THAI KRAFT PAPER INDUSTRY COMPANY LIMITED

Waste Heat Reuse from Flash Tank to Reduce the Moisture Content in the Bark and Sludge before it is used as Boiler Fuel

SUMMARY OF THE OPTION

Thai Kraft Paper Industry Company Limited (TKIC) was founded in 1991, is located in Kanchanaburi in Thailand and produces more than 550,000 ton of paper per year.

During the energy assessment, the Team found that large amounts of heat is lost in Boiler no.14 due to the high moisture content of the biomass fuel used. The plant modified the sludge dryer unit by utilizing the waste heat from the flash tank to reduce the moisture content in the bark and sludge before feeding it into the boiler as fuel.

Investment costs were US$ 5460, annual savings are $13,636 and the payback period was 6 months. Each year, 441 tons of coal is saved, which results in greenhouse gas (GHG) emission reductions of 816 tons CO2.

KEY WORDS

Pulp and paper, Thailand, Waste heat recovery, Boilers and thermic fluid heaters, Flash tank

OBSERVATIONS

The following observations were made:

- There is a substantial amount of heat loss in Boiler PB # 14 due to the high moisture content of the biomass (bark and sludge) fuel used. The moisture content inside the fuel feeding conveyor is approximately 60-70%.
- PB#14 is the largest boiler on site, consuming more than 30 tons of fuel per hour to produce 150 tons/hour superheated steam at 105 barg, 505°C. Fuel used in PB#14 comprises of sub-bituminous coal, lignite, and a mixture of bark and sludge.
- Sludge (obtained from the wastewater treatment plant) is partially dehydrated by a belt press and a screw press. The moisture content of the belt-pressed sludge is 70-75%, versus 60-65% in sludge from the screw press. The Wastewater Treatment Plant produces about 80 tons (BDT, Bone Dry Ton) of sludge (NCV=3600 Kcal/kg BDT) per day.
- A daily mixture of about two hundred tons of bark (NCV= 4300 Kcal/kg-BDT) and sludge (with a combined moisture content of about 50%) is fed as fuel for PB#14 per day. The balance is made of 550 tons coal per day (GCV= 6000 Kcal/Kg).

The reduction of the bark and sludge moisture content is considered to have high potential of reducing boiler losses, in other word increasing boiler efficiency, during firing.

OPTIONS

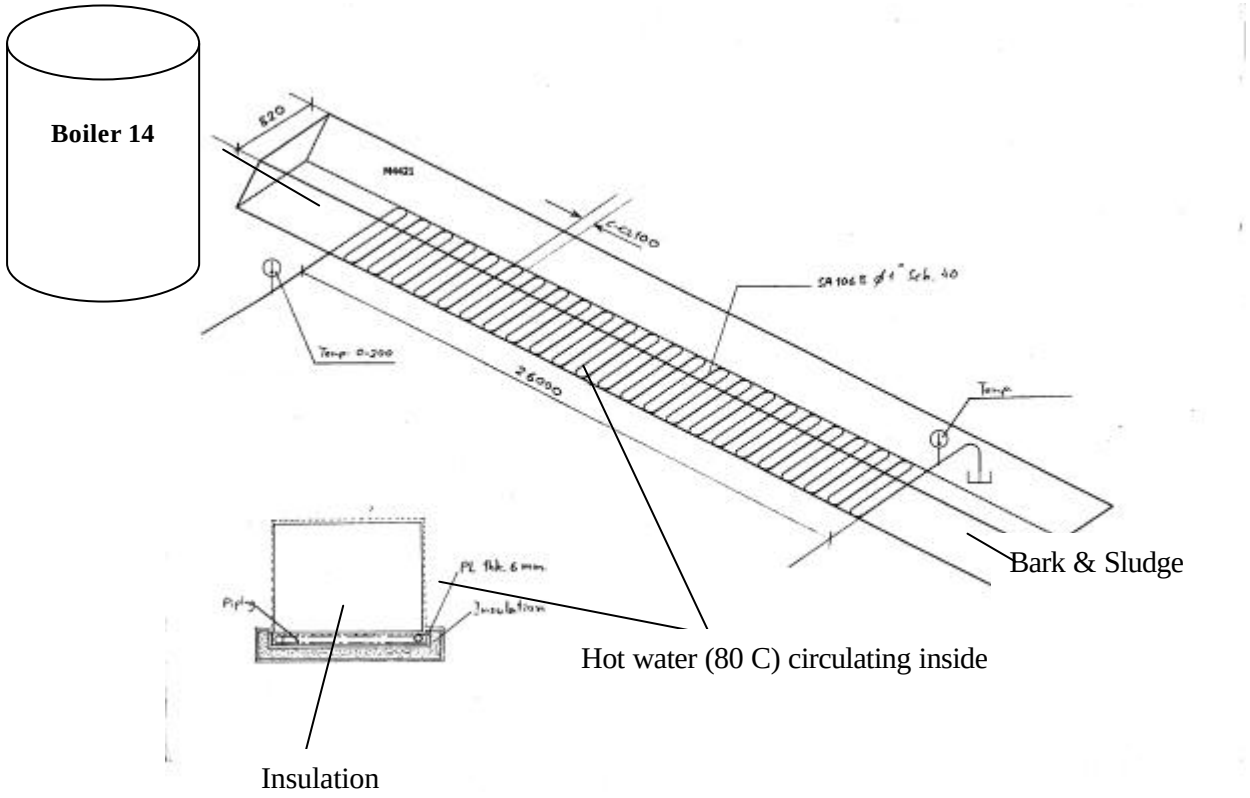
The idea of utilizing the waste heat from flash tank (80°C) to dry bark and sludge was raised. The concept of the implemented option is as follows (see Figure 1):

