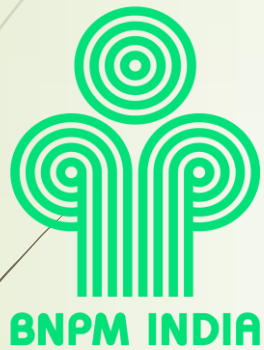


HEAT RECOVERY FROM PULP MILL EFFLUENT AND AIR COMPRESSOR SYSTEM



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Bank Note Paper Mill India Private Limited

(JV of SPMCIL, A Govt of India Enterprises & BRBNMPL- A Subsidiary of RBI)

BNPMIPL

- ▶ **Bank Note Paper Mill India Private Limited has been incorporated and registered on October 13, 2010.**
- ▶ **BNPM is a Joint Venture between Security Printing & Minting Corporation of India Limited (SPMCIL- A wholly owned Public Sector Undertaking of Government of India under Ministry of Finance).**
- ▶ **The paper mill has commenced its production from 9th November 2015, installed capacity of 12000 MT per annum.**
- ▶ **BNPMIPL has achieved 133% efficiency within a span of 2 years by adopting various process improvements.**


Abstract

- The temperature of pulp mill effluent which is going to effluent treatment plant (ETP) is 70 – 75°C, due to Which the biological treatment of the effluent is severely affected.
