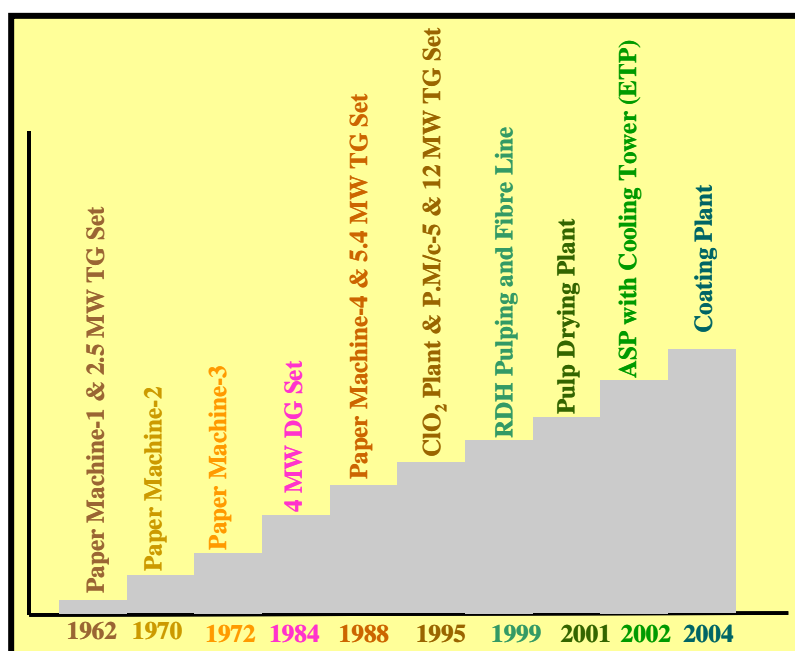


## JK Paper Mills, Orissa

### Unit Profile

Expansion / Modernization / Renovation is a way of life at JK Paper Mills. To be self sufficient in power demand w.r.t. expansion, the company has been putting up additional power generation plants without overburdening the grid demand and have been modernizing / discarding the old boilers and discarded old Pulp Mills (2 nos. of 80 TPD BD Bleached Pulp Production Capacity). The various milestones achieved in the expansion / modernization front is furnished below in Table-2.

**Table 2: Expansion & Modernization at JKPM**



Even with growing cost of fuel, electricity tariff and the manufacturing cost of power, the total electrical energy cost remains around 10.8 % of total manufacturing cost (as detailed below in Table-3) due to continuous effort to conserve energy:

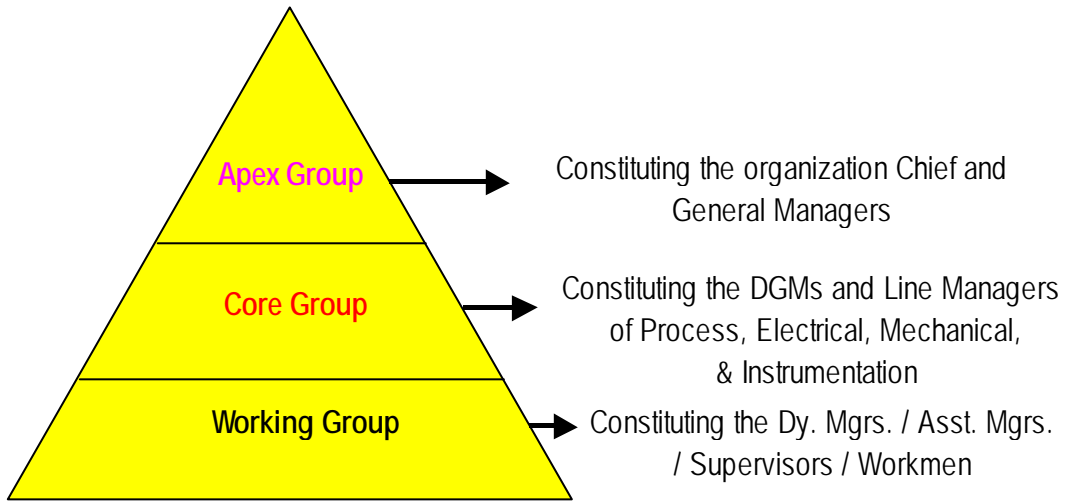
**Table-3 – Energy Cost Vs Manufacturing Cost for last 3 years**

| Particulars                            | Unit        | 2002-2003 | 2003-2004 | 2004-2005 |
|--|-------------|-----------|-----------|-----------|
| Manufacturing Cost                     | Rs in Lakhs | 22524.81  | 22820.95  |           |
| Total Electrical Energy Cost           | Rs in Lakhs | 2941.74   | 2462.38   |           |
| Energy Cost as % of manufacturing cost | %           | 13.06     | 10.79     | 10.80     |