- Construct the pipeline (coil) and place it underneath the loading conveyer, which elevates the bark and sludge from the storage area to the boiler. The waste heat inside the pipeline unit

acts as a heat exchanger unit. The moisture content of bark and sludge is reduced due to the heat transfer from the waste heat through the surface area of the pipeline.

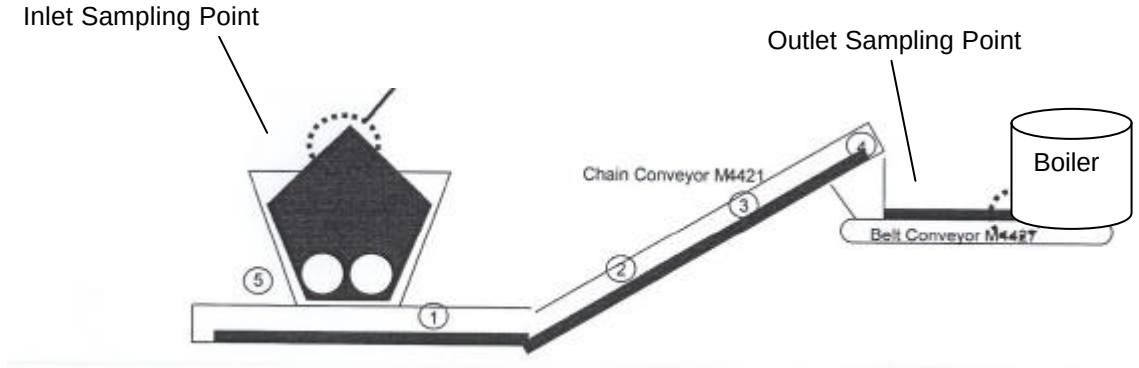
- Furthermore, the whole unit of the conveyor is also insulated in order to reduce the heat loss.

Figure 1. Loading Conveyor



The table below displays the figures, which include % moisture content, relative humidity and temperature, collected at sampling points at the site shown in Figure 2.

3 times Sampling	Inlet 1	Inlet 2	Inlet 3	Outlet 1	Outlet 2	Outlet 3
% moisture content	64.8	63.22	67.35	63.05	61.83	64.08
Average	65.12			62.99		



5 ambient condition collected point

Figure 2. Sampling point

Ambient collection point	Ambient	1	2	3	4	5
% RH	69	84.5	83.6	80	84	71
Air Temp (^{o}C)	28	34.5	35.5	44	41	33
Plate Temp (^{o}C)		38	38	50	45	

The figures show that the percentage of moisture content in the bark and sludge loading conveyor was hardly reduced. Only 2-3 % of moisture content was removed by heat transfer from the pipeline underneath the plate. The team believes that the heat might be lost to the ambient environment. High relative humidity may be another reason.

Some new ideas were raised:

- The ventilation fan is likely to be added to the loading conveyor in order to reduce the humidity inside the loading conveyor chamber.
- The conveyor loading speed might be re-adjusted to minimize the moisture content but needs to relate with steam generating requirement.

Any additional changes must be approved by management before implementation.

Utilize other waste heat resources was also discussed but not found feasible:

- Flue gas was seen as a heat source with temperatures as high as 200-250 ^{o}C. However, if the flue gas is used, sulphurdioxide (SO_2) will react with H_2O and become H_2SO_4 which will cause corrosion to the materials.
- Waste heat sources from the pulp and paper plant is an alternative, but since the boiler is located a few hundred meters from the plant, the Team concluded that this was not feasible.
- Blow down from the boiler was considered as another heat source. However, the distance between the two locations was one of the concerns. The second concern is the residue from blow down which may affect the surface inside the pipeline in the long term of implementation.

RESULTS

The approximate financial and environmental results after the implementing of this option are:

Financial Benefits:
Investment: US$ 5,460
Annual operating costs: negligible
Annual cost savings: US$ 13,636
Payback period: 6 months

Financial Benefits:
Annual coal savings: 441 ton
Annual GHG emission reductions: 816 ton CO_2

The option is yet to provide good performance.

FOR MORE INFORMATION

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