- Waste heat from pulp mill effluent can be recovered and used as boiler make up water and to cater the hot water requirement of paper mill to reduce process steam requirement.
- Oil in the air compressor system get heated up to 100°C and same is being cooled in after-cooler to bring down the temperature.
- Instead of rejecting heat to surroundings for cooling the oil, thermal energy is being transferred to condensate water. The temperature of condensate can be enhance from 65°C up to 85°C, there by additional steam requirement for heating condensate water can be reduced.

HEAT RECOVERY FROM PULP MILL EFFLUENT

- Study was conducted to identify the hot water requirement in plant. About 165 m³/day of hot water is required in entire plant at different temperatures.

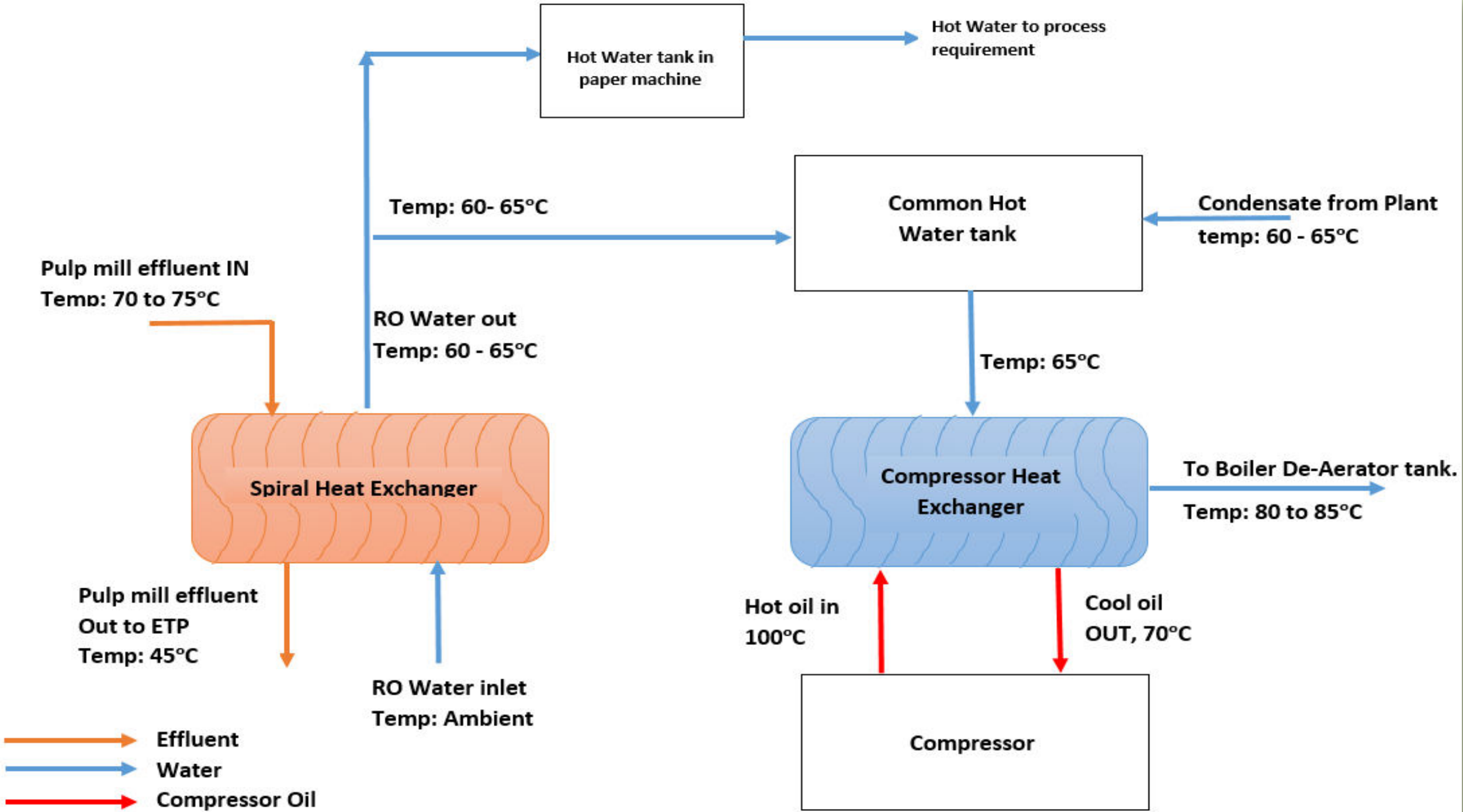
Location	Requirement (m ³ /day)
Makeup water to boiler	40
Sizer roll shower	25
PVA batch cooking	5
CMC filter flushing	5
PVA dilution & transfer and cleaning	45
Broke preparation	35
Miscellaneous uses	10
Total hot water requirement for process	165

