P. T. INDOCEMENT TUNGGAL PRAKASRA, TBK

COMPANY DESCRIPTION

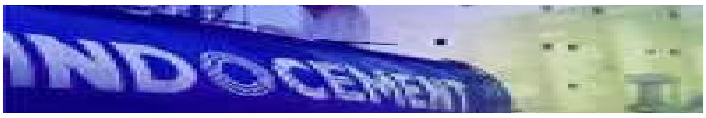
Indocement is one of the largest cement producers in Indonesia. The Company has integrated cement operations with a total annual production capacity of 15.4 million tons of clinker. The Company was established in 1985 and currently operates 12 plants, nine of which are located in Citeureup, Bogor, West Java; two in Palimanan, Cirebon, West Java; and one in Tarjun, Kotabaru, South Kalimantan. The Company's main product is Ordinary Portland_Cement (OPC). It also produces other types of cement such as Portland Cement Type II and Type V, Oil Well Cement, and Portland Pozzolan Cement. Indocement is the only White Cement producer in Indonesia.

In 2001, Heidelberg Cement Group, one of the world's leading cement producers, based in Germany and operating in 50 countries, assumed a controlling majority shareholding of the Company. Since then, the Company has focused on regaining financial sustainability, lost during the Asian financial crisis. With the support of the Heidelberg Cement Group's international expertise in technical, financial and marketing areas and a global network, Indocement has refocused its activities on the core business of producing cement, with the ultimate goal of regaining its financial strength. In 2003, the Company achieved total sales of more than Rp 4 trillion. Indocement's shares are listed on the Jakarta Stock Exchange and Surabaya Stock Exchange. It employed more than 7,100 personnel as at year-end 2003.

PROCESS DESCRIPTION

In general terms, cement is manufactured by pyro-processing selected, prepared raw materials and fine grinding the produced clinker. The most common cement, Portland Cement requires four major chemical components to achieve the proper chemical composition. These are lime (limestone), silica (sand), alumina (clay) and iron oxide (iron ore). Small quantities of gypsum are normally added during grinding to retard setting.

- ***Raw Material Supply*:** The Indocement Tunggal Prakasra Citeureup Cement Factory operates quarries for the supply of limestone and clay. In order to achieve correct raw mix proportions, silica sand, alumina component (normally bauxite) and iron bearing materials are purchased.
- ***Raw Material Preparation*:** All raw materials are crushed, ground and homogenized to fine powder prior to entering the burning process. Pre-drying of raw materials is required for dry process raw grinding.
- ***Fuel Preparation and Pyro-processing:*** The most complex stage in manufacturing Portland Cement is the burning process. It encompasses the conversion of a chemically designed and physically prepared raw material mixture into cement clinker. This is done in rotary kilns through controlled combustion of primary fossil fuels as solid (coal), liquid (diesel oil), or alternative fuels. Coal is by far the most common fuel due to cost considerations.
- ***Additive Material Preparation and Fine Grinding*:** The last step in the process of manufacturing Portland Cement is the finishing of grinding of clinker together with a small amount of gypsum, less than 4%, to produce Ordinary Portland Cement type I. Other cement types result from introducing additive pozzuolana materials or limestone in cement grinding.
- ***Quality Control:*** The production process at each plant is monitored by the particular plant's individual and centralized control room where computerized equipment is used to



monitor the entire process from taking raw materials from storage to the finishing stage of grinding cement. Cement quality checks are carried out continuously. To ensure the production of consistently high quality cement, a modern system of automatic samplers, automatic X-ray analyzers and process computers perform on-line control of the proportioning of raw materials to maintain consistent chemical composition of the cement produced.

- ***Shipping:*** Cement storage, packaging, handling and shipping facilities are essential elements of a cement plant. These facilities appear insignificant compared to other portions of a cement plant, but their capita cost account for a significant share of the total plant.

The company has implemented excellent measures to hopefully become accredited under Indonesia's new "Good Corporate Citizen" scheme. First, Indocement offers free public medical services for emergencies both at the on-site clinic, as well as from a mobile clinic. Both clinics are funded by the company, and are used by twelve (12) surrounding villages. In addition, prescribed medicine is offered free of charge. Secondly, Indocement takes a leadership role among the surrounding village leaders for issues such as disputes, new facilities, etc that affect the local communities.

