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GREEN ENERGY A REALITY FOR INTEGRATED PULP AND PAPER MILL

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Abstract:

The Pulp and Paper Industry (PPI) is an energy intensive sector and approximately 6% of global industrial energy is consumed by Pulp & Paper industry. Lot of fossil fuel is consumed in the form of coal, petcoke, FOC, Petrol and Diesel. Decarbonisation has gained immense important with recent India's commitment in UNFCCC (United Nations Framework Convention on Climate Change) towards the goal to achieve net zero emission status by 2070 and the intermediate goal to achieve 45% reduction in carbon emission by 2030. Despite of so many initiatives still Pulp and Paper mills depend on fossil fuel and emit significant amount of both biogenic and fossil carbon dioxide (CO2). To meet global climate objectives and to increase sustainable growth, the use of advanced technologies and renewable resources in the industrial sector is crucial. Now industries worldwide are devising and implementing bioeconomy strategies to initiate transformation towards sustainable future. Vision of the future bioeconomy, however, tend to rely on strong assumption about the economic, social, and environmental sustainability of bio-based and development of some break-through non-carbonic technologies.

Pulp and Paper Industry (PPI) is producing large amount of energy using biomass and there are possibilities for renewable energy production, which will play a vital role for the sustainable energy generation. Over the last three decades, Pulp and paper Sector in India has reduced the GHG emissions significantly by means of various technological upgradation, Policy interventions, energy efficiency, use of low carbon technologies. switching to clean fuel, renewable energy, alternative source of energy and raw material etc.

Pulp and Paper Industry has great potential to contribute carbon dioxide emission reduction worldwide and the share of fossil fuel can be decreased through increasing use of biofuel and self-generated green electricity through new out of the box technologies.

This article highlights, how to achieve zero fossil fuel use through use of bioenergy, new technology adaptation and process changes in an integrated Pulp and Paper Industry.

Key words: *Paper industry, sustainable, fossil fuel. Decarbonisation, Green energy, energy security, biofuel.*

Introduction:

Energy is the most vital for the development of the world economy as well as human society. Pulp and Paper Industries (PPI) is also part that journey which consume approx.6% of global industrial energy. Most of the energy requirement of this PPI industry is still fulfilled through burning of fossil fuel. Fully decarbonization is the crucial for the climate change and sustainability. The Pulp and Paper Industry is a large energy producer as only part of the initial biomass is turned into final products. Most of the side steam is converted into energy. It means PPI has good possibilities to increase renewable energy production, which play a crucial role in the sustainable energy transition.

The energy demand and total energy emissions for the Indian PPI sector is estimated to reach 12.62 mTOE and 42.87 MtCO2 respectively by FY 2030-31 under normal business scenario. As per BEE study to assess the NDC goals, PPI has to make potential contribution of emission reduction of about 39.7 MtCO2 by FY 2030-31. To achieve the stringent goal, PPI in India has to adopt different energy saving approaches as well as alternative sustainable energy sources.

Indian PPI has already taken up different initiatives to reduce its overall environmental footprint through process optimisation, utilisation of biomass for power generation, use of alternative energy sources and waste minimisation.

This paper highlights how the PPI can reduce the GHG emission by reducing the fossil fuel use to net zero. Also, other alternative

green and sustainable energy source which may eliminate the use of fossil fuel. We at JK paper committed to completely stop the use of fossil fuel by 2030 under Tagline "ZFF2030".

1. Present Green Energy Sources in PPI

1.1) Energy from Burning Lignin (Residue after chemical pulping):

Approximately 25-30% of wood mass contains lignin. Which is a colouring material and gives strength and external microbial attack to wood tree. This lignin is separated during pulping and later burnt through recovery boiler to generate energy in integrated PPI. This is the main source of green and sustainable energy source in integrated pulp and paper mill.

1.2) Methanol recovery from SOG

Recovery of methanol from stripped off gases (SOG) separated from foul condensate. This initiative also reduces foul smell from surrounding drastically. We are at JKPM, first in Indian Pulp & Paper industry to install methanol plant to recover the methanol. The recovered methanol is mainly used as lime kiln which replaced the use of furnace oil. This is a green initiative to reduce the use of fossil fuel.