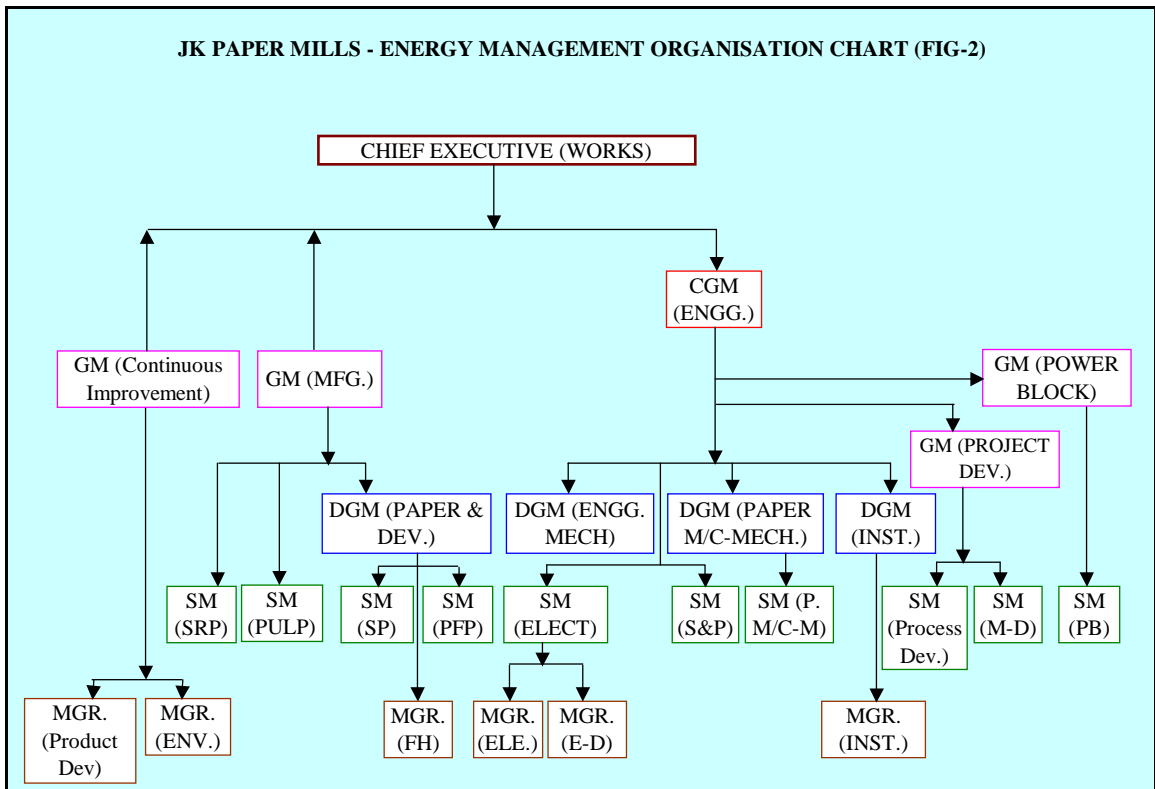
### ENERGY CONSERVATION COMMITTEE, POLICY & SET-UP:

The company has been forming various committees from time to time namely, Energy Conservation Cell, Cost Compression Cell, Continuous Improvement Cell etc. with new energetic committee head and team members to achieve maximum benefit in conserving resources and reduce cost of production to meet market challenges.

The broad structure of the committee is as under :



The activities, achievements and failures are reviewed every month at Head Office by the Chair Person. The details of organizational set up is furnished in Fig-2.



The total energy conservation committee receives support from top management, including Managing Director of the Company, which can be observed from the energy conservation policy of the organization, which is reproduced below:-

The function of the cell is to minimize losses and wastages, use technique to substitute high cost energy by low cost energy, optimize consumption, and maximize utilization of plant and machinery capacity etc. by following tools:

1. To Study specific energy consumption trend in terms of Power, Steam, Water in various sections of the mill and monitor.
2. To follow up with various departments to arrest steam leakages, condensate leakages, water leakages and provide adequate insulation as required to minimum heat losses thereby save energy.
3. To prepare energy conservation projects / proposal and ensure their financial approval and timely implementation.
4. To assist quality circle, evaluate ideas generated by suggestion schemes and to implement useful energy conservation schemes.
5. To implement suggestions given by internal auditors (ISO & TPM) from time to time.
6. To engage external agency i.e. auditors / consultants to assess the health of the organization w.r.t. energy consumption and optimize investment for additional power generation station.
7. To arrange essay / poster / slogan competition (with attractive prizes) to enhance consciousness among employees (about scarcity of energy, its depleting production and increasing cost from time to time), inculcate habit of conserving and effective use of energy, emphasizing on environmental impact to have a continuous improvement in reduction in cost of production.
8. To impart training to improve the skill of personal to evaluate the opportunity by material balance, heat balance, energy balance etc.
9. To celebrate the 14<sup>th</sup> Dec. as the Energy Conservation Day involving employees, their family members (including school children), employees of nearby small scale industries to motivate them to achieve the goal of conservation of energy for future generation.

