10 to Nov-10 = 58765 x 0.16

= 9402.4 x 711

Equivalent = Rs.66.85 lacs.

Power Saving

To reduce energy consumption of building lighting following steps are taken,

i. Day-Night lighting is separated and control through DCS, we developed logic and graphics in DCS so that we can change timing of night lighting as per weather requirement.

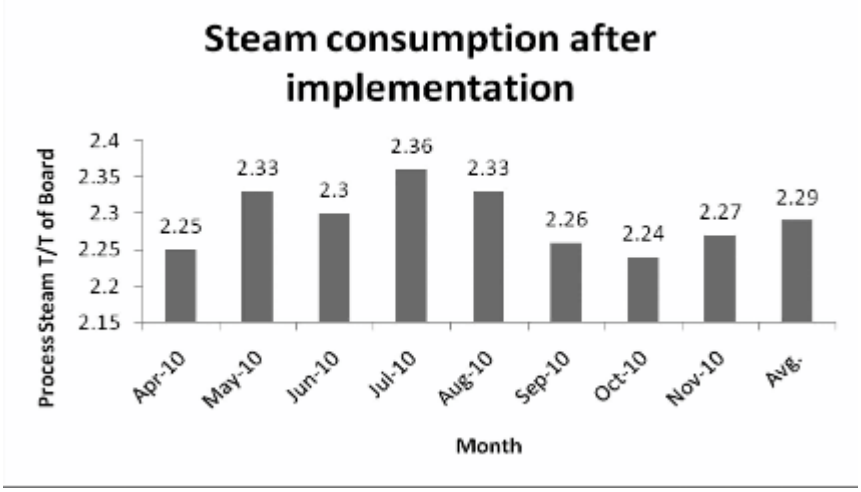
Unit Saving = 37 KWH/day
Total Saving = Rs.0.39 lacks/annum

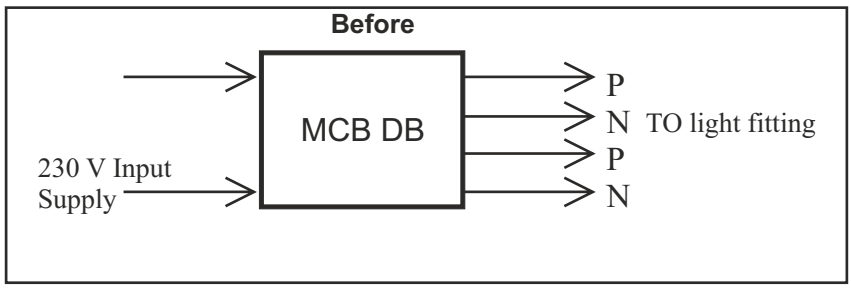
ii. Installation of energy saver to reduce energy consumption. Due to this energy saver the applied voltage for lighting fixture is reduced from 235 V to 210 V, and also power factor increased from 0.5 to 0.85

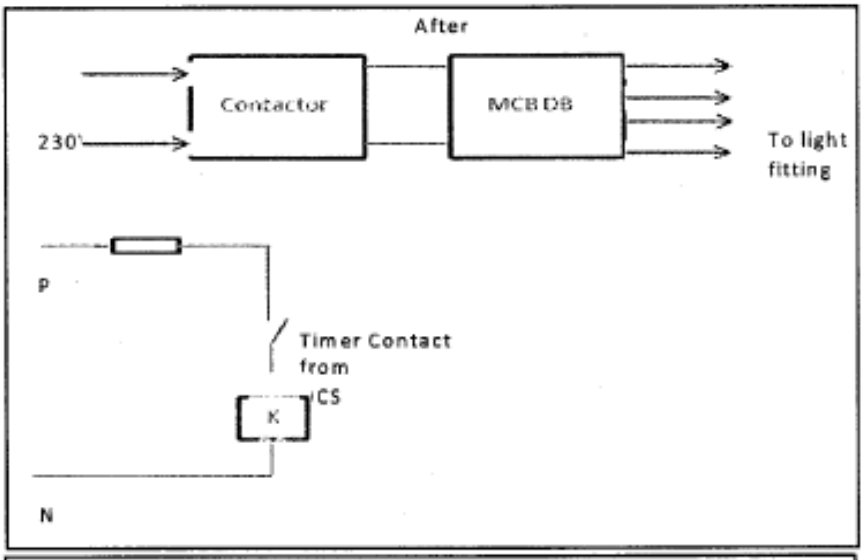
Total Unit saving = 140 KWH/day
Total Saving = Rs.4.75 lacks/annum
Total Investment = Rs. 2.8 lacs.

