P. T. PINDO DELI PULP & PAPER MILLS

Steam loss reduction through pipe insulation, repairing steam trap leakages and steam trap management

SUMMARY OF THE OPTION

PT. Pindo Deli Pulp & Paper produces photocopy paper, specialty paper and tissue paper with a production capacity of 1,465,000 tons per year. The GERIAP project focused in machine number 8 (PM#8) that produces mainly photocopy paper with a production capacity of 240,000 tons per year.

The Team observed and found many steam leaks, steam traps leaks and a lot of un-insulated or poorly lagged steam piping that caused large quantities of unaccounted steam losses. It was then recommended to do a survey to locate all the unaccounted losses, repairs required for the leaks and a follow-up repaired campaign.

The company repaired the leaks and it was found that after the repair, the steam losses decreased from 10,199 in 2003 to 8,165 tons per month in November 2004 and the steam saved was recorded at 30,517 tons per year. The investment cost needed for this option was US $ 200,000 (Rp.1,800,000,000,-*) and the annual cost saved is US $ 366,192 (Rp.3,295,280,000,-*), with a payback period of 6 months. The company saved natural gases for about 45,887.64 tons per year and the annual GHG reduction was about 311,163 tons of CO_2.

KEYWORDS

Indonesia, Pulp & Paper, Steam Distribution & Utilization, Insulation, Steam Traps

OBSERVATIONS

The audit team observed that there were many steam leaks, leaking steam traps and a lot of un-insulated or poorly lagged steam piping. The combinations of these issues are causing large quantities of unaccounted steam losses.
There are approximately 500 steam traps at Pindo 2 that are inspected on a quarterly basis. A database of steam traps locations has been established and each trap location is numbered. During the last survey conducted in July 2003 it was found that more than 25% of the traps had leaks. The highest cause for energy loss in a steam distribution system is through unaccounted losses including pipework leaks, faulty or passing steam traps and poor or missing thermal insulation (lagging). At Pindo Deli there is a lot of steam loss due to the above reasons.
According to observations made, the Team gave the following recommendations:
The steam trap management program at Pindo 2 is not comprehensive. Surveys are only made on the reticulation steam traps, i.e. the ones on the roads only. None of the steam traps inside the process areas or paper machines appear to be surveyed. Visual inspections are adequate for steam traps that have an open discharge, however steam traps that discharge into a condensate return system requires specific skills and equipment for testing.

OPTIONS

By modifying the existing steam trap management program so that steam losses are quantified, prioritized and documented. Currently, the high failure rate of 25% of the trap population should be reduced to less than 10% within one year, resulting in measurable steam savings. According to the observations made, it was recommended to reduce steam losses through:

- Comprehensive steam traps management, conducting a steam trap, steam leak and piping insulation survey to find all unaccounted losses. It is critical to locate, identify and repair steam leaks. The losses from pipework steam leaks are estimated to be about 3-5 Tph.
- Repair steam traps leakages and insulation of pipes.
- Repair campaigns can then be conducted to reduce the unaccounted losses.
- To conduct a steam pipework insulation survey to provide the locations, dimensions, access requirements and temperature of poorly insulated and bare piping.

The action plan agreed for these options are as follows:

1. Collect maintenance data at Pindo II and Power House (during period of Jan-Apr. 04) for HP, MP, LP steam systems, mainly:
   - Number of steam traps to repair and/ or replaced
   - Number of steam and condensate leaks repair (Jan – Apr. 04)
   - Insulation (meter of pipelines)
2. Documentation of savings was measured / recorded.
   - Collect and plot flow meter readings in Pindo II and Power house
   - Calculation of steam consumption for machine #8 before and after (i.e. Nov. 2003 vs. May 2004)
   - Calculation and graph the achieved savings
   - Calculation of natural gas reduction.
   - Calculation of annual GHG/CO_2 reduction.
3. List factors that have influenced results.

RESULTS

There were more than 160 points of steam traps, condensate leaks and insulations at Pindo II and Power House that have been repaired during the period January – November 2004.
The flow meter reading in Pindo II and Power House and the data for steam consumption for PM#8 are in the following tables 1 and 2. Data flow meter reading of Steam in Powerhouse, Pindo II and in the Machine #8, before and after repair can be seen in table 1.

Table 1. Flow meter reading of steam consumption on Powerhouse, Pindo II and PM#8 before and after repaired

Month	Total Generation at Power House tons, (b)	Total Steam Consumption at PD II tons, (a)	Total Steam Consumption at Machine #8 (PM#8), ton	Remark
Aver. 2003	105,206	99,882		Before repaired
Jan-04	109,284	104,170	41,149	Before repaired
Feb-04	106,093	99,829	40,159	Before repaired
Mar-04	108,137	101,190	36,917	Before repaired
Apr-04	100,331	95,275	35,081	After repaired
May-04	112,340	108,120	41,981	After repaired
Jun-04	107,444	103,266	39,277	After repaired
Jul-04	112,698	109,222	43,885	After repaired
Aug-04	112,512	109,561	42,644	After repaired
Sep-04	108,840	105,638	43,588	After repaired
Oct-04	115,371	112,219	44,893	After repaired
Nov-04	115,027	111,751	44,442	After repaired

