PT SEMEN PADANG

False Air Leak Survey and Leak Repair in Kiln

SUMMARY OF THE OPTION

PT Semen Padang produces 5,240,000 tons of cement per year, which comes from five plants, one of which is not functioning any more. The GERIAP project focused on Indarung IV where inefficient energy consumption occurred because of false air in the kiln system. The kiln system is operated in a vacuum condition. However, false air enters in the system due to equipment leaks. The leaks in that area will cause sucking of the outside air into the system. False air that results from ducting leaks and equipment will give poor energy inefficiency and fan motor loading will increase. According to false air observation results, the cost of repair and GHG emission reduction in the Cyclone pre-heater and inlet kiln, it was found that total cost spent to repair false air is Rp 164,648,300,- (US $18,294). Electricity reductions are 885,600 kWh and coal reductions are 11895 tons per year. Total cost saving is US$ 400,637 per year. Total GHG emission reductions are 30,617 tCO_2 per year.

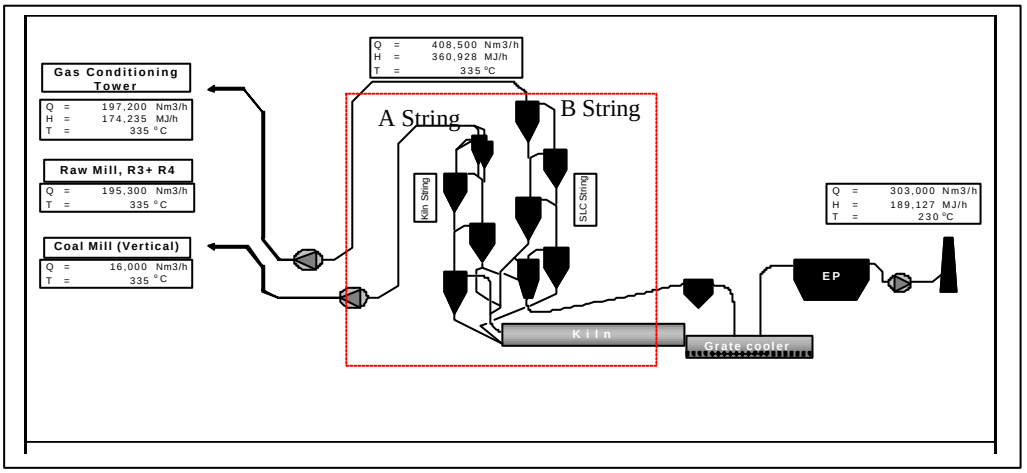
KEY WORDS

Indonesia, Cement, Furnaces & Refractories, Kiln, False Air, Vacuum Leaks

OBSERVATIONS

Observations were made during the assessment of Indarung IV and many large vacuum leaks were detected. The following figure shows the location of vacuum leaks. Sometimes false air is also called vacuum leaks.

Figure 1. Observation area



Based on the results of the measurement of the exhaust gas in kiln of Indarung IV plant, the amount of gas/kg clinker is as follows:

Total exhaust gas	408.500	Nm^3/h
Kiln capacity	225.000	kg/h
Kiln Gas specific	1.82	Nm^3 / kg Clinker

The total exhaust gas tolerable (+10 % theoretic)1.59 Nm3/kg clinker; therefore, it is assumed that there is leak of about 0.23 Nm^3 / kg Clinker.

OPTIONS

- This option tries to reduce the leaks which will prevent the increase of energy and fuel consumption for combustion process at kiln system. The process starts by conducting a detailed leak survey, including identification and pinpointing all sources of leaks.
- Vacuum leaks or (False air) are caused because of the following reasons:
    - Increase in coal consumption, as coal is used for heating false air from ambient to operational temperature.
    - Increase in electricity consumption of motor fan.

RESULTS

- False air is found at several leak sources that is in Man hole, Check hole, Down pipe, Roof, Flap gate, and Sleep ring seal in kiln inlet.
- After the repair, it is compared to energy consumption before and after repairing. The results are shown in the following table;

Table 1. Comparing energy consumption before and after repair

Items Remark	Before repairing	After repairing
Total Exhaust Gas	408,500 Nm^3/h	364,500 Nm3/h
Total Electricity Consumption	3080 kWh	2957 kWh
Production	225 tons/h	225 tons/h
Kiln Gas specific	1.82 Nm^3 / kg clinker	1.62 Nm^3 / kg clinker
Spec. Power Consumption	13.68 kWh/ton	13.14 kWh /ton

Financial Benefits

- Investment: Rp 164,648,300,- (USD 18,294(*))
- Annual cost saving: Rp3,605,735,040 (US $ 400,637 (*))/ year), calculated as follows:
    - Electricity = Rp 453564400 = US $ 50396 (*)/ year)
        - 885600 kWh x Rp 512.15 /kWh
    - Coal saving = Rp 3,152,175,000 (US $ 350252 (*) / year)
        - 11895 tons coal x Rp 265,000 /ton
- Payback period: 2 weeks (Rp 164,648,300 / Rp 3,573,591,006)

Environmental Benefits

- Annual electricity saving: 885600 kWh
  = 3080 kW/h – 2957 kW/h / t = 123 kW/h
  = 123 kW/h x 24 h/day x 300 day/year = 885600 kWh
- Annual coal savings: 11,895 tons (= 1,652 kg/h x 24 h/day x 300 day/year)
- Annual GHG Reduction: 30,489.8 tCO_2
    - GHG from Electricity reduction (**) = 641 tCO_2. (885600 kWh x 0.000724 tCO2)
    - GHG from Coal reduction (**) = 30617 tCO_2 (11895 tons x 2.52 CO_2)

(*)US $ 1 = Rp 9,000

(**) www.uneptie.org/energy/tools/ghgin

Figure 2: Leaks source at cyclone pre-heater; cyclone roof is opened

Figure 3: Leaks source at down pipe; flange is open

FOR MORE INFORMATION

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