1.3) Other green Energy source used in PPI i.e. wood dust and rice husk:

In integrated PPI 2.5-3.0% wood dust is generated during wood chipping. This wood dust is used along with coal in CF boiler. Similarly rice husk also used an energy source alternate to fossil fuel. These are energy source is alternate to coal is sustainable. This green energy source is having higher gross calorific value, low ash as well as low sulphur contain. Low ash content means low solid waste generation.

2. Innovative approach to make process more energy efficient

2.1) LTRC (Low Temp Heat-Recovery Colum) at ESP Outlet of CF boiler:

LTRC-equipment is a heat exchanger designed to recover heat from flue gas through Convective mode. Hot flue gas passes over the tube-bundles, and the heat is transferred from the gas to the water flowing inside the tubes. The tubes have special MOC that can withstand the corrosive effects of acid dew points, which are likely to be present in the flue gas while the ducts are coated with special heat and corrosion-resistant paints to protect from the harsh environment. We are at JKPM, first in Indian PPI industry to adopt this process.

Photo-1: Multi evaporator with LF boiler

Photo-2: Methanol Generation Plant

Photo-3: Wood dust and Rice husk

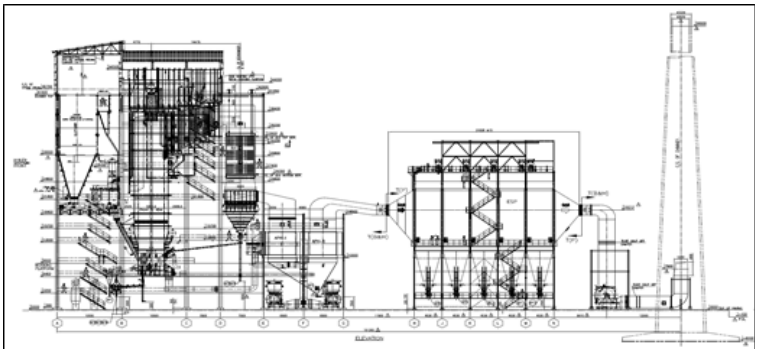


Photo-4: LTRC (Low Temp Heat-Recovery Column

2.2)Centralised refining system:

Pulp refining is highly energy intensive process. Earlier there is separate refining system for each machine. Centralised refining system is replaced with combining all into one. Due to the modification huge amount of energy is saved.

2.3)Micro Turbine TG

At pulp mill, due to high pulp production form its design capacity, rendering to high steam production at recovery boiler. To utilise the excess steam a micro-Turbine was installed which resulted in coal saving and improve the renewal share.

3.0) Other Source which can be used for the alternative to fossil fuel

3.1)Brown and white sludge

Brown and white sludge are the solid waste generated during paper making. This sludge contains around 40-50% of inorganic material and 50-60% organic matter mainly fibre, lignin, and starch etc.

3.2)Bark and other wood residue

Generally, hardwoods are used without bark for pulping hence wood is debarked before it is taken into process. Hardwood generally contains 8-10% of bark. Similarly other parts of wood like leaves and small branched which are also generated during the harvesting of wood for the pulping. This entire wood residue can be used as an alternative green fuel, which has less ash content as well as high calorific value compared to fossil fuel.

Photo-8: Wood Bark

3.3) Cashew nutshell and oil

Cashew nutshell is separated during separation of cashew nut. Later oil is extracted from this shell. Both the oil and oil extracted shell can be used as fuel replacing fossil fuel. Ash and sulphur content is very low in oil and calorific value is very high and like furnace oil.

Photo-9: Cashew nutshell oil

Photo 5: Centralised Refining System

Photo 6: Micro TG

Photo-7: Brown and white sludge

3.4)Solar Energy/Wind Energy

Another sustainable energy source which can be used in PPI is solar and wind energy. There is no doubt that the sun can generate huge amount of energy and it is used not only to power for home only but paper industry also making good use of it. Certain operation in pulp and paper industry has usual demand when it comes to power supply. There are many paper mills in India that they are now supplementing their operations using solar energy. Similarly, generation of wind power and its application also be possible in PPI. For sustainable business adaptation of solar and wind energy replacing fossil fuel another option for reduction in GHG.