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 1a – Meeting with top management***

The company scored high on the Energy Management Matrix because it has many elements in place to ensure effective energy management, most notably:

- A strong push from majority shareholder Heidelberg Cement group to strive for excellence in environmental and energy performance
- An ISO 9001 certified quality management system and an ISO 14001 environmental management system, and plans for an ISO 17025 management system
- A sophisticated on-line, real-time information system is in place at the modern Plant #11 and will be expanded to other plants. This system monitors and logs, among other things, the specific power and heat (thermal) consumption for clinker production, environmental emissions, such as dust, SOx and NOx
- Monitoring of the community's attitude towards the plant: one of the company's Operating Success Parameters (OPS) is the Public Response's Environmental Index

<u>Lesson learnt: High scores on the Energy Management Matrix indicate that there is sufficient basis for a successful energy assessment at the plant and for continuous improvements in the long run.</u>

- ***Task 1d – Select focus areas***

This large company has almost twenty parallel cement production lines. Because of this, a production flow chart and data collection was only done for one of the production line that would be used as a basis for this project, and not for the entire plant. Because of similarities between production lines, the work done at one production line could later be carried out for other production lines in very much the same way.

<u>Lesson learnt: For large companies with parallel production lines, it is more practical to focus on one line only and later to apply the same principles to the other.</u>

- ***Task 2d – Quantify inputs and outputs and costs to establish a baseline***

Energy consumption is managed through the quality and environmental management systems, managed by a Management Representative. Each unit of the company has been given a

minimum baseline performance and each month each unit's actual performance is evaluated against this baseline, with the purpose of identifying energy losses and areas for improvement. As a result it was relatively easy to obtain baseline data for energy and determine where the losses occur.
Lesson learnt: If a company already has a system to measure energy for different departments then it is relatively easy to establish an energy baseline and identify losses.

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

Options that require more than US $ 10,000 investment costs must be authorized by the Singapore office, which adds to the time needed before the implementation of options can start.
Lesson learnt: Find out early in the process what the approval process is for options and investments in options, to avoid delays in obtaining approval for the implementation and monitoring proposal.

- ***Task 5a – Implement options and monitor results***

In Plant #6, which was the focus area for the assessment, a major cable burnt and therefore the plant had to be stopped for several months, which also caused delays in the implementation of option. Additional options were identified and implemented for two new focus areas to compensate for this, natural gas consumption and electricity generation using excess pressure supply
Lesson learnt: Sometimes the implementation of options cannot go ahead for reasons that the Team cannot influence (such as a major overhaul or breakdown in the focus area). Depending on time availability and at what stage of the assessment and/or implementation you are, it is possible to select other focus areas for investigation or other options for implementation.

- ***Step 6 – Continuous improvement***

This company is at the forefront of reducing GHG emissions and because it is such a large plant in a developing country, it has been looking to participate in clean development mechanism (CDM) projects. Possible projects eligible for CDM have been identified and developed. The company is now in negotiations with the World Bank and several industrialized countries, who are the potential buyers of emission reduction credits (ERUs), to agree on the CO_2 baseline and reductions to be achieved through the proposed projects.
Lesson learnt: The clean development mechanism (CDM) under the Kyoto Protocol for climate change can be an important driver for future GHG emission reductions through energy efficiency improvements for large companies in developing countries.

- ***Step 6 – Continuous improvement***

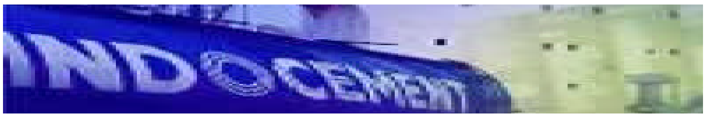
To ensure that energy efficiency and GHG reductions are sustained after the GERIAP project, top management added two new parameters in the Management Control System in January 2005, which will appear in monthly reports to management:

- AFR (Alternative Fuel Ratio), which measures the percentage of alternative fuels (such as waste tyres) in each plant at the company.
- Clinker to Cement Ratio, which measures the percentage of clinker in cement produced, with the aim to replace clinker with alternative additives as this will reduce the costs of producing cement and GHG emissions (as burning of limestone releases CO_2)

Lesson learnt: By including energy and GHG related parameters in monthly reports to top management, more pro-active management of energy and GHG emissions is possible.

OPTIONS

- Preliminary seven options were identified in the two focus areas: Electric power factor correction and the Power House. The following sub areas were selected: Electricity power



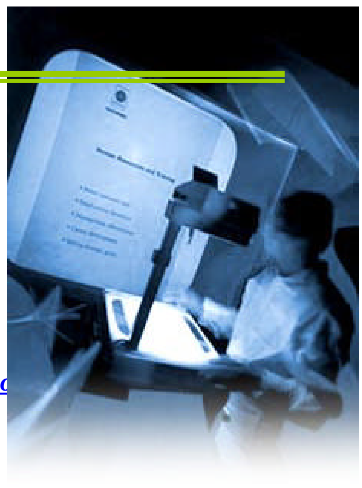
factor correction, Fan optimization, false air, Coal particle sizing, and Compressed air use at packing house.

