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ACHIEVING NEW BENCHMARKS IN FIELD OF ENERGY EFFICIENCY AND SUSTAINABILITY IN PULP & PAPER INDUSTRY

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Abstract:

With the rising cost of energy, total energy consumption is a big cost to the company. A lot of energy is wasted by mean of steam and condensates which makes the overall process very inefficient. These areas of efficiency improvement need to be identified regularly through audits and sustainable actions needs to be taken on observations to improve plant efficiency. The following paper discusses various steps and CAPEX projects taken by the company for energy efficiency. A healthy and safe surrounding and operating environment is the priority for any organization. The industries now invest in equipment and systems which enables them to control their emissions within prescribed government norms. The following paper also discusses those steps.

Introduction

In the race of being an energy efficient organization, all industries are now diverting their thought process towards efficient energy utilization. Opportunity for energy savings lies in supply of steam and power to process units. Proper working of DE superheating system, traps and line insulations should be monitored regularly and continuous improvements should be done in these systems by incorporating new technologies which have been introduced. The clean and safe environment can only be achieved through the target of Zero discharge in all forms of solid, liquid and gas. Also, the industries must promote plantation and have a five-year vision for taking plantation to a next level.

1. Energy Efficiency And Optimization:

The company has been continuously decreasing its specific energy consumption. The company also has the lowest targets in specific energy consumption per ton of paper among agro and wood-based paper Industries. The company is fully committed towards energy conservation and always implements energy conservation projects.

Few implemented and ongoing projects include:

- Installation of HRSCC Clarifier for reuse of Paper machine back water.
- The raw material storage yard lighting system has been provided with automatic ON/OFF sensors.
- Reduction in condensing loads of turbines to improve the cycle efficiency of the turbines.
- Installation of condensate polishing unit for saving of water and steam energy.
- Installation and commissioning of black liquor heating project in pulp mill for saving of LP steam @ 100 TPD.
- Optimization of running of pumps in pulp mill and saving in aux. power consumption @150 KWH.
- Stoppage of one green liquor transfer pump through modification in transfer system from old re-causticizing leading to saving of 264 KWH.
- Annual auditing by CII for identification of energy saving opportunities.
- Minimizing the use of PRDS to save the energy losses within the plant.

Specific energy consumption in terms of TOE/MT of finished production:

Description	UOM	2021-22	2022-23
Specific Energy Consumption	Sec (Mtoe)	0.579	0.372

With sincere energy saving efforts, the company has been able to achieve Y-O-Y specific energy consumption. There has been reduction in specific energy consumption by over 17% from PAT-I to PAT-VII. The company has also won several energy conservation awards at state and National levels.

Case Study:

"Reducing the pulp cost & making system environment friendly by optimizing Steam and Power consumed in producing pulp bleaching chemicals in ECF bleaching".

Most of the Indian paper mills are having non-integrated ClO2 technology due to small size & less availability of power in comparison with Integrated ClO2 plants. High ClO2 cost is major cost concern for paper producers. Technological changes in different areas have helped in optimizing steam, power, and chemical consumption & zero effluent.

Technologic innovations in ClO2 production to make it energy efficient:

MP steam consumption from 8 ton/ton ClO_2 to zero: Replaced the steam ejectors with vacuum pumps in three steps. Now we are running successfully with:

-Zero steam consumption for vacuum generation

-Zero pumping power for supplying water to condenser.

-No chilled water in condenser, which was being used to condense the MP steam.

-Elimination of plant tripping due to MP steam pressure variation.

- **VAM chiller machine design modification:**

  Replacement of MP steam in VAM chillers with LP steam.

- **Steam saving in VAM chiller operation by optimizing water quality:**

  Replacement of make-up water in cooling towers from raw water to soft water.

- **Increasing final ClO2 solution concentration:** By increasing ClO_2 strength in steps from 9-10 gpl to 11.5-12.0 gpl has reduced the demand of chilled water by 15%. Thus reduced the steam and power in VAM chiller by 15%.

- **Increased the concentration of sodium chlorate solution feed to generator:**

  By optimizing the strength of sodium chlorate feed to generator, in the range of 725-750 gpl solution had further reduced 15% water intake in generator and helped to reduce 10-15 % steam consumption.

- **Double filtration design –Key to zero effluent discharge with power, steam saving:** By double filtration of chemical enriched sodium sulphate, total 18-20% sulphuric acid & 0.8% sodium chlorate is extracted and taken back in generator. This has helped to achieve sulphuric acid consumption as 0.760 ton/ton ClO_2 (designed 0.800 ton/ton ClO_2) & sodium chlorate consumption as 1.620 ton/ton ClO_2 (against designed 1.660 ton/ton ClO_2).

- **Steam & chemical saving by producing dry sodium sulphate:** Benefit of producing dry sodium sulphate is:

  - Saving of one ton steam/ton ClO2 used for diluting slurry.
  - Power saved for pumping slurry to soda recovery section.
  - Eliminate the ClO2 plant running dependency on soda recovery running.
  - 99.95% pure sulphate market saleable moisture free, neutral pH product is produced.
  - Zero probability of acidic sodium sulphate to sewer.

Kuantum Papers has also sucessfully comissioned small size film type sulphur burning and sulphur dioxide generation plant which is a state of art of technology which is being used in sugar industry for purification purpose with adding the safety features by our experienced technical team and additional feature of adiabatic cooling of SO2 gas for **minimizing cooling water** requirement, which is key feature of plant.