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- **Steam is being used for heating water for process use. Instead of steam, hot water having temperature of about 60 - 65°C from the spiral heat exchanger is used.**
 - **Existing steam supply network is kept intact, additional heat requirement if any on and above the 60°C can be fulfilled by using steam.**
 - **The pulp mill effluent contains lot of dirt & fibres, Suitable vibrating screening machine was installed (Make: Russel Finex Ltd.) for separating suspended solids like dirt, fibre etc. from pulp mill effluent prior fed to spiral heat exchanger.**
 - **About 160 M3 /day of process water is being heated up to about 60°C, which resulted in reduction of about 8000 kgs steam consumption on regular basis.**

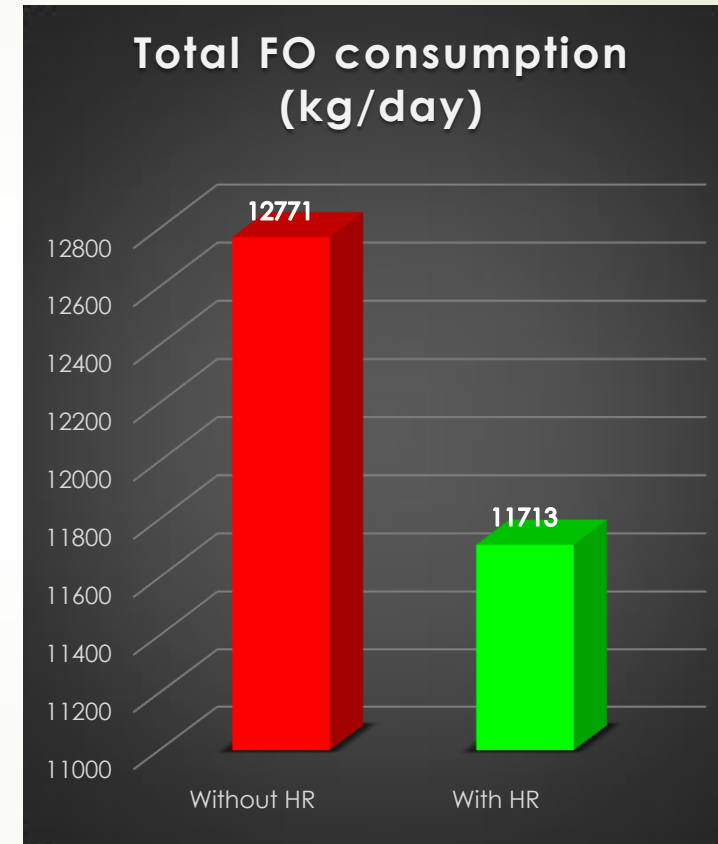
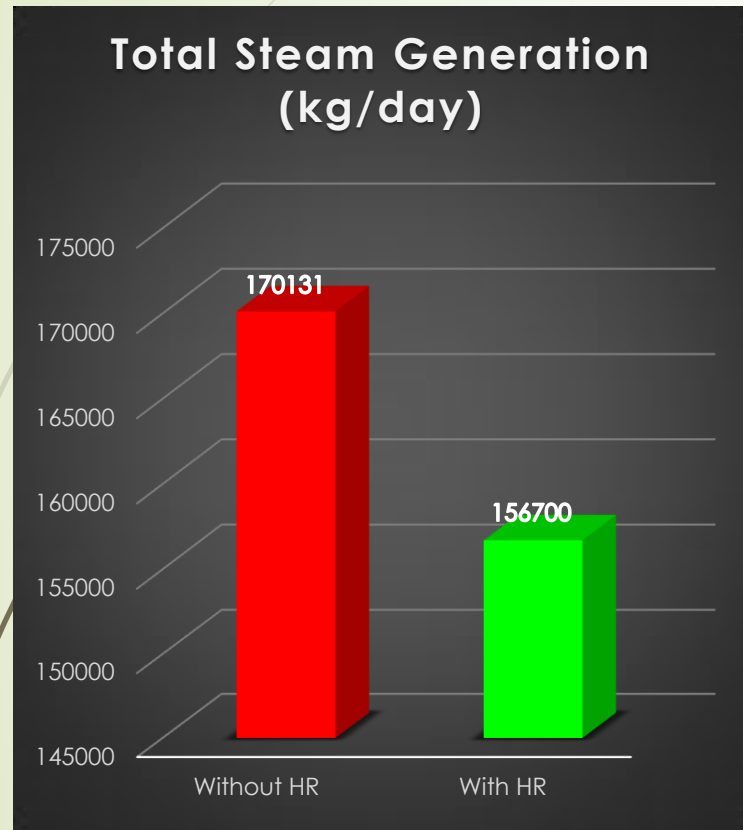
HEAT RECOVERY FROM COMPRESSED AIR SYSTEM

- ▶ **The condensate water return from plant is at a temperature of about 65°C. Condensate water and part of hot water having temperature of about 65°C taken from spiral heat exchanger (as boiler makeup water) is collected in common tank.**
- ▶ **The condensate & make up water so collected is passed through the compressor heat recovery unit (Plate Heat Exchanger) where the temperature of condensate is raised up to 85°C from 65°C and sent to boiler. About 160 m³/ day of water is passed through the compressor heat exchanger for raising the temperature to 85°C from 65°C.**
- ▶ **Due to this project, steam consumption has reduced by about 5,000 kg.**