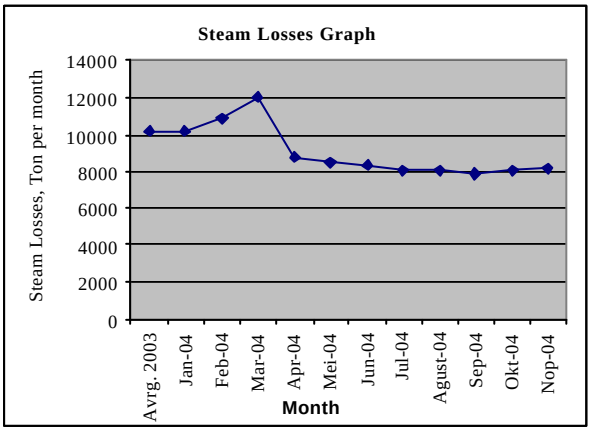
Total steam losses consist of steam loss in powerhouse area (powerhouse and distribution between powerhouse and Pindo II) and steam losses in Pindo II process area. Steam losses in powerhouse calculated from steam generation in powerhouse is deducted from total steam

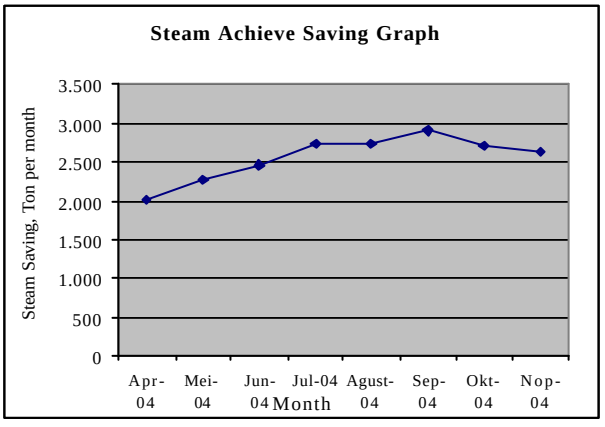
consumption in Pindo II (b – a) tons, and steam losses in Pindo II, which is calculated from total steam consumption in Pindo II deducted by actual steam consumption in all unit processes in Pindo II (PM#8, PM#9, PM#10, PM#11, NCR, Corrugated Box Plant, Pallet workshop etc.), d tons. Data for the calculated steam loss in powerhouse, in Pindo II, total steam loss and steam saved can be seen in table 2.

Table 2. Steam Losses and Achieve Steam Saving Data

Month	Steam losses in powerhouse (tons), b - a (c)	Steam losses in Pindo II (tons), (d)	Total steam losses (tons) c + d (e)	% Total steam losses, e/b * 100%	Achieve Steam saving (Ton), f – e (g)	% Achieve Steam saving, g/h *100%
Aver. 2003	5,324	4,855	10,179	9.68	Average steam losses year 2003-march 2004 = 10,783.30 (h)	
Jan-04	5,113	5,022	10,133	9.73		
Feb-04	6,263	4,622	10,856	10.26		
Mar-04	6,948	5,017	11,965	8.81		
Apr-04	5,055	3,720	8,775	8.78	2,008	18.62
May-04	4,221	4,308	8,528	7.59	2,255	20.91
Jun-04	4,178	4,147	8,326	7.78	2,458	22.79
Jul-04	3,476	4,593	8,069	7.16	2,714	25.17
Aug-04	2,951	5,056	8,054	7.15	2,730	25.31
Sep-04	3,202	4,649	7,894	7.25	2,889	26.79
Oct-04	3,152	4,894	8,088	7.01	2,695	24.99
Nov-04	3,276	4,847	8,165	7.10	2,616	24.26
Average achieve steam saving per month (tons), Apr – Nov. 04 (j)					2,546	23.61
Annual steam saving (tons), j x 12 months					30,552	

Steam losses and steam saved per month can be seen in Figures 1 and Figure 2 below.





The financial, environmental and other results are as follows:

Financial Benefits

- Investment (for monitoring and steam trap equipment): US$ 200,000 (Rp.1,800,000,000*)
- Annual operating costs: nil, are included in regular maintenance cost

- Annual cost savings: US $ 366,624 (Rp.3,299,616,000*). (Annual steam savings 30,552 tons, steam price/ton US $12 = Rp.108,000,-*)
- Payback period: 6 months

Environmental Benefits

- Annual natural gas reduction (from steam savings): 106,199 tons.
- Annual GHG emission reduction: 311,163 tons CO_2 (= 105,199 tons NG x 2.93 tons CO_2/ tons NG)

* USD1 = Rp. 9,000,-

Factors that have influenced the results of Steam Loss/ Steam saved:

- The yield for paper product on PM#8 and PM#9 varies therefore, both the machines often stops operation to change according to the type of paper production with steam still running, thus causing high steam consumption. The type of product also influences the steam consumption. The thicker the paper produced, the higher the steam used.
- The problem faced at PM #8&9, where the machine breaks the paper (the drying part which runs the heat load, causing the opening of steam valves).

FOR MORE INFORMATION

GERIAP National Focal Point for Indonesia
Dr. Ir. Tusy A. Adibroto or Ms. Widiatmini Sih Winanti
BPPT - Jl. MH Thamrin 8
BPPT II building 20th floor
Jakarta, Indonesia
Tel: + 62 21 316 9758/68
Fax:+ 62 21 316 9760
E-mail: tusyaa@ceo.bppt.go.id
widiatmini@yahoo.com

GERIAP Company in Indonesia
Mr. Suwandi Mulyono or Mr. Himawan Anwar
PT. Pindo deli Pulp & Paper
Ds. Kuta Mekar, Ciampel-Karawang,
West Java-Indonesia
E-mail: suwandi_mulyono@app.co.id; himawan_anwar@app.co.id