Benefits of onsite sulphur dioxide generation-

- Decrease in sulphur dioxide cost by 65 % in comparision with purchased liquid sulphur dioxide as transportation and liquifaction cost of sulpur dioxide eliminated.
- Risk of emission to atmosphere reduced to zero in comparision with high pressure liquid sulphur dioxide from cylinders as well as absorption tower.
- No dependency on market.
- Adiabatic cooling system of SO2 gas ,first ever sucessfully adopted helped in minimising cooling water requirement saving pumping cost & water.
- \• Zero logistics for the transportation of SO2 filled/empty cylinders.

Results achieved

- MP steam –In conventional processes ,MP steam consumption /ton ClO_2 is 8 ton/ton ClO_2 reduced to zero in Kuantum.
- LP steam consumption reduced from designed consumption 10.2 ton/ton ClO_2 to 7.6 ton/ton ClO_2.
- Zero effluent target achieved by making total sulphate packed & saleable.
- Environment friendly process –zero SO_2 emission to atmosphere, zero contaminated effluent to sewer achieved.
- Significant saving in power & water by replacing cooling load with adiabatic cooling and reducing pumping activities.

2. Commitment on Green Energy:

Company is committed for optimal utilisation of energy resources by installing state of art energy efficient equipment & adopting various energy conservation measures. Several initiatives have been taken to reduce carbon footprint as mentioned below in bullet points.

- Usage of Bio-fuel such as Rice Husk, Biogas from ETP & Bio-waste materials such as Wheat straw dust, Wood dust & Bagasse pith as a fuels in Power Boilers.
- Installation of Solar lights, VFDs, LED lights, energy efficient motors.
- Installation of state of art CFBC Power Boiler from ISGEC
- Upgradation of Pulp mills & Paper machines to reduce the specific energy consumption i.e. Power & Steam.
- Installation of Energy efficient Centrifugal Air Compressors.
- Replacement of 10MW STG with state of the art 13.5MW latest technology STG from Siemens.
- Saving of 200 kL/day of drained condensates through installation of condensate polishing unit in DM Plant.
- Replacement of fresh water @ 100 TPH with recirculation through newly installed white wate clarifier at paper machine.
- Using of cooling tower blowdown in pulp mill, thus saving 150 m3/day of fresh water.
- Using MB back wash, Anion backwash and sample water in softening plant thus saving of 150 m3/day of soft water per day.

3. Carbon Neutrality And Emmission Reduction:

Kuantum Papers Limited also uses the mill waste as a fuel in boilers for environment cleaning.

- Wood chips dust
- Bagasse Pith
- Wheat Straw Dust
- Utilization of ETP sludge for board making
- Boiler fly ash generated is 100% used in cement plants.
- With all boilers equipped with ESPs the company is committed towards reduction

in emission. The high pressure CFBC boiler is equipped with 5 field ESP and setting a benchmark for achieving emission below 30 mg/Nm3.

- Installation of bag filters in lime go down for arresting of dust in environment.
- Installation of white-water clarifier at paper machines for recirculation and replacement of freshwater consumption.
- In ETP, there are two types of streams, which are identified as,

1. Low COD stream- The Low COD streams (PM-1,2,3,4 & Recovery boiler & PCC Plant) go under Aerobic treatment which consists of Primary, Secondary (ASP, Activated sludge process) & tertiary treatment.

2. High COD stream- The High COD streams (Wet washing) go under anaerobic treatment, which consists of UASB followed by aerobic treatment (pre-aeration & ASP), Secondary treatment & tertiary treatment.

The company is also planning to install two numbers of white-water clarifiers with upgraded HRSCC technology.

Benefits: -

- Recirculation of backwater at paper machines
- Water reduction and replacement of fresh water
- Minimizes dewatering cost of downstream equipment and reduces load in ETP
- Consistent treated water quality for recirculation

Kuantum Papers has taken several initiatives by strengthening the effluent treatment plant and addition of various equipment primarily with the objective of better water clarity and recycling of the water in the process for reduction of effluent load to ETP.

4. RESEARCH AND INNOVATION:

- The company has upgraded the existing Effluent Treatment Plant with an objective of sustaining parameters of treated effluent as well as to be 'future ready' to meet all Environmental norms. The treated effluent is used to irrigate almost 3,300 acres of fields in the surrounding villages, through a network of pipelines laid by the Company at its expense.
- Social, Farm and Agro forestry programmes are green sustainable initiatives undertaken by paper companies to contribute to the small and marginal farmers having barren, unutilized, non-fertile land, apart from providing a catalyst to deforestation.
- These initiatives also contribute to securing raw materials within a specific radius, hence reducing the overall manufacturing costs, and highlighting a dependency on multiyear resource visibility.
- Kuantum has successfully launched its **Social-Forestry Plantation Project** and is producing quality clonal plants of Eucalyptus and other pulp wood species like Poplar, Casuarina, Subabul & Melia and over the years has covered approximately **7060 acres** area under clonal plantation as on date.
- We aim to increase our footprint to almost **1 crore** saplings per annum in the next **3-4 years** to ensure a sustainable source of wood material.

5. RESULTS & CONCLUSION:

- Y-O-Y specific energy consumption. There has been reduction in specific energy consumption by over 17% from PAT-I to PAT-VII.
- Saving of 100 TPD of LP steam through installation of black liquor heat recovery system.
- Saving of 2000 KL of fresh water through in house utilization of wastewater through various water saving projects.
- Achieving benchmark emission norms in below 30 mg/Nm3 in high pressure boilers.
- Saving of energy as well as zero emission in ClO_2 plant through energy saving initiative in ClO2 plant.
- Saving of 60 TPD fossil fuel consumption through in house utilization of waste generated.
- Saving of 200 kL of drained condensates in DM plant through condensate polishing unit.
- Yearly plan and implementation for increasing plantation to 1 Cr. In next 3-4 years.