An Expedition On Energy And Environment At SPB Ltd

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ABSTRACT

Energy has always been a vital resource in the development of any nation. The prosperity of a nation is measured in terms of per capita energy consumption besides GDP, GNP, etc. While the world has seen hectic industrial activity in the past century it has also come face to face with serious problems arising out of haphazard utilization of the energy resources. There are also many environmental issues with energy, largest being climate change due predominantly to the burning of fossil fuels and the direct impact of greenhouse gases on the Earths environment. Hence Energy Management has become a major concern in today's world. Rapidly advancing technologies can achieve a transition of energy generation, water and waste management, towards better environmental and energy usage practices using methods of systems ecology and industrial ecology. SPB has shown significant improvements in Energy and Environment management by way of adopting innovative energy efficient technologies in practice.

Introduction

Purchased energy and energy-related capital investments represent major production costs in the Pulp and Paper industry. The variety of corporate philosophies and structures across the industry preclude generalizations about how decisions are made relating to these costs. Reducing process energy needs also has some important cascade effects. It directly leads to reduced environmental impacts. It also facilitates quantum improvements in cogeneration technologies for on-site heat and power generation. It is worth to mention here that Paper plant is both Steam and Power intensive and hence requires more attention in both the areas. The paper aims in bringing out the stages of improvement in the energy scenario at SPB.

Power - Steam Island

The energy scenario in SPB has found a vast improvement after the commissioning of the High Pressure Captive Cogeneration Plant. The state of the art High Pressure Steam Cogeneration Plant was put up in the year 2005, mainly with a view to reduce specific steam consumption and to achieve quantum jump in overall cycle efficiency of the cogeneration plant.

As part of CPP, SPB commissioned 117 TPH coal fired (Atmospheric Fluidized Bed Combustion) boiler generating very high pressure steam (105 kscg, 510°C) along with a 21MW Double extraction condensing turbine.

A criterion for efficient cogeneration is

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to maximize net available power by minimizing station power consumption. Station power reduction is achieved in SPB through following means:

- Energy efficient pumps
- Energy efficient fans
- Energy efficient motors
- Installation of Variable Frequency Drives (VFD)
- Total CPP on DCS with auto controls / management

Mill Development Plan

SPB embarked on a "Mill Development Plan" (MDP) in 2006.The primary objective of this is to improve energy and environmental performance. As part of MDP, SPB has;

- Installed a New Modern Hard Wood Pulp Mill of 400TPD Capacity with RDH **Double Displacement Cooking** from GL&V USA, with Oxygen Delignification followed by ECF Bleaching with D0/EOP/D1 sequence to meet brightness level of 87+.
- Replaced two old Evaporator streets with Single Street Free Flow Falling Film with Water Evaporation Capacity 200T/hr from M/S Alfa Laval India.
- Replaced two inefficient Chemical Recovery Boilers operating at low pressure with One Single Chemical Recovery Boiler from M/S Enmas Andritz India with a capacity of 600 / 900 TPD at 64 ata pressure.
- Replaced old smaller TG sets with Single Extraction cum Back

pressure turbine of 16MW from M/S BHEL India.

- Retrofitted causticizing section with WLCD
- Installed Rotary Lime Kiln of 140/200TPD from M/S FLS India
- The Whole MDP is operated through C300 Honeywell DCS

As a result of MDP, dependence on grid power has been avoided because of the New Black Liquor based Cogeneration Plant.

Case Study - Energy Saving in New Pulp Mill

SPB has installed a fiber line in which hot and highly alkaline effluent of pH: 11 at a temperature of 80^{0}C is generated. This needs to be discharged to the ETP after cooling and neutralization.

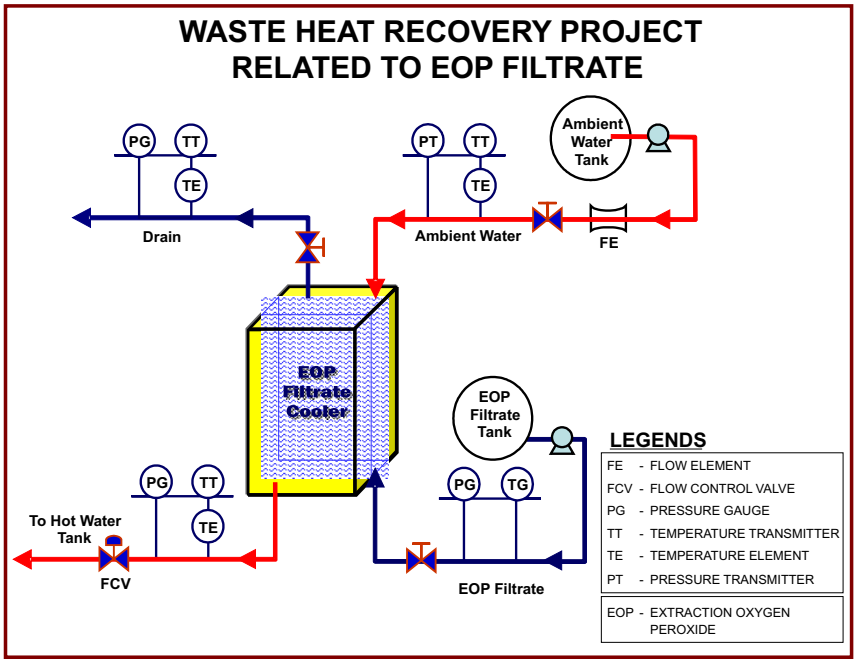
Conventional Practice in Vogue

- Conventional method is throwing the hot effluent stream to the cooling tower for effecting temperature reduction. This causes increased electrical energy consumption, as well as the inherent possibility of volatilization of organic compounds prior to treatment in the effluent treatment plant and their releases into the atmosphere.
- Alternative is to dilute the hot effluent with other streams or with fresh water before discharging the same. This would result in loss of heat as well as additional water consumption.

