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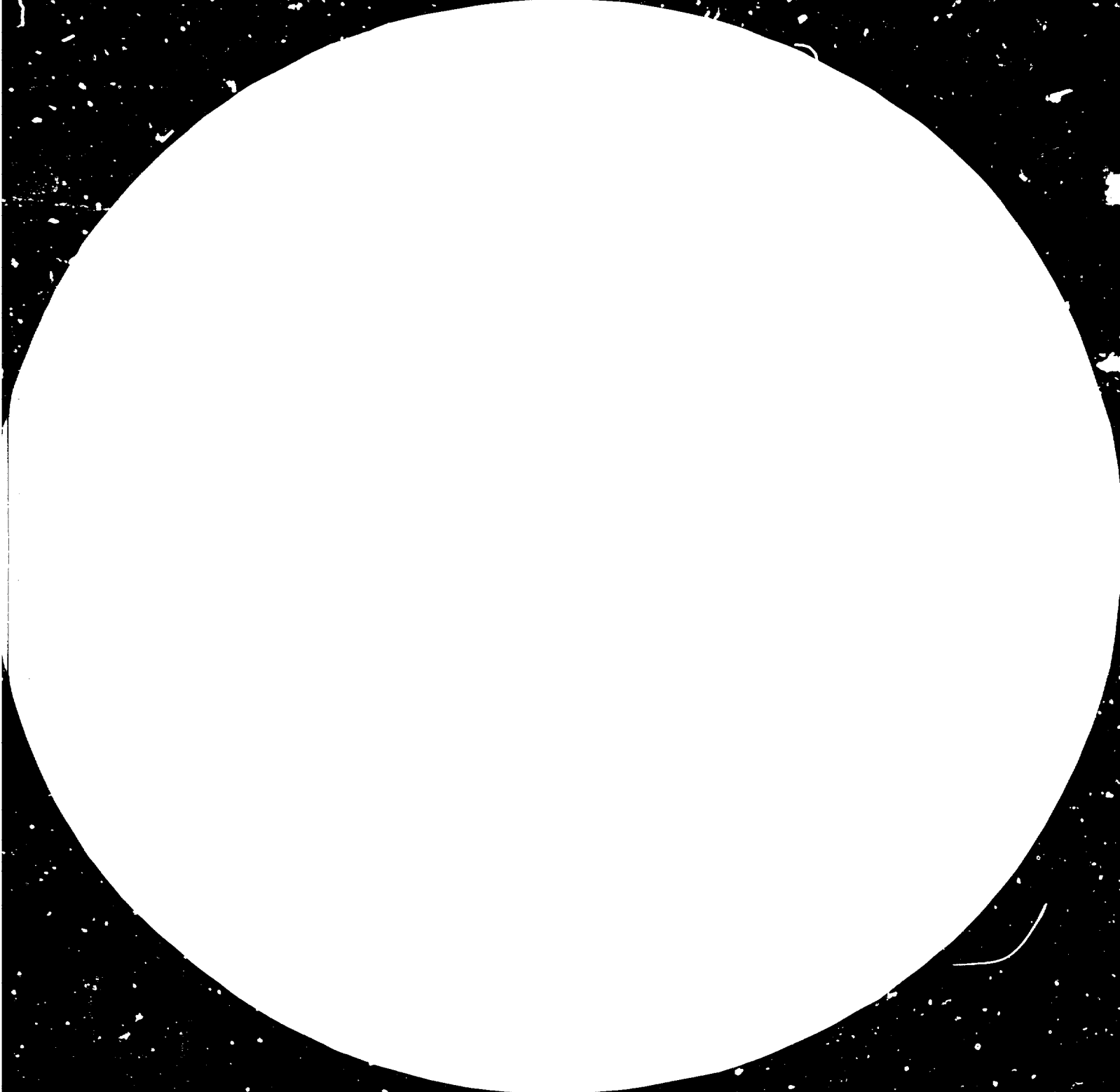

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CURRENT STATUS OF THE TECHNOLOGY OF THE PHILIPPINE CEMENT AND CONCRETE PRODUCTS INDUSTRY*

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GIST:

The Philippine cement industry had its beginning in 1914. Rapid development began after World War II in conjunction with the rehabilitation program that followed thereafter.

There are presently 18 cement plants in operation. Six (6) are wet-process plants; four(4) are under the category of semi-dry using the ACL-LEPOL and/or the MIAG Calcinator systems and eight (8) are dry-process using the Suspension Pre-Heater (SP) systems. The re-rated total annual capacity of these plants is 5,656,920 metric tons.

Concrete products also started to progress by early 1950. There are now no less than 15 ready-mix concrete plants servicing the Metro-Manila area alone. Batch plants are also located elsewhere in the country. However, these are mostly installed to service specific purposes such as to meet the concrete needs of large dams and infra-structure projects in the area.

Quality-controlled concrete products have likewise proliferated in the Metro-Manila area. There are eleven (11) pre-stressed concrete plants; twenty one (21) concrete hollow block and pipe factories; and three (3) large scale housing panel plants.

Country-side block manufacturers are numerous. These non-quality blocks serve the rural needs in low cost housing and improvements thereon.