#### **ENERGY CONSERVATION ACHIEVEMENTS:**

The specific reduction in power and fuel consumption for 3 years is summarized below:

| Year    | *KWh/ Tonne of finished paper | % Reduction over Previous year | *M.kCal/ Tonne of finished paper | % Reduction over Previous year |
|---------|-------------------------------|--------------------------------|----------------------------------|--------------------------------|
| 2002-03 | 1264                          | 3.22                           | 3.9684                           | 13.96                          |
| 2003-04 | 1235                          | 2.29                           | 4.5719                           | -15.21                         |
| 2004-05 |                               |                                |                                  |                                |

#### **ENERGY CONSERVATION SCHEMES IMPLEMENTED ARE AS FOLLOWS: .**

##### **Year - 2002-2003**

|   |  |       |      |
|---|--|-------|------|
| 1 | The Power generation from 2.5 MW and 5.4 MW TG sets was optimized by improving Power factor from 0.80 to 0.95                                    | 403.2 | 1.25 |
| 2 | Replacement of Damper control system by VVVF drive for FD Fan motor of CF Boiler II resulted in saving of 30 KW.                                 | 10.08 | 2.09 |
| 3 | Conversion of Delta to star connection for lightly loaded motors resulted in power saving of 40 KW.  | 13.76 | Nil  |
| 4 | Use of Acrylic translucent sheet to avoid day lighting in Power Block, Mechanical and Electrical workshop  | 0.24  | 0.25 |
| 5 | Replacement of chest 4 pump No.1 by energy efficient pump in Stock Preparation, resulting in reduction in power consumption from 45 KW to 37 KW. | 1.08  | 0.15 |
| 6 | Replacement of Vacuum pump No.6 of PM-V by energy efficient Siemens Germany Make Vacuum pump resulted in power saving of 21 KW.                  | 7.06  | 1.50 |
| 7 | Stopping of 2 Nos. Scanner cooling fan motor of 3.7 KW by making alternate arrangement from existing FD fan for LF Boilers IV & V                | 1.34  | 0.25 |

|                  |   |               |              |
|------------------|---|---------------|--------------|
| 8                | Replacement of Incandescent bulb fittings with Energy efficient CFL lamp fittings in Colony | 0.27          | 0.25         |
| 9                | Increase in Steam production in CFB V by modifying coal feeding line                        | 2.87          | 16.00        |
| 10               | Auto switching off of cooling towers fan in winter season                                   | 1.01          | 0.15         |
| 11               | Use of dual speed motor for cooling tower fan in Effluent Treatment plant                   | 1.68          | Nil          |
| 12               | MP Steam saving in warm fill operation by maintaining good temperature profile              | 109.32        | 0.03         |
| 13               | Reduction of Steam consumption by removal of 2 Nos. dryers in PM 4                          | 9.28          | 2.45         |
| <b>Sub Total</b> |   | <b>561.19</b> | <b>24.37</b> |