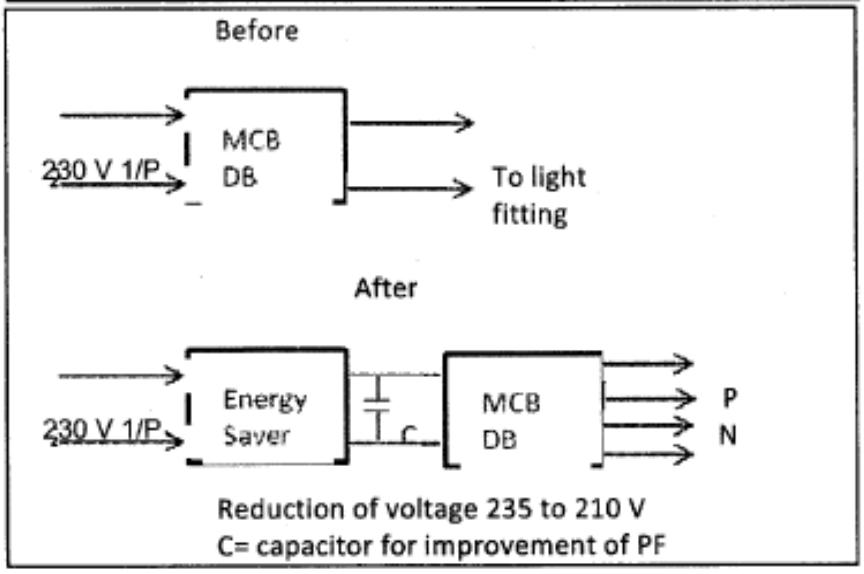
iii. Installation of Soft starter for vacuum pump motor.

In our existing system vacuum pump motor was running on DOL starter, due to high starting kick motor was failure frequently so we installed soft starter for this motor. After using this soft starter motor, starting kick was reduced from 1200 amp. to 675 amp. Also we run this soft starter in energy saving mode, due to this we saved energy.









Total Saving = Rs.4.1 lacs per annum
Total Investment = Rs.1.4 lacs

Vi. Replacement of energy efficient motor for vacuum pump.

In our existing system vacuum pump motor was having lower efficiency due to which energy consumption is more, so it was replaced with higher efficiency motor having higher frame size. It decreases the running load of vacuum pump motor from 220 amp. to 195 amp.

Total Saving = Rs.3.4 lacs per annum
Total Investment = Rs.2.5 lacs
Total Power Saving from above schemes = Rs. 12.64 lacks/annum

v. Stoppages' of Hood and Ventilation Motors in Stock off condition.