Total Steam reduction from both the projects is about 13000 kgs / day

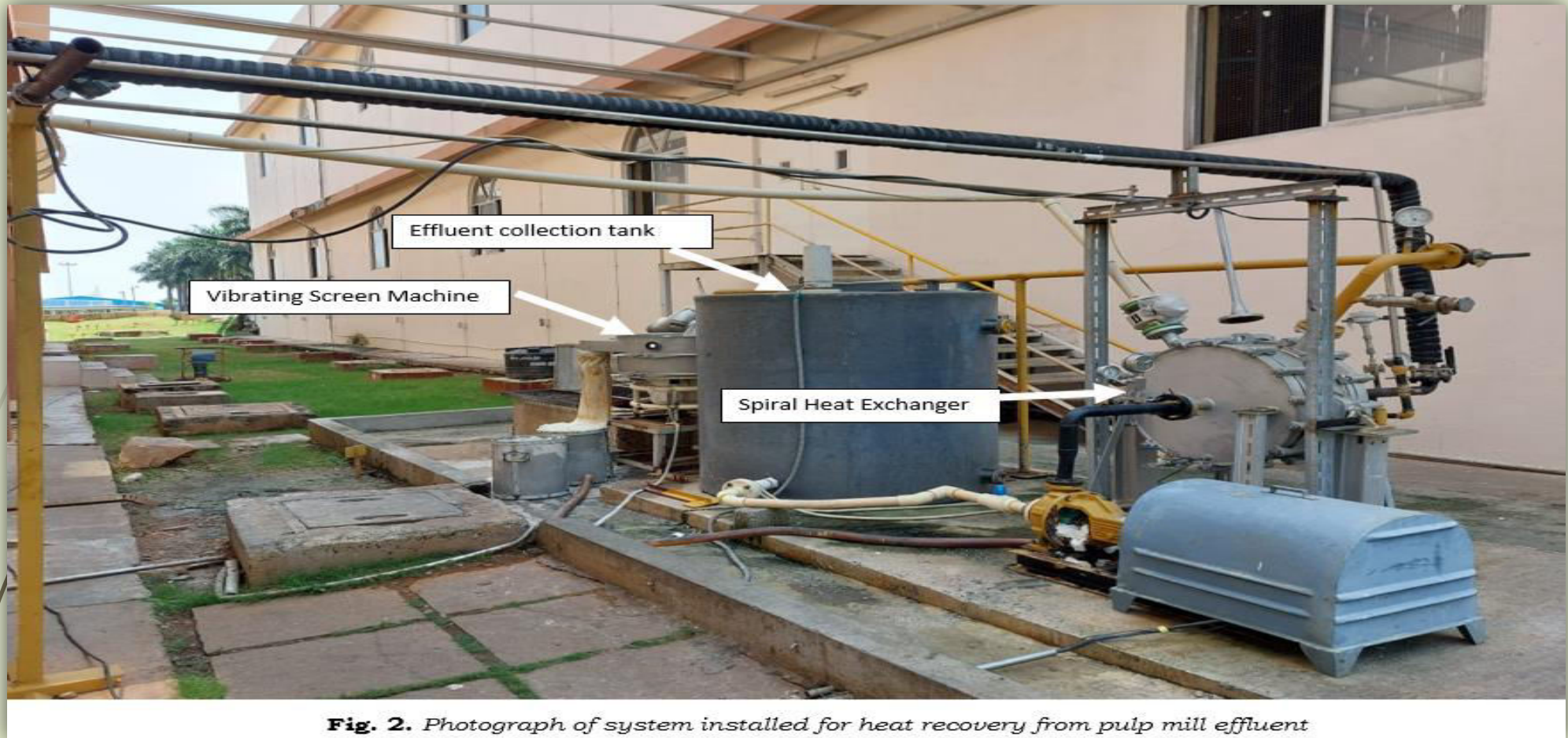


DETAILS OF AVERAGE STEAM GENERATION AND AVERAGE FO CONSUMPTION WITH AND WITHOUT HEAT RECOVERY UNITS DURING THE TRIAL PERIOD WITH SIMILAR PRODUCTION PATTERN.



Graph of reduction in steam generation and Furnace oil (FO) consumption achieved by installation of the above mentioned heat recovery systems.