#### Year 2003 –04

|    |  |       |       |
|----|--|-------|-------|
| 1  | Shutting down inefficient vacuum pumps in PM-1 with operation of other pumps in efficient ways.  | 63.58 | 0.00  |
| 2  | To replace HDPE Tops of Flat suction with Robadur Tops at PM 3, thereby savings of power and reduction in downtime.  | 4.08  | 7.80  |
| 3  | Use LP steam instead of MP steam in feed water heater for LFB 5  | 16.00 | 0.00  |
| 4  | DSH station for LP steam in LFB 5 for reduction of LP steam consumption.   | 1.90  | 1.80  |
| 5  | Cascading of air heater steam to reduce heat loss in LF Boilers and Flash steam from LF5 condensate flash tank to be used in deaerator                           | 61.00 | 12.00 |
| 6  | Running of 5.4 MW TG at 49 Hz frequency continuously with Electronic Governor, resulted in reduced power consumption   | 40.8  | 0.00  |
|    | Arresting the steam leakages at 2.5 MW TG ejector line, new 10/2.8 ata PRDS line flange, MP steam header drain line and LFB-4 main steam line near CFBoiler.     | 0.59  | 0.25  |
| 8  | Providing insulation to un-insulated pipelines and valves (includes 25 points like valves/pipes/flanges/tanks/headers etc in various locations)                  | 1.55  | 0.25  |
| 9  | Optimizing the flue gas losses by shifting O <sub>2</sub> analyzer to control room & repairing the bed thermocouples in CF 1 & 2                                 | 8.36  | 3.00  |
| 10 | Downsizing white liquor supply pump and weak white liquor pump in the Causticizing section   | 3.60  | 1.20  |
| 11 | CFB 5 - Optimizing flue gas & Radiation loss by insulating the damaged areas / manddoors / flanges and arresting the air heater tube leakages.                   | 9.87  | 5.00  |
| 12 | Replacement of chest-4 pump No.2 in Stock Preparation by energy efficient pump with lower capacity motor No.2 i.e. from 45 KW to 37 KW resulted in Power saving. | 1.04  | 0.25  |
| 13 | 10 K2 Vacuum pump of PM-1 was replaced by energy efficient. Siemens Germany make vacuum pump, resulted in reduction of power consumption from 110 KW to 60 KW.   | 16.80 | 10.00 |
| 14 | Installation of VVVFDrive for PA fan of CFB-5 resulted in reduction of power consumption from 73 KW to 52 KW.  | 7.14  | 4.25  |
| 15 | Installation of VVVFDrive for fan pump of P.M/c-3 to improve the reliability of fan pump and reduce electric losses in variac.                                   | 5.20  | 4.89  |

|                  |  |               |               |
|------------------|--|---------------|---------------|
| 16               | Interconnection of old & new cooling tower in ClO <sub>2</sub> Plant resulted into stopping of extra transfer pump and thereby resulting into power saving.                    | 4.85          | 0.15          |
| 17               | Intermittent shutting down of inefficient vacuum pump of PM-1, resulted into power saving of 18.5 KW   | 6.28          | Nil           |
| 18               | Make up water pump to white water silo was stopped for Energy saving in PD Plant   | 1.36          | Nil           |
| 19               | Installation of synchronizing panel for power change over from DG Set to 12 MW TG Set, to avoid PM-2 & PM-3 Machine stoppage during power change over.                         | 1.66          | 6.00          |
| 20               | Installation of synchronization panel for running TDR & DDR refiners on 12 MW TG Set / Grid supply, to make use of low cost turbine power, whenever it is available in excess. | 1.68          | 0.44          |
| 21               | PM-4 Size press demo to cooling blower removed and cooling air duct connected to motor.  | 0.32          | 0.05          |
| 22               | 2 Nos. of Felt dryers removed at Paper Machine- V, which were not required for Process, resulted in steam reduction of 500 to 600 Kgs / Hr.                                    | 5.04          | 0.20          |
| 23               | Reduction in steam leakages in 2.5 MW TG   | 1.69          | 0.10          |
| 24               | Improvement in steam generation & condensate recovery by providing indirect black liquor heater in LF Boiler-V   | 5.37          | 10.50         |
| 25               | Replacement of steam ejector with vacuum pump in black liquor evaporator Plant   | 47.80         | 14.00         |
| 26               | Insulation provided to white liquor clarifier top and green liquor clarifier in recausticizing plant to improve liquor temperature by arresting heat losses.                   | 11.17         | 10.50         |
| 27               | Installation of modified steam-shattering nozzle in LF boilers-4 & 5 at smelt dissolving tanks to conserve steam.  | 8.20          | 8.00          |
| <b>Sub Total</b> |  | <b>336.93</b> | <b>100.63</b> |

#### Year 2004 –05

|   |  |       |        |
|---|--|-------|--------|
| 1 | Use of Star mode for lightly loaded motors   | 14.0  | 0.00   |
| 2 | Installing Variable Frequency Drives in FD Fan of CFB-2  | 7.86  | 11.30  |
| 3 | Installation of Indirect Black Liquor Heater in L.F. Boiler No.5 for reduction of dilution of Black Liquor and achieve additional steam generation | 4.00  | 16.20  |
| 4 | Steam ejector in evaporator in evaporator replaced with vacuum pump for steam saving   | 32.00 | 170.00 |
| 5 | Steam shattering nozzles in both the Soda Recovery Boilers changed to reduce MP steam consumption  | 2.40  | 0.60   |
| 6 | Installation of new electric governor in 12 MW Turbine to reduce frequency to 49 Hz.   | 26.70 | 27.50  |
| 7 | Improve power factor of all turbines from 0.90 to 0.95 to load TG further  | 27.10 | 19.00  |
| 8 | Install new coal shed store coal during rainy season.  | 32.20 | 31.20  |
| 9 | Recovery of flash steam at LFB-IV air heater as done for LFB-V.  | 18.6  | 14.83  |