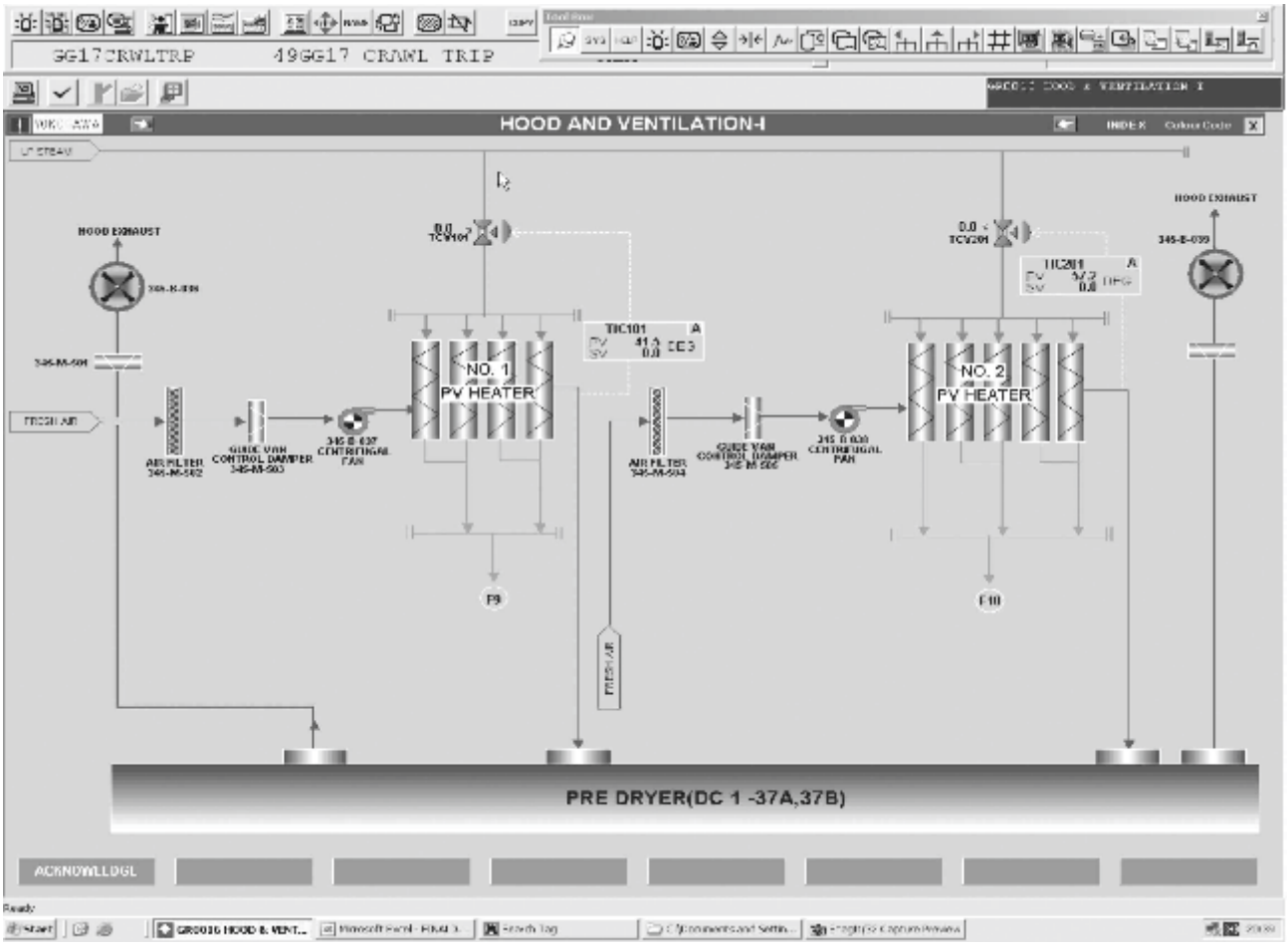
Logic developed in DCS if Stock off on wire then after 15 min all hood and ventilation motor should be stopped in sequence from 1st group to 10th group, also individual temperature control valve should be zero if motor stopped. After stock on all three wire then all hood and ventilation motors start in sequence from 1st group to 10th group, also temperature control valve will take previous set point.

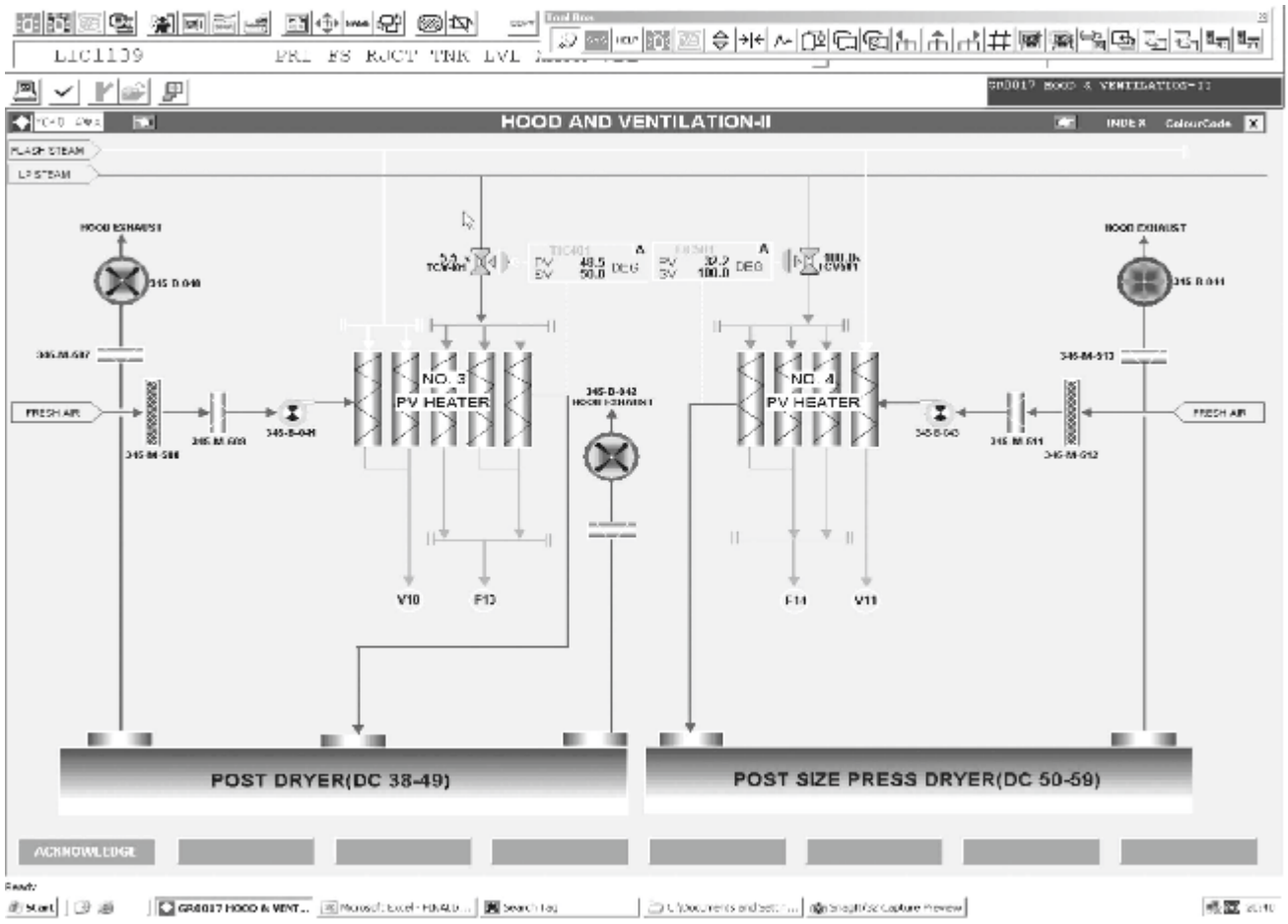
Total Saving = 499 kw for 12 motors.
Total Saving = Rs. 1472/hr.
Total Saving = Rs. 0.35 lacs/annum approx.