Instead, as part of Energy conservation activities, the heat in the effluent is recovered by the Wide-Gap Plate Heat Exchanger and is used to generate hot water for the process. Alfa Laval (Sweden) had come out with a special design in the style of Wide Gap Plate Heat Exchangers for handling fibrous fluids and fine particulates in the hot stream. This effectively reduces LP steam consumption which would have been used otherwise for process heat generation. Hence, the project activity essentially saves LP steam. The HRU was assembled in ALIL Pune works, though the SS plates of special design were imported from Sweden.

Technical Specifications

Sl.No	Description	UOM	Hot Side	Cold Side
1.	Fluid		Effluent water	Mill Water
2.	Density	Kg/m^3	985.2	990.10
3.	Specific Heat Capacity	Kcal/kg^{0}C	1.00	1.00
4.	Thermal Conductivity	Kcal/mh^{0}C	0.556	0.544
5.	Viscosity Inlet	cP	0.353	0.736
6.	Viscosity Outlet	cP	0.654	0.484
7.	Volume flow rate	m^3/h	75.0	125.0
8.	Inlet temperature	^{0}C	80.0	34.0
9.	Outlet temperature	^{0}C	40.0	57.85
10.	Pressure drop	Kg/cm^2	1.38	0.8
11.	Heat Exchanged	mcal/h	2955.6	
12.	L.M.T.D	K	12.36	
13.	O.H.T.C Service	Kcal/m^{2}h^{0}C	3187	
14.	Heat Transfer Area, Effective	m^2	75.05	
15.	Rel. Directions of Fluids		Counter Current	
16.	Number of Plates		97	
17.	Number of Passes		8	3
18.	Plate Material/ Thickness		ALLOY 316/0.60 mm	
19.	Sealing Material		EPDM	EPDM
20.	Connecting Material		SS 316 lined	SS 316 lined
21.	Design Pressure	atg	6.0	6.0
22.	Test Pressure	atg	7.8	7.8
23.	Design Temperature	^{0}C	100.0	100.0



Benefits of the project:

Benefits accrued through the project are listed below;

- Drastic Reduction in L.P. Steam Consumption (~2.1TPH)
- Reduction in Coal consumption leading to indirect avoidance of environment destruction and pollution associated with coal mining and coal transportation.
- Effluent Dilution Avoidance
- Cooling Tower Avoidance
- Non-Release of Hazardous Volatile Organic compounds [HVOC] to Atmosphere
- Thus Benefit of Heat & Water saving ensured
- Reduce maintenance Cost

Also, the project reduces coal consumption by reducing specific steam usage and lessens emission from coal usage thereby leading to indirect avoidance of environmental destruction and pollution associated with coal mining and coal transportation. With such unique reasons, the project clubbed with some other initiatives are under consideration for carbon credits.

Points to Ponder

1. Selection of Heat Exchanger should be done with utmost care. Usual shell and tube Heat Exchanger cannot be used as the filtrate would contain fibers and fines
2. Wide Gap Plate Heat Exchanger is very expensive
3. More over EOP filtrate tends to scale a lot and hence it is required to use de-scaling chemicals which are very costly.

Other Innovative Projects Impemented

SPB gives lot of importance to innovative projects focused on energy conservation. The list of projects include;

- Replacement of higher capacity pump with Energy efficient Feed Water Pump for Boiler 10
- Pulp refining to be centralized in PM5 complex using the existing large refiners. This would result in stoppage of many small refiners in PM (1-4) complex.
- In MDP Pulp Mill, the steam consumption is brought down by decreasing the heat input to the system. This is achieved by deliberate study of the entire system and thereby reduction in temperature of the system intact.
- Many energy efficient and environment friendly projects are being accomplished which are also under the process of CDM registration. They are;
  - Blow Heat Recovery system in New Pulp Mill
  - Waste heat recovery from EOP filtrate
  - Steam consumption optimization in ClO_2 plant
  - Heat recovery from evaporator condenser return water
  - Replacing furnace oil with woody charcoal in lime kiln
  - Replacing anaerobic lagoon with anaerobic digesters to capture methane which is let into atmosphere and replace part of the furnace oil in lime kiln.

SPB also uses renewable energy sources like solar lights in the guest house area. The canteen hot water usage is met with solar water heaters. SPB is also looking for biogas generation from canteen waste, residential colony wastes etc to be used as replacement of non-renewable fuels.

Conclusion

Thus Energy Conservation in SPB is a daily, routine activity. SPB concentrates more on such innovative projects like heat recovery from waste stream i.e., Wealth from Waste. SPB has a separate "Energy Cell" which constantly discusses with the departments about energy conservation opportunities and implements the measures for energy conservation. With the stabilization of operation of new technologies, SPB aims to be one among the most energy efficient paper mills in the country.

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