Photo-10: Solar/Wind Energy

3.5) Hydrogen as alternative Energy source for PPI

Currently, there is virtually no hydrogen production in pulp and paper mills. Some mills consume hydrogen very litter ie less than 2% of their energy requirements. Different study stated that Pulp and paper mill can be suitable for the generation of hydrogen from renewable energy.

However, reducing greenhouse gas emissions isn't its only advantage. Green hydrogen also promotes energy security. As industries reduce their dependence on fossil fuels, their energy security increases.

4.0 Our journey to eliminate fossil fuel:

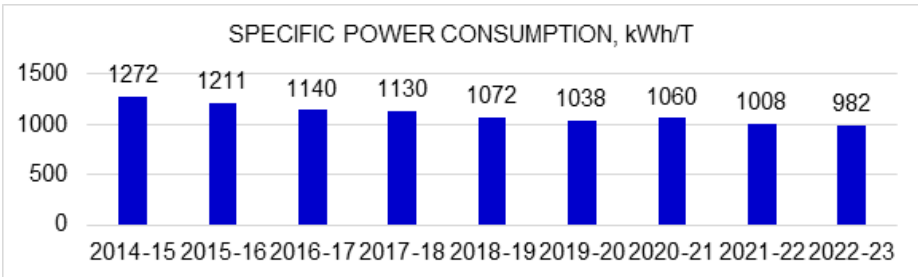
We at JKPM improved our Energy efficiency through innovative approaches. At present approx. 68% of our energy requirement is fulfilled through renewable sources. Below trend indicates our commitment towards use of renewable and sustainable energy sources for fulfilling energy requirement and reduction in fossil fuel use.

Conclusion:

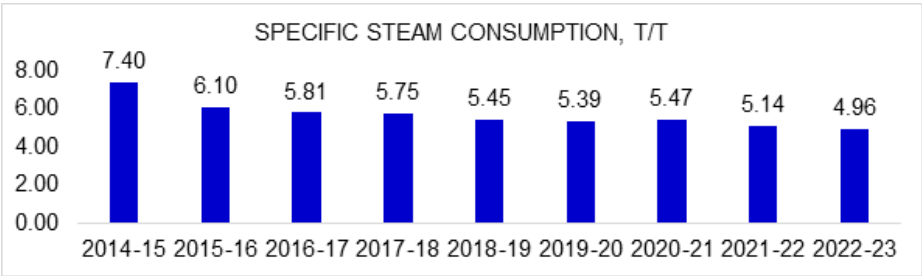
Pulp and Paper Industry in India has already responded to the need of energy transitions by improving energy efficiency, switching bio-based fuel, and increasing on site renewable energy production. The transition to more sustainable operation is important for achieving global as well as regional carbon dioxide reduction target. This sustainable operation also promotes the circular economy in the industry.

We in JKPM, at we already fulfil more than 70% of our energy requirement from renewable sources and our target to complete elimination of fossil fuel from the manufacturing process is 2030.But if our progress is evaluated then, we can say that we will achieve the target much before the target fixed,

Photo-11: Solar Energy



Graph 1: Trend of specific Power consumption per ton of paper



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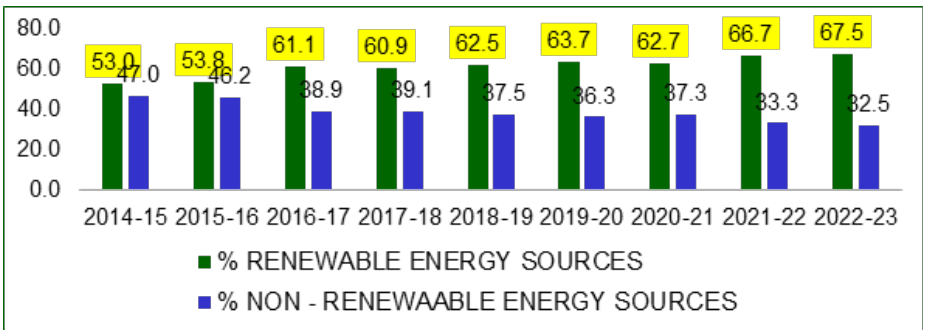

Graph 3: Trend of renewable Energy Sources

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