LANKA TILES LIMITED

COMPANY DESCRIPTION

Lanka Tiles is a tile manufacturing company in the Colombo District of Sri Lanka. The company was established in 1986 as a subsidiary of the government-owned Sri Lanka Ceramic Corporation holding 55% of the shares, which when sold converted Lanka Tiles into a private company. Lanka Tiles manufactures Glazed Ceramic Floor Tiles of the international category "B II a" type. The company holds 35% - 40% of the local market and about 30% of its products are exported. Currently, the plant operates at about 80 – 85% of its total capacity which equals about 2 million square meters of tiles. Lanka Tiles employs about 450 staff, of which 375 are directly working at the factory production line.

Lanka Tiles management decided to participate in the GERIAP project when they were approached by the Small and Medium Enterprises Developers (SMED) who are the project's National Focal Point in Sri Lanka. They are pleased to have participated in the project for the following reasons:

- Opportunities for the company to reduce energy consumption
- Improved knowledge of Cleaner Production and Energy Efficiency
- Introduction to a new way of thinking to find avenues for energy efficiency and total productivity improvement

Lanka Tiles wishes to continue to work with GERIAP and SMED to maximize their potential for energy saving and gaining financial and environmental benefits, achieve their Environmental Management System's targets. Lanka Tiles would further be interested to participate in potential CDM projects.

PROCESS DESCRIPTION

The main process steps involved at Lanka Tiles are as follows:

- ***Material preparation:*** raw materials used for tile production include potassium, sodium feldspar, ball clay, silica sand, and small quantities of dolomite and talk. Large particles of feldspar are crushed in a jaw crusher and milled in a hammer mill to produce particles of <5mm in size and then stored in a material bin. All raw materials are weighed and ground in a ball mill in a water medium for 7.5 hours or 16 hours depending on the type of grinding media (quartz or alubid). Slurry from the grinding process is filtered and stored in an underground storage tank.
- ***Powder preparation:*** Material slurry is sprayed and dried in a spray dryer to form fine powder that is stored in a vertical silo. This spray dryer uses kerosene to reach temperatures of up to 560 ^{O}C, while the powder's moisture content is maintained at around 6 - 6.5%.
- ***Powder pressing:*** the powder mix is pumped in batches from the silo to a metal mould and pressed under hydraulic pressure to form the green tile.
- ***Drying:*** Green tiles are dried in a vertical dryer at 160 ^{O}C to reduce the moisture level to about 0.3%. These dryers are either kerosene fired or LP gas fired.
- ***Glaze making and glazing*****:** Glaze of the required colors is imported and top glaze mixtures are prepared in a ball milling process. The glaze mix is put on the green tiles passing over a glazing conveyor line and tiles are then temporarily stacked in racks.
- ***Final firing in kiln:*** Green tiles are sent through the final firing kiln to produce finished tiles. The kiln has four heating zones namely: pre-heating zone (35 – 1000 ^{O}C), heating zone (1000

– 1200 ^{O}C), rapid cooling zone (1200 – 600 ^{O}C) and final or slow cooling zone (600 – 80 ^{O}C). Finished tiles are further cooled, packed and sent to customers.

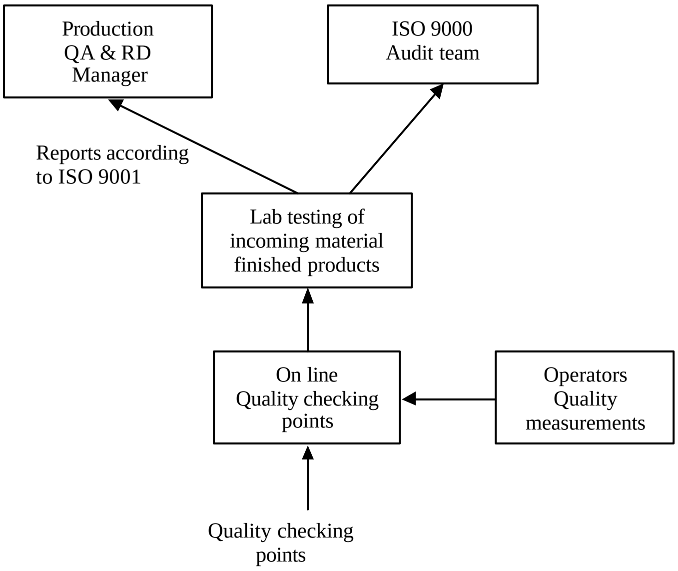
- ***Auxiliary processes:*** these include
  - Compressed air system to provide high quantities of compressed air to the glazing line and to material handling processes
  - Tile chamfering line, which was set up recently to produce more accurate sized tiles, when end-users do not want tile grout filling in-between the tiles when these are paved
  - Waste water treatment, with almost all treated effluent water and sludge being reused in the process.