- The first focus area for sub area electric power factor correction, features two operations, as follow; the change of normal open tie bus to normal close, which is being implemented and a case study to install capacitor bank on power factor. Sub area 2, is also being implemented, sub area 3 and 5 are implemented because those are daily operations, even though there is barrier on the sub area 5, because it cannot be calculated for saving, while for sub area 4 it is not implemented.
- The second focus area is the Power House. The following sub areas were selected: cooling tower and recovery of flash steam. On sub area 1, the cooling tower is being repaired hence, the real calculation is still on hold for the repairing results, and preliminary calculations have been done. Implementation is not done in sub area 2. In addition, a number of tasks were agreed with PT. Indocement Tunggal Prakarsa at the initial meeting of the in plant assessment in August 2003. These tasks are to be undertaken by PT. Indocement Tunggal Prakarsa's Team by March 2004, in order to commence the assessing of the feasibility of the identified areas for options.
- Total investment cost for the five options implemented were US $ 337,195 and the total savings were US$ (1,579,884-337,195) = US$ 1,242,689 with a payback period of 2.5 years.
- Annual environmental saving for the five options implemented were 28,694 tons for greenhouse gas emissions (CO_2 equivalents)/year. This reduction accounted for about 26% of total greenhouse gas emissions by plant # 6 (produce 1.2 million tons per annum, Mtpa).
- 5,530,120 kWh electricity saving/ year was observed and 13,375 tons of coal saving/ year was recorded.

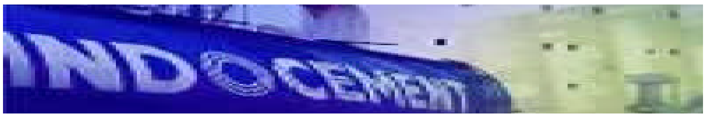
Table 1: EXAMPLES OF OPTIONS IMPLEMENTED

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRONMENTAL BENEFITS	COMMENTS
Plant# 6, Electrical Power/ Change mode operation of tie bus to normally close (NC) for sharing load of transformers and install capacitor bank to improve power factor	Production process /equipment modification	▪ Investment: US$ 170,000 (cost for new panel connection about Rp. 200,000,000 or US$ 21,739) ▪ Cost savings: US$ 1,124,130 /yr ▪ Payback period: 1.5 months	▪ Electricity savings: 3 MVA ▪ GHG Emission reduction: 24,349 tCO_2 /yr	Capacitor bank was not yet implemented at time of writing of this case study
Plant#6, Kiln Fan / Install variable speed drives (VSD) on 12 fans to reduce electricity use by motors	New equipment/ technology	▪ Investment: US$ 136,000 ▪ Cost savings: US$ 320,000 /yr ▪ Payback period: 5 months	▪ Electricity savings: 5530 MWh ▪ GHG emission reduction: 4004 tons CO_2/yr	
Plant#6, Kiln: False Air Leak Survey and Repair	Good housekeeping	▪ Investment: US$ 3,804 ▪ Cost savings: US$ 121,265 ▪ Payback period: 0.5 month	▪ GHG emissions reduction: 828 tons CO_2 /yr	This option is a daily maintenance operation, leak detection is conducted if the oxygen content in the top of cyclone is more than 3%
Plant #6, Packing House / Install auto drain for compressed air	New technology/ equipment	▪ Investment: US$ 217	▪ Not provided	
Power House/ Cooling Tower improvement: revised fan procedure, regular cleaning, float valve repair	Good house keeping	▪ Investment: US$ 27,174 ▪ from turn of 1 fan Inflow per Yr: 34.8 kW XRp 532/kWh X 24 h X300 days = Rp 133,297,920 or US$ 14,489 ▪ Payback period: 1.8 yrs	▪ Electricity savings : 34.8 kW ▪ GHG emission reduction: 181.41 tCO_2/yr	Project was planned for implementation in 2005

FOR MORE INFORMATION



GERIAP National Focal Point for Indonesia
Dr. Ir. Tusy A. Adibroto or Msi Widiatmini Sih Winanti
BPPT - Jl. MH Thamrin 8, BPPT II building 20^{th} 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

Team Leader: Gunawan Purwadi
General Manager
PT. Indocement Tunggal Prakasa.Tbk
Tel: head office +62 21 2512121; plants +62 23 8752812;
+62 231 343760; +62 518 61000
Fax: head office +62 21 5701693; Plants +62 21 8752956;
+62 231 343617; +62 518 61090
E-mail: Gunawan@indocement.co.id

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