It is estimated that no less than 40,000 people are directly related and 460,000 indirectly connected with the industry. Foreign currency savings in the form of non-importation is placed at US$112.95 Million for 1980. Contribution to foreign exchange receipts is placed at US$34.34 Million for last year in terms of exports (794,379MT) to the Indian Sub-Continent, Middle East and South East Asian neighbors and even Australia.

In connection with the world-wide drive to metrication, the Philippines now uses a 40-kg bag standard for domestic use and 50-kg bag for export.

The industry is under the direct supervision of the Philippine Cement Industry Authority which is the policy-making and regulatory agency of the government under the Ministry of Industry.

I. Philippine Cement Manufacturing Status:

A. General -

Cement manufacturing in the Philippines started in 1914. The rapid development of the industry in the late 1960's led to its present size with eighteen (18) plants installed and in operation. It has kept pace with the technology of plant size and/or scale up of main equipment available during the period such that most of the plants are in the 1,200-1,500 metric tons per day single kiln-mill unit system, with the latest plants adopting the Suspension Pre-Heater (SP) type design.

Heat rate for the kilns is at an average of 1,116 kcal/kg clinker produced. The wet process units are at 1,250 kcal/kg clinker and the most efficient SP units at 800-950 kcal/kg clinker. Power consumption is at an average of 120-140 Kw-hrs per metric ton cement produced. Overall energy consumption therefore averages 1,231 kcal per kg clinker production (5.15×10^6 KJ/kg).

Problems in the equipment technology of the 1,200-1,500 MTD units designed in the late 1960 particularly from mills of Japanese and German manufacture have been encountered. These are cracked mill heads and main drive gears; and relative short

life of kiln carrying rollers and tires for the SP kilns with 1.5 to 3.0 RPM.

All the plants have been designed to meet ASTM C-150 Type I cement specifications.

B. Raw Materials -

The three main island groups of the Philippines have been amply blessed with the required base raw materials for cement and concrete products.

On Luzon island, the Sierra Madre Mountain ranges extends over three-fourths of its east coast. These contain the necessary calcareous materials mainly in the form of limestone of varying hardness. Argillaceous and siliceous materials are also abundant together with any needed fluxing component such as limonite, hematite and other iron containing ores. Quartz type silica sand have also been used to maintain the silica modulus when the clayey materials are high in alumina.

Essentially the same comments as above may be said on the Visayan island and Mindanao island groups. The islands of Cebu, Negros, Panay, Bohol have ample raw materials for cement making in the Visayan island group. Mindanao island at the Surigao; Lanao Del Norte; Misamis Oriental and Davao City have the cement making raw materials mentioned.

The existing cement plants are located geographically as follows:

LUZON ISLAND

1.	BCI, La Union Plant	- North Luzon
2.	Northern Cement Corp.	- North Luzon
3.	Central Cement Corp.	- Central Luzon
4.	RI Cement Corporation	- Metro Manila
5.	Republic Cement Corp.	- Metro Manila
6.	Continental Cement Corp-	Metro Manila
7.	Filipinas Cement Corp.	- Metro Manila
8.	Island Cement	- Metro Manila
9.	Rizal Cement	- Metro Manila
10.	Midland Cement	- Southern Luzon
11.	Fortune Cement	- Southern Luzon

VISAYAN ISLAND GROUP

1.	Universal Cement	- Cebu Island
2.	APO Cement	- Cebu Island
3.	Prime White Cement	- Cebu Island

MINDANAO ISLAND GROUP

1.	Pacific Cement	- Surigao Del Sur
2.	Mindanao Portland Cement	- Iligan City
3.	Iligan Cement	- Iligan City
4.	Floro Cement	- Misamis Oriental
5.	BCI, Davao Plant	- Davao City

The plants have been principally located as close to the source of the raw materials, its nearness to the market, available infra-structure facilities including deep water wharfs for cement transport advantage.

The concentration of plants in Luzon island is primarily due to the economic activity thereat. This is particularly true in the Metro-Manila area and environs which is easily 55% of the total economic activity in the Philippines.

Concrete products are mainly concentrated in the Metro-Manila area also. The presence of several rivers in the area for aggregate source has also contributed to the situation.

C. Plant Design -

Only one of the relatively new plant has adopted the use of covered in-process material storage utilizing the latest method of storing and reclaiming via stackers, distributing and reclaiming conveyors.

The rest of the plants are on the classical T or parallel design with a central storage hall serviced by overhead travelling cranes. The SP kilns, however, have their raw grinding mills in line with the kilns for the usual waste heat gas utilization.

Despite relatively low site costs, the plants are all compact in its layout to minimize conveying and concrete work in the structures.

European, American and Japanese design concepts may be found in all these plants. Usual trial burnings of the raw material to be used; Work Index determination; type of process, etc. are made by the machinery manufacturer. Local consultants are availed of in the design of the plant infra-structure, machinery foundation, and others.

Except for Prime White Cement, which produces white masonry cement, all the plants have been designed to produce ASTM C-150 Type I cement.

The cement making process of the plants are as follows:

LONG WET PROCESS -

Island Cement	-	2-kilns x 1300 MTD
Midland Cement	-	1-kiln x 1300 MTD
Rizal Cement	-	3-kilns x 425 MTD
Pacific Cement	-	1-kiln x