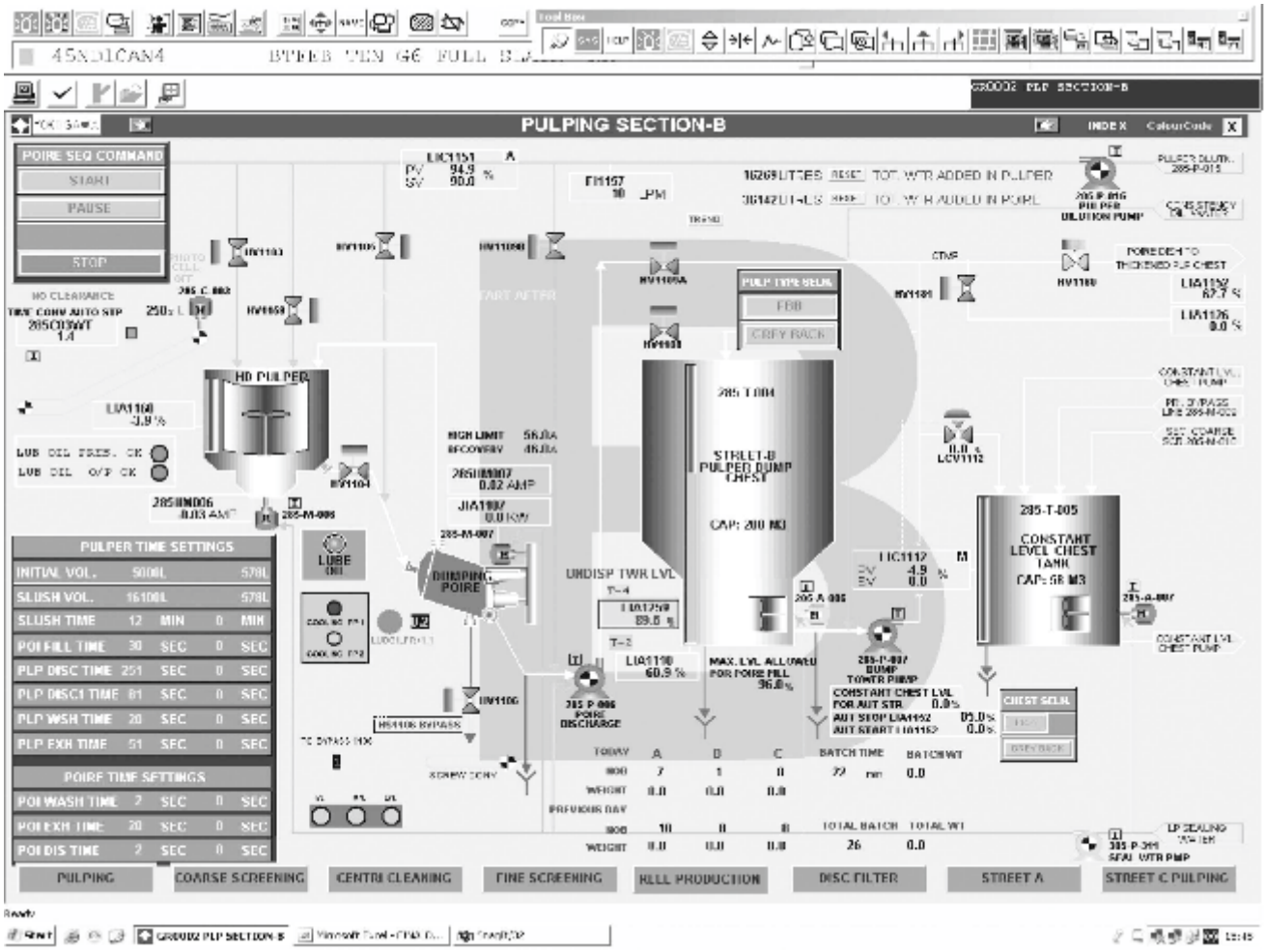
vi.Reduce High Density Pulper total batch preparation time.