|           |   |        |        |
|-----------|---|--------|--------|
| 10        | Installation of variable speed drive for lime mud slurry pumps at White Liquor Clarifier, thereby reducing compressed air consumption and saving power. | 2.31   | 8.08   |
| 11        | 10 K3 Vacuum Pump No.6 of PM-I to be replaced by energy efficient, vacuum pump of Siemens, Germany make   | 0.7    | 1.15   |
| Sub Total |   | 167.87 | 299.86 |

## A FEW EXAMPLES OF ENERGY CONSERVATION SCHEMES

### EXAMPLES OF ENERGY CONSERVATION SCHEMES

#### Project No. 1

Improvement in power factor from 0.80 to 0.95 resulting in reduction of energy loss.(i.e Improvement in Power generation)

#### Description:

The maximum loading was controlled on the actual MW reading of generators by the shift Incharge. The load is immediately disconnected when MW reading reaches to maximum MW value of generations as given below :-

The 12 MW TG Set was not loaded upto full capacity due to heating problem on the bus bar contacts to connect CT. The power factor of all generators was 0.8 and the MVA and current capacity of generators were as follows :

| Sl. No. | MW Capacity | Maximum generator loading | MVA Capacity | Current Capacity |
|---------|-------------|---------------------------|--------------|------------------|
| 1.      | 12 MW       | 11.5 MW                   | 15 MVA       | 1375 Amps        |
| 2.      | 5.4 MW      | 5.4 MW                    | 6.75 MVA     | 591 Amps         |
| 3.      | 2.5 MW      | 2.5 MW                    | 3.3 MVA      | 289 Amps         |

If the voltage drop at contact is not maintained below 35 m Volts, there would be problem of heating of contract in distribution system, while doing the connection. Since the loading of generator depends upon current (instead of MW Capacity), by improving the power factor of generators and using full current capacity, the increased MW capacity of different generators achieved as under :-

| Sl. No. | Unit      | Power Factor | MW at full current capacity |
|---------|-----------|--------------|-----------------------------|
| 1.      | 12 MW TG  | 0.95         | 14.4                        |
| 2.      | 5.4 MW TG | 0.95         | 6.2                         |
| 3.      | 2.5 MW TG | 0.95         | 3.0                         |

By improving the busbar joints, by using the methods of checking of voltage drop of bus bar contacts / joints & maintaining if less than 35m Volts for full current capacity it helped to use distribution system upto full load without any problem of heating. Accordingly, the Shift Incharges were instructed to monitor current / MW capacity of each generator as follows :

| Sl. No. | Unit   | 90% of Current Capacity | MW Capacity |
|---------|--------|-------------------------|-------------|
| 1.      | 12 MW  | 1273 Amps               | 12.4        |
| 2.      | 5.4 MW | 531 Amps                | 5.6         |
| 3.      | 2.5 MW | 260 Amps                | 2.7         |

There by there was substantial improvement in power generation as follows :

| Sl. No. | Unit | Month Average Power generation | Increase in power |
|---------|------|--------------------------------|-------------------|
|---------|------|--------------------------------|-------------------|

|    |              | At power factor of 0.8 | At power factor of 9.5 | generation (MW) |
|----|--------------|------------------------|------------------------|-----------------|
| 1. | 12 MW TG     | 10.5 MW                | 11.2 MW                | 0.7             |
| 2. | 5.4 MW TG    | 4.9 MW                 | 5.1 MW                 | 0.2             |
| 3. | 2.5 MW TG    | 1.9 MW                 | 2.2 MW                 | 0.3             |
|    | <b>Total</b> | <b>17.3 MW</b>         | <b>18.5 MW</b>         | <b>1.2 MW</b>   |

Thus, annual savings = 1200 x 24 x 350 x 4 = Rs. 403.2 Lacs / Annum

## Project No. 2

Optimizing the flue gas losses at CF Boilers I & II to improve the efficiency of boilers resulting in saving the coal.

### Description:

The O<sub>2</sub> meter of the CFB –1 & 2 were provided at the field and not extended to control room. So the O<sub>2</sub> meters were shifted to control room for optimizing the excess air. By rectifying the above measures, boiler efficiency improved to an extent of 0.5% per boiler.

