LIME MASTER LIMITED

Installation of Magnetic Timers to Turn off Conveyors during No-load Periods

SUMMARY OF THE OPTION

Lime Master Co Ltd is located in Saraburi, Thailand and produces 99,000 tons of lime per year. Limestone is transported via main conveyors from the materials stockpiles to the two kiln shafts. During conveying, the limestone passes over a vibrating screen to eliminate particles of less than 2 inches in size, which are carried away by a bypass conveyor to separate stockpiles. The screen and bypass conveyors were found to be operating continuously, whereas the main conveyors only operated for 8 minutes during each 13 minute cycle. To save electricity wasted during the 5 minute no-load time, two electro-magnetic timers were installed to switch off the bypass conveyors between cycles. This option resulted in US$ 2,385 electricity cost savings and required only US$ 50 investment with a payback period of eight days. Each year 52,998 kWh of electricity and 32 tons of CO_2 emissions are reduced. These results were encouraging for top management and the Team that identified and implemented this option because it showed that also simple options can result in worthwhile savings.

KEY WORDS

Cement, Thailand, Electricity, Conveyors, Magnetic Timers

OBSERVATIONS

Figure 1 illustrates how limestone is transported from material stockpiles to two vertical shaft kilns to produce lime. Each day, nearly 600 tons of limestone is transported from the material stockpile over the main two main conveyors 1 to the sizing screen. Only limestone parts of 2-4 inches in size continues on two main conveyors 2 and is loaded into buckets, carried to the top of the kiln and unloaded into one of the two shafts that operate alternately. About 5% of the limestone is less than 2 inches in size and falls through the screen on two bypass conveyors, after which is it carried away to a separate stockpile.

Upon investigation of the system, the following was found:

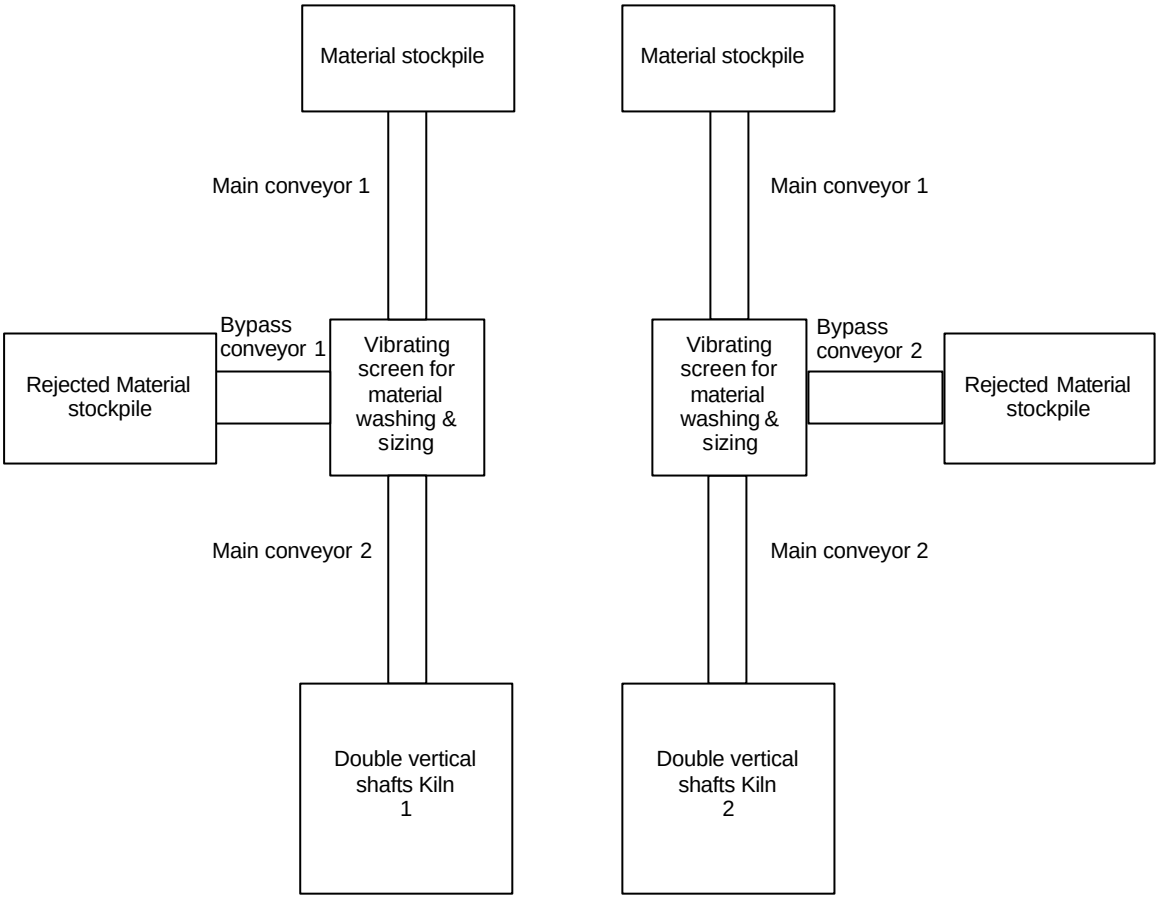
- Main conveyors 1 and 2 are running simultaneously for only 8 minutes during a 13-minutes alternate burning cycle in the two shafts of the kiln (i.e. 13-minutes is the optimum burning cycle)
- During the 5 minute no-load period raw materials are not washed or sized
- The sizing screens and the bypass conveyors are running continuously

