HOLCIM BULACAN PLANT

COMPANY DESCRIPTION

The HOLCIM Bulacan plant under the HOLCIM Philippines Inc. (formerly Union Cement Corporation) was established in 1964 in Bulacan. The modern plant uses the latest technology to produce Portland cement under the Hi-Cement brand name, mainly for Luzon in the Philippines. It has 307 employees working three shifts, covering 24 hours operation per day and producing about 1.9 million tons cement annually.

Company management participated in the GERIAP project because it could contribute to HOLCIM's Energy Conservation and Management Program, which is promoted in all its plants. This program focuses on optimizing knowledge, technology and expertise, reducing costs and minimizing the impact of its operations on the environment and the local community. Under this program, procedures are adopted to comply with local legislation, international standards and best practices.

PROCESS DESCRIPTION

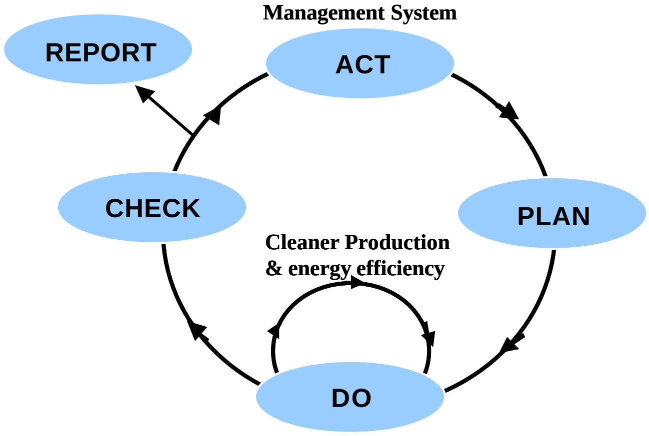
The major process steps in the production of cement include:

- ***Quarrying:*** Two types of materials are necessary for the production of cement: one that is rich in calcium or calcareous materials such as limestone, chalk, etc., and one that is rich in silica or argillaceous materials such as clay. Limestone and clay are either scraped or blasted from the quarry and then transported to the crusher.
- ***Crushing:*** The crusher is responsible for the primary size reduction of the quarried materials.
- ***Pre-Blending*:** The crushed materials pass through an on-line analyzer to determine the pile composition.
- ***Raw Grinding and Blending:*** A belt conveyor transports the pre-blended piles into individual bins, where a weighing feeder proportions the materials according to the type of clinker to be produced. The materials are then ground into the desired fineness.
- ***Burning and Clinker Cooling*:** The homogenized raw mix is fed into the pre-heater, which is a heat exchange equipment composed of a series of cyclones wherein heat transfer between the raw mix feed and the counter current hot gases from the kiln takes place. Calcination partially takes place in the pre-heater and continues in the kiln, where the raw meal is turned into a semi-molten state with cementitous properties. At a kiln temperature of 1350-1400°C, the materials turn into solid nodules known as clinker and are discharged into the clinker cooler, where quenching air brings the clinker temperature down to 100 °C.
- ***Finish Grinding:*** From the clinker silo, clinker is transferred to the clinker bin. It passes through the weighing feeder, which regulates its flow in proportion with the additive materials. At this stage, gypsum is added to the clinker and then fed to the finished grinding mills. Either the mixture of clinker and gypsum for Type-1 cement or the mixture of clinker, gypsum and pozzolan material for Type-P cement is pulverized in a closed circuit system in the finish mills to the desired fineness. Cement is now piped to cement silos.

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***

Because the company is working towards ISO 14001 certification of its environmental management system, top management wanted to be assured that the energy assessment as part of the GERIAP project fitted within this framework to avoid parallel environmental projects being carried out at the company. A meeting between top management and the external facilitator was organized to explain how Cleaner Production and energy efficiency fit in with an environmental management system as illustrated below:



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

Specific electricity consumption and heat rate data were readily available, but specific GHG emission data were more difficult to obtain. GHG emissions expressed as tons CO_2/ton clinker were found to be wrong and it was only possible to determine correct figures for tons CO_2/ton cement. In addition, reliable GHG emissions data were only available from November 2003 onwards, after the installation of the new continuous emission monitoring system (CEMS).
<u>Lesson learnt: Greenhouse gas emissions data is not as easily to obtain as energy data because GHG emissions are not as often measured or calculated by Asian companies.</u>