### Basis for evaluation of ideas :

|   |   |                        |
|---|---|------------------------|
| Improvement in Boiler efficiency (@ 5% x 2 boilers)   | = | 1.0%                   |
| % Fuel saving (considering thermal efficiency of 82%) | = | (1 / 0.82) = 1.2%      |
| Annual coal consumption                               | = | 73,634 TPA (two units) |
| Annual coal savings @ 1.2% on 73634 TPA               | = | 880 MT                 |
| Annual Coal savings due to efficiency improvement     | = | Rs. 8.36 Lacs / Annum  |

### Implementation:

Implemented in July 2004

## Project No. 3

Interconnection of old and new cooling towers in ClO<sub>2</sub> section and switching off new cooling tower pump and new condensate transfer pump

### Description :

LP steam is used as the driving media in the ClO<sub>2</sub> Plant to produce chilled water. The LP steam after passing through the jets is condensed in condensers. Cooling tower water is used in these condensers to condense the steam. Two sets of condensers and cooling towers are provided.

One cooling tower is not sufficient to remove the entire heat load of the condenser, due to which the cooling water temperature was not being maintained within limits by one cooling tower, forcing the plant personnel to run the second cooling tower with the set of pumps.

### Recommendation:

It is recommended to interconnect the cooling towers, both at the inlet and outlet.

By doing so, one set of cooling tower pump and condensate transfer pump were not required to run, resulting in energy savings. The following table gives the power consumption by the pumps.

| Parameters            | Old CT pump | Old condensate transfer pump | New CT pump | New condensate transfer pump |
|-----------------------|-------------|------------------------------|-------------|------------------------------|
| Power consumption, kW | 40          | 13.8                         | 47.2        | 15.1                         |

### Savings evaluation :

|  |   |                       |
|--|---|-----------------------|
| Energy savings (by stopping cooling tower pumps)           | = | 62.3 kW               |
| Annual energy saving @6,000 Hr. (Considering 9 months use) | = | 3.73 lakh kWh         |
| Value of energy savings                                    | = | Rs. 4.85 Lacs / Annum |

### Project No. 4

Use of indirect steam-black liquor heater in place of direct steam black liquor heater at L.F.Boiler V to reduce excess heat loss through flue gasses and to recover condensate.

#### Description:

Right now one direct black liquor heater is used to heat up the black liquor in each the LFBs to heat the liquor from 95 to 118°C.

#### Proposal:

The proposal is to use an indirect heater first to heat from 95 to 115°C and the remaining 3°C is to be obtained from a direct heater. This shall reduce the dilution of liquor. Also, recoverable condensate shall be generated which is not the case now. However, additional steam requirement shall be there.

#### Basis for evaluation of ideas:

|   |                  |        |
|---|------------------|--------|
| Dilution in LFB 5   | Kg/h             | 440    |
| Additional Steam generation due to increased BL firing  | TPA              | 3740.0 |
| Additional steam generation at LF Boiler  | TPA              | 3740.0 |
| Steam consumption by indirect heater  | TPH              | 0.691  |
| Excess steam consumption = $(0.691 - 0.44 \times 8500)$   | TPA              | 2333.5 |
| Benefit in terms of coal @ Rs. 240/T steam  | Rs. Lacs / Annum | 9.0    |
| Excess steam used, considering condensate recovery @ Rs. 70/ Ton of condensate = $2333.5 \times (240 - 70)$ | Rs. Lacs / Annum | 3.63   |

### Savings evaluation

|  |                 |             |
|--|-----------------|-------------|
| <b>Net Savings per annum (Rs. Lacs 9.0 – 3.63)</b> | <b>Rs. Lacs</b> | <b>5.37</b> |
|--|-----------------|-------------|

**Amount Saving: 5.37 Lacs per year**

### Project No. 5

Reduction of steam consumption at 5.4 MW T.G.Set by running the generator at 49 Hz. instead of 50 Hz.

#### Description:

Earlier, a frequency of 50 Hz was being maintained on the 5.4 MW.

#### Proposal:

The proposal is to run the generator constantly at a frequency of 49.0 Hz with existing electronic governor. This will reduce condensing load on turbine. Further this additional steam can be passed through turbine and power can be generated. Thus additional power generation which was expected as follows.

**Assumptions/ Basis for evaluation of ideas:**

|                          |      |            |
|--------------------------|------|------------|
| Avg. load on 5.4 MW      | MW   | 5.2        |
| Running days in year     | days | 358        |
| Total generation in year | kWh  | 44678400   |
| Anticipated saving       | %    | <b>3.0</b> |
| Saving                   | kWh  | 1340352.0  |
| Actual savings achieved  | KWh  | 10,20,000  |

**Implementation:**

The project was implemented in three months without any investment.

**Amount Saving:**

Rs. 40.8 Lacs / Annum

**Project No. 6**

Installation of VFD at ID Fan of CF Boiler V resulted in power saving.