OPTIONS

Two options were considered:

- Stopping of bypass conveyors and sizing screens during the no-load period. However, a frequent short start-stop interval would damage crankshafts of sizing screens that cost much more than the savings obtained from the conservation of electricity.
- Installation of electro-magnetic timers to reduce the operating speed of bypass conveyors and sizing screens

Figure 1: Transport of limestone from material stockpiles to two kiln shafts



The second option was implemented. Two electro-magnetic timers were installed at two bypass conveyors and serve as switches to control the electric motors used for driving the bypass conveyors. Each timer was pre-set to match the timing of the alternate burning cycles of each kiln shaft as follows

- the bypass conveyor is switched off after 8 minutes + 20 extra seconds to stop shortly after the main conveyor stops. This is to ensure that rejected materials from the completed cycle are not piled up on the bypass conveyor but transported to the stockpile
- the bypass conveyor is turned back on at 13 minutes, minus 20 seconds to start shortly before the main conveyor starts it second cycle of 8 minutes. This is to ensure the rejected materials are immediately carried away to avoid piling of materials which would disturb the process.

RESULTS

Financial benefits

- Investment: US$ 50.8 (including purchase and installation of two timers)
- Annual operating costs: already included in net electricity reduction
- Annual cost savings: US$ 2,385 (52,998 kWh x US$ 0.045 / kWh)
- Payback period: 7.8 days {(50.8/2,385) X 12 X 30}

Environmental benefits

- Annual energy savings: 52,998 kWh, calculated as follows:
  - Electrical energy savings: (2.2 kW X 2 motors X 13,140 hours/yr) = 57,816 kWh/year
    - Capacity of Motor for by-pass conveyor: 2.2 kW
    - Number of cycles: 108 cycles/day/kiln
    - Raw material feeding: 2 buckets/cycle
    - Average no-load running period: 5 min/bucket
    - Operation: 365 days/year, 24 hours/day
    - Total no-load running period: (108 X 2 buckets X 2 kilns X 5 min X 365 days)/60 min per hour = 13,140 hours/year for two kilns
  - Electricity use by motors during no-load running time: (2.2 kWh X 2 motors X 1,095 hrs/yr) = 4,818 kWh/year
    - Average no-load running time: 0.42 min/bucket
    - Total no-load running period (for 2 kilns): 1,095 hours/year {(108 X 2 X 2 X 0.42 X 365 days)/60 min per hour}
  - Net electricity savings: (57,816 - 4,818) = 52,998 kWh
- Annual GHG emission reduction: 33 tons CO_2 (52,998 kWh X 0.000618 ton/kWh)

FOR MORE INFORMATION

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