PHOTGRAPH OF HEAT RECOVERY FROM PULP MILL EFFLUENT



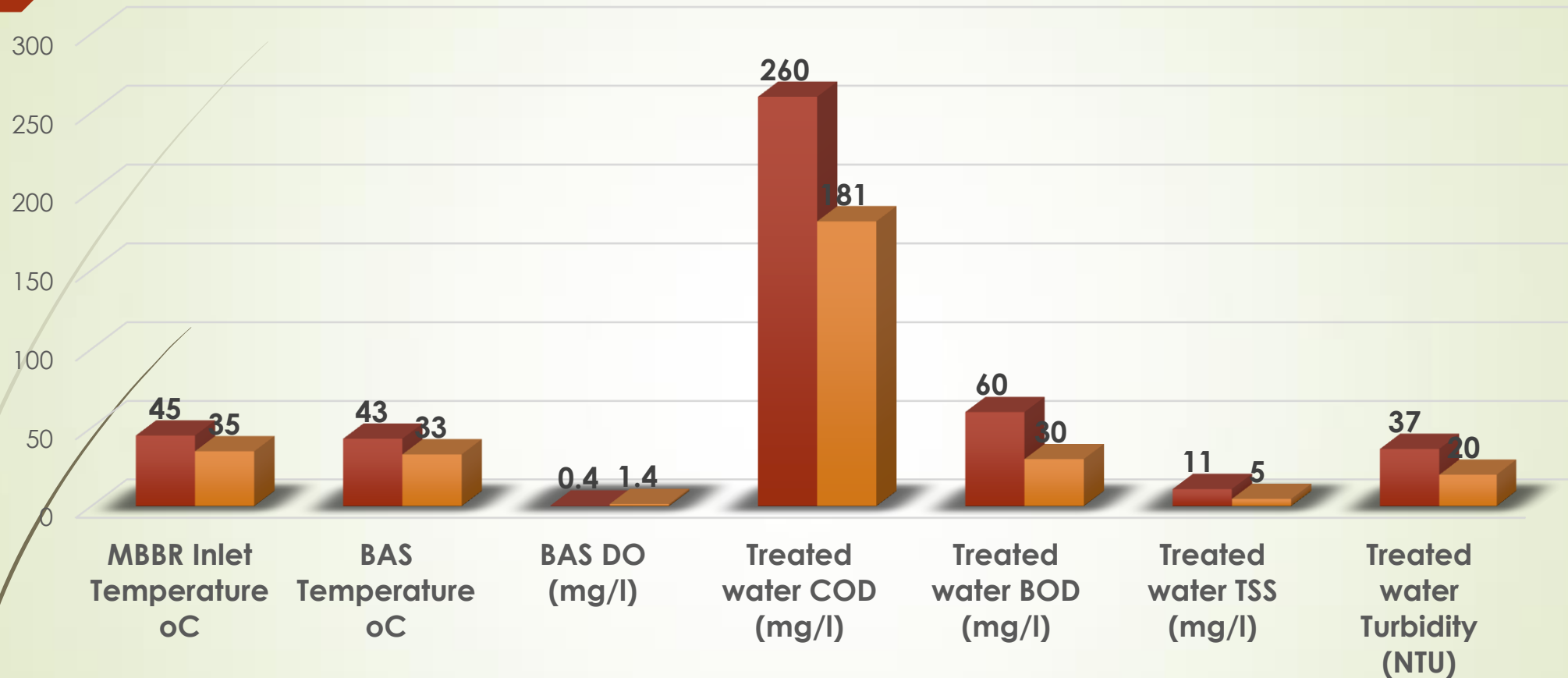
- The project was successfully commissioned on October 2020, and it is found that about 8,000 kg of steam has been reduced on regular basis.

PHOTGRAPH OF HEAT RECOVERY FROM AIR COMPRESSOR SYSTEM



The project was successfully commissioned on Sept 2022, and it is found that about 5,000 kg of steam has been reduced on regular basis.

Process improvements achieved at ETP due to introduction of heat recovery from Pulp Effluent




- Average parameter values before Heat Exchanger
- parameter values achieved after Heat Exchanger installation

RESULTS

Trial was conducted for 5 days without heat recovery and subsequently compared with system after incorporating all heat recovery systems as cited above. Following benefits were observed from the trial.

- ▶ By supplying hot water to meet the plant requirement, about 8,000 kg of steam consumption was reduced.**
- ▶ By increasing the temperature of condensate water from 65°C to 85°C in compressor heat recovery system, about 5,000 kg of steam consumption was reduced.**
- ▶ Overall, about 1,000 kg of furnace oil (FO) consumption was reduced with the implementation of above projects.**
- ▶ Average cost of FO (Furnace oil) is about Rs. 50 per kg, accordingly the saving on regular basis is about Rs. 50,000/-; annual saving is about Rs. 1,65,00,000 (Rupees one Crore sixty Five lakhs).**

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- **Temperature of effluent has been reduced and now the temperature of effluent in aeration tank is about 35°C, which is conducive temperature for biological treatment for achieving desired BOD and COD reduction.**
 - **About 7-8 % of steam consumption has reduced.**
 - **Every kg of FO generates about 3.11 kg of CO₂, accordingly about 1,100 MT of CO₂ emission reduction is achieved annually apart from huge reduction in SO_x & NO_x. Combustion of FO leads to generation of gases having high potential for ozone depletion and which have global warming potential. Hence by reducing FO consumption, reduction in release of corresponding quantities of combustion by-products like CO₂, SO_x, NO_x etc. was achieved.**



Thank you