To reduce HD pulper total batch preparation time (from 30min to 24min) for power reduction and pulper capacity enhancement by: 1. Modifying pulper and Poire logic and 2. Reduction of slashing time by 3 min.

Pulper Motor KW = 360 , Running load = 24 Amp., Empty load = 12 Amp., Calculation on no load in one batch = (1.732x6600x12x0.8)/1000 = 110 KWH. No of Batches = 60 / day. Reduce time 06 min per batch =


HOOD AND VENTILATION-I
HOOD EXHAUST
NO. 1 PV HEATER
NO. 2 PV HEATER
FRESH AIR
PRE DRYER(DC 1 -37A,37B)
ACKNOWLLDGL


HOOD AND VENTILATION-II
HOOD EXHAUST
NO. 3 PV HEATER
NO. 4 PV HEATER
FRESH AIR
POST DRYER(DC 38-49)
POST SIZE PRESS DRYER(DC 50-59)
ACKNOWLEDGE



360 mins = 06 Hrs/day. Take 50% pulper stoppage time = 180 mins = 3.00 Hrs/day. Power save = 3x110 = 330 kwh /day = 330x27x12 = 106920 kwh/annum. Power cost saving = 106920x2.95 =3,15,414.00 / annum. Say Rs.3.15 lacs/Annum.

vii. Provide VFD in place of Hydraulic motor.

In coater section hydraulic motor provided for applicator roll speed increase/decrease. For this system we have using hydraulic power pack, one solenoid valve, one flow control valve and hydraulic motor. Failure frequency of this system was more also its flow control valve cost is above Rs.1.5 lacs. So, removed all this system and install VFD with gear motor. Hydraulic power pack motor kw = 9.3, now VFD running kw = 2.2.

Saving = 7.1x24x330x2.95

Total Saving = Rs.1.65 lacs/annum.

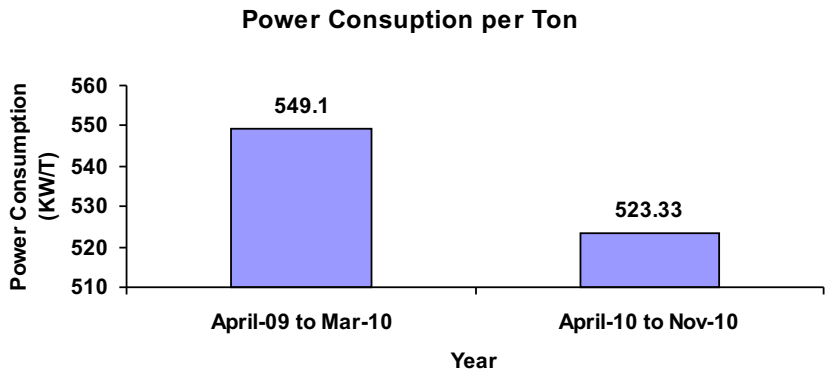
Total Power Saving from above schemes = Rs. 17.79 lacs/annum

We are using different schemes for power saving, so total power saving

Power saving = 25.77 KW/T
= 58765 X 25.77
= 1514374.05 KW
= 1514374.05 X 2.97
= Rs.44.97 lacs.

Total Steam Saving Rs. 66.85 lacs

Total Power Saving Rs. 44.97 lacs



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