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

During the monitoring phase different aspects were monitored: (1) results of the implemented option in the kiln (2) the evaluation of the feasibility of variable speed drives installation for the clinker cooler fans (3) general monitoring of energy parameters which resulted in the identification of new options.
<u>Lesson learnt: In practice it is necessary to plan several monitoring sessions, because different options will go through the identification, evaluation and implementation stages at a different pace.</u>

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

The company will continue with energy efficiency as part of its Manufacturing Performance Review (MPR) that is carried out across HOLCIM's plants worldwide. The MPR aims to,

  - Reduce variable costs such as thermal and electrical energy, optimize fuel mix and AFR usage, purchased materials, clinker substitution by mineral components and wear parts

- Reduce fixed costs consisting of maintenance materials, labor-own plus sub-contracted and third party services
- Review and prioritize investments for the next two years
- Maximize utilization of the plant's production capacity by improving the overall equipment efficiency and optimize product's clinker factor.

<u>Lesson learnt: Continuous energy efficiency improvement can be part of efforts to improve the overall performance of a plant.</u>

OPTIONS

- Focus areas included (1) the Kiln area and (2) the Raw Mill #3 area
- The team identified 13 energy and waste minimization options and two options were implemented. Ten of these options were identified during the second monitoring visit in 2005 and still being considered for implementation. Therefore the results for these were not available at time of writing of this company case study.
- For the two options implemented no investment was required and resulted in annual savings of about US$ 12,283.
- For the two implemented options, coal savings were 24.5 tons per year, resulting in greenhouse gas reductions of about 45 tons CO_2/year.

Table 1: EXAMPLE OF OPTIONS IMPLEMENTED AND INVESTIGATED

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRONMENTAL BENEFITS	COMMENTS
Kiln area/ Repair vacuum leaks at the kiln hood door to avoid heat loss *(see case study)*	Good Housekeeping	▪ Investment: Minimal ▪ Cost savings: US$ 12,283/yr ▪ Payback period: immediate	▪ Coal savings: 24.5 t coal/yr ▪ GHG emissions reduction: 45 t CO_2/yr	Coal leaking from the kiln hood door was also eliminated
Raw Mill/ Improvement of power factor at crusher through reduction of medium voltage and load-based regulation of capacitor operation *(see case study)*	Good housekeeping	▪ Investment: Nil ▪ Cost savings: not quantified ▪ Payback period: immediate	▪ None because improved power factor does not lead to reduced electricity consumption	
Raw Mill/ Installation of variable speed drives (VSD) for motors of reducer high pressure pump and reducer low pressure pump at raw mill *(see case study)*	New equipment / technology	▪ Investment: US$ 9,877 ▪ Cost savings: US$ 3,500 /yr approximately ▪ Payback period: 2.5 years	▪ Electricity savings: 81,913 kWh ▪ GHG emissions reduction: 16 t CO_2/yr	Option was not implemented because the payback period was considered too long for the relatively high investment costs

Other options investigated but still considered for implementation include *(see case studies):*

- Screening of raw material feed size and management of load to increase the performance of jaw and hammer crushers at raw mill
- Nozzle angle modification and armour ring adjustment to increase raw material flow at raw mill
- Installation of on-line oxygen analyzer at calciner exhausts of preheater to improve leaks management
- Use of high efficiency fans and motors for clinker cooler fans
- Damper removal for fans with full open damper and installation of slip power recovery system for fans with slip ring motor drive

FOR MORE INFORMATION

GERIAP National Focal Point for the Philippines
Dr. Alice B. Herrera
Officer-in-Charge, Fuels and Energy Division
Industrial Technology Development Institute
Gen. Santos Ave., Bicutan, Taguig City, Metro Manila Philippines 1631
Tel: +632 837 2071 ext 2190
Tel fax: +632 837 2071 ext 2204
E-mail: aherrera@dost.gov.ph, abherrera@pacific.net.ph

GERIAP Company in the Philippines
Mr. Julius B. Yballe
SVP Operations
HOLCIM – Bulacan Plant
Philippines
Tel: +632 7322230
Tel fax: +632 7322564
E-mail: julius.yballe@holcim.com