**Description:**

The ID fan of CFB-5 having efficiency of 67.5% and damper position is about 67% at near to full load operation. Providing VFD would save energy and more so when it is operated at lower loads hence, VFD was installed.

**Idea Evaluation**

Load taken by motor without V/F drive : 125 amps  
KW load : 73 KW

Load taken by motor with V/F drive : 80 amps  
KW load : 52 KW

Therefore Saving in 73 – 52 : 21 KW

Annual Saving = 21 KW X 8500 Hrs. / Annum x @ Rs. 4 per KWH = Rs. 7.14 Lacs / Annum

**Project no 7**

Use of flash steam by cascading system at three stage (H.P, M.P. L.P.) at air preheater of L.F.Boiler V

**Proposal:**

The proposal is to use the flash steam from HP stage to MP stage and MP stage to LP stage through a cascading system. In addition to the air pre-heater steam the flash from feed water heater steam (MP) will also be used in the LP coils of air pre heater. The last stage flash shall be used in one of the LP coils of the air pre heater. The system shall be based on the use of individual trap for each coil, control valves, pressure transmitters and Flash vessels.

**Basis for evaluation of ideas:**

|                               |         |      |
|-------------------------------|---------|------|
| HP inlet                      | kg/h    | 1000 |
| Sat. water enthalpy at 28 bar | kcal/kg | 237  |
| Sat. water enthalpy at 11 bar | kcal/kg | 190  |
| Evap. Enthalpy at 11 bar      | kcal/kg | 474  |
| Flash steam at 3 bar          | kg/h    | 99   |

|                                |         |      |
|--------------------------------|---------|------|
| Qty left                       | kg/h    | 901  |
| MP inlet                       | kg/h    | 2500 |
| Exhaust from feed water heater | kg/h    | 1200 |
| Sat. water enthalpy at 3 bar   | kcal/kg | 144  |
| Evap. Enthalpy at 3 bar        | kcal/kg | 509  |
| Flash steam at 3 bar           | kg/h    | 416  |
| Qty left                       | kg/h    | 4185 |
| LP inlet                       | kg/h    | 2500 |
| Sat. water enthalpy at 1 bar   | kcal/kg | 120  |
| Evap. Enthalpy at 1 bar        | kcal/kg | 526  |
| Flash steam at 1 bar           | kg/h    | 305  |
| Total flash steam generation   | kg/h    | 820  |
| Run hrs of LFB 5               | hrs     | 8500 |

#### Implementation:

The project was implemented in three months.

#### Saving Actual achieved:

MP steam consumption reduced 1 ton per hour

LP steam consumption reduced 2 ton per hour

**Amount Saving** : 61lakhs per year

#### Energy Conservation Plans and Targets:

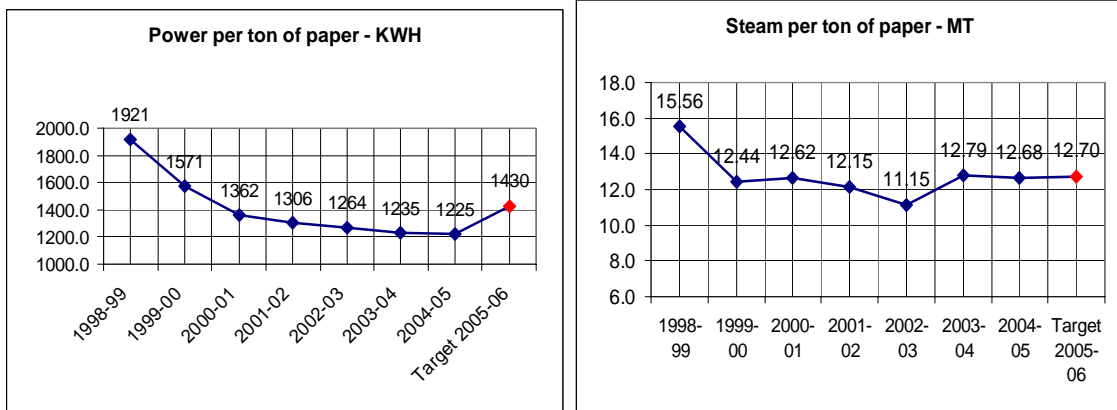
| SI No | Energy Conservation Schemes (in progress)  | Savings in (Rs Lakh) | Investment Rs. Lakhs |
|-------|--|----------------------|----------------------|
| 1     | To provide flash condensing deaerator head in GC tank to recovery flash steam                      | 6.9                  | 1.5                  |
| 2     | Using L.P. Steam instead of M.P. Steam for hot water heater at RDH.                                | 7.5                  | 19                   |
| 3     | To provide flash steam recovery in RDH.  | 35.75                | 18                   |
| 4     | Installation of V/F Drives in PA fan of CFB 5 for draft control                                    | 6.17                 | 10                   |
| 5     | Installation of Solar Heater at Guest House for generating hot water                               | 0.7                  | 1.25                 |
| 6     | Energy saving by installing V/F drive for slurry pumps and stopping ODS pumps with air compressor. | 6.67                 | 12.5                 |
|       | Total  | 63.69                | 62.25                |