METHODOLOGY APPLICATION

The draft Company Energy Efficiency Methodology was used as a basis for the plant assessment to identify and implement options to reduce energy and other materials and wastes. Some of the interesting experiences are:

- ***Task 1c – Pre-assessment to collect general information***

The company has an ISO 9001:2000 certified quality management system. During the pre-



assessment it was found that the information flow developed as part of this system (see figure below) could also be useful for future communication and reporting of energy information.

- ***Task 1d – Select focus areas***

While focus areas are often mainly selected because of high energy consumption and costs, at this company the "raw material preparation area," including jaw crushing and hammer milling, was selected as a focus area because of high losses of energy and raw materials, which made it immediately clear that a lot of improvement opportunities existed:

- The driving motors of the jaw crusher and hammer mills consume a considerable amount of energy
- Major raw materials for the process (Feldspar and Dolomite) are received as a mixture of a wide range of particle sizes and are crushed by the jaw crusher and hammer mill into small particles. The smaller particles in the received raw materials do no need to go through the jaw crusher and the very small particles not even through the hammer mill

but could be added directly to the ball mill or standby raw material heap. Therefore energy is wasted and separating small particles from the raw materials would thus make sense

- Small particles act as a cushion for the larger particles and therefore reducing the effectiveness of milling operation, the material throughput and ultimately increased the energy consumption per unit load of raw material. Separating small particles prior to crushing would therefore make sense
- Very large lumps of raw material also increase the jaw crusher power consumption (and reduce the throughput). Manual breaking of large lumps prior to feeding them into the crusher would reduce the jaw crusher energy consumption
- Raw material is lost at the standby raw material piles due to the "carpeting effect" (i.e. small sized materials spreading around the piles like a carpet which makes it difficult to collect them for processing)

Lesson learnt: Focus areas are sometimes selected because it is immediately clear that there are significant losses and many options for improvement.

- ***Task 2a – Staff meeting and training***

Two technical staff and one accounts person attended a five-day technical training course at the start of the start of the energy assessment. Although a consultant from India gave some training sessions in English, most training sessions were given in Singhalese, which made it easier for participants to understand the information.
Lesson learnt: If staff are trained in their own language then they will learn more from the training course.

- ***Task 4c – Prepare implementation and monitoring proposal for top management approval***

Changes were made to the production line by adding a tile chamfering line. As a result the implementation plan for options had to be slightly adjusted.
Lesson learnt: When preparing the implementation and monitoring proposal the Team should consider any recent or upcoming changes to the production process.

- ***Step 6: Continuous improvement***

The results from going through the methodology steps once and from implemented options as part of the GERIAP project convinced management to more systematically look at improving energy efficiency in the future.
Lesson learnt: Demonstration projects can lead to a commitment from top management to continue with Cleaner Production and energy efficiency.

OPTIONS

- The main focus areas of the project were the raw material processing and the kiln firing stages in the glazed tile manufacturing process.
- In total, 12 options were identified, two options were implemented, one option still is in the progress of implementation, two options still to be implemented, Seven options require further analysis, and none of the identified options were found unfeasible/ not to be implemented.
- For the two implemented options, the total investment costs were US$ 65,000, annual savings were US$ 15,850 and total payback was 4 years
- For the two options implemented, the total energy reductions were 36 MW and 49,000 liters kerosene per year resulting in 131 ton CO_2 emission reductions per year

Table 1: EXAMPLES OF OPTIONS IMPLEMENTED

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRONMENTAL BENEFITS	COMMENTS
Separation of large raw material particles and installation of additional jaw crusher for large particles to increase crusher throughput (see case study)	Process/ Equipment Modification	▪ Investment:: US$ 5,000 ▪ Cost savings: US$ 3,600/yr ▪ Payback period: 14 months	▪ Electricity saving: 36 MW/yr ▪ GHG emission reductions: 7 t CO_2/yr ▪ Noise reduction	Increased production. There exists potential to implement particle segregation option at the feeding stage.
Kiln: Use of waste heat from kiln for chamfered tile drying (see case study)	Onsite Recovery/ Reuse	▪ Investment:: US$ 60,000 ▪ Cost savings: US$ 12,250 ▪ Payback period: 5 years	▪ Kerosene saving: 49,000 l /yr ▪ GHG emission reduction: 126 t CO_2/yr	Expected results only. Improved working environment because lower temperatures and kerosene odors at kiln

FOR MORE INFORMATION

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