| SI No | Water Saving projects (In Progress)  |
|-------|--|
| 1     | The size of backwater line from PM-I to reclamation plant to be increased to increase the pumping quantity (saving expected - 60 M <sup>3</sup> / Hr.) and reduce overflow to drain. |
| 2     | PD Plant backwater line to reclamation plant to be modified (saving expected - 40 M <sup>3</sup> / Hr.)  |
| 3     | Cooling water drain of all feed pumps, sealing water of feed tanks and all other drain water to be collected into a sump and pumped to reclamation plant                             |

|    |  |
|----|--|
| 4  | To arrest the drainage of Paper Machine clarified water and to be reused.  |
| 5  | The Paper Machine Warm water, which is presently overflowing continuously to be recovered & reused.  |
| 6  | To use reclaimed water for Talc preparation and for washing purpose at Colour Kitchen and Coating Machine area.  |
| 7  | Excess warm water (40 M <sup>3</sup> /Hr.) available from Evaporator Plant presently being drained at Causticizing Plant, can be used at DP2 for pulp washing.         |
| 8  | Backwater available pH 9 from post oxygen washer to be used in cleaning of logs at chipper house   |
| 9  | Treated effluent water to be used in washing of logs in place of reclaimed water at Chipper House.   |
| 10 | Warm fresh water @ 80 M <sup>3</sup> /Hr. available from Air Compressor House to be pumped back into 18/21" water mains to conserve fresh water and heat also.         |
| 11 | In PM-5, COL cooling water to be diverted to warm water tank, instead of presently being drained.  |
| 12 | PM-4 & 5 Clarified water to be used in place of fresh water at hydrapulper of PF Plant   |
| 13 | In PM-5 Clarified water can be used for drain jam cleaning in place of fresh water by hose pipe  |
| 14 | The sealing water of Vacuum pumps of Paper Machines 1 to 5 to be cooled at cooling tower, filtered and reused for the system.  |
| 15 | To install V-Notch (90°/60° at various plant drains (including SR Plant) to monitor effluent flow and thereby conserve water to march towards achieving zero effluent. |

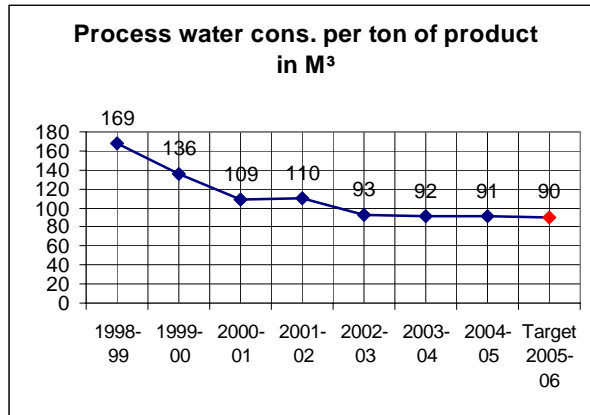
### Our Energy Performance

The power and steam consumption per ton of product for last 6 years is shown below:



### Water conservation:

The Water consumption at Mills have been consistently reducing. The water consumption trend for last 6 years is furnished below:



Presently, JKPM has the lowest water consumption @ 92 M<sup>3</sup> / ton of paper against Indian average of 170 M<sup>3</sup> / ton of paper. This could be achieved by adopting following methods.

- 1) Recycling the hot water through cooling towers.
- 2) Reclamation of Paper Machine Process water after clarification and reusing it in Pulp Mill.
- 3) Use of clarified water at Chipper for raw material washing and floor cleaning instead of fresh water.
- 4) Arresting leakages and spillage throughout the Mill
- 5) Use of surface condenser in place of barometric condenser and use of reclaimed water at barometric condenser in place of fresh water.
- 6) Avoid contamination of generated condensate for reuse in process as hot water.
- 7) Use of evaporator foul condensate in brown stock washing at Pulp Mill and recausticizing sludge washing.
- 8) Use of Treated Effluent Water for land irrigation in place of River & underground bore-well water
- 9) Making people aware about loss in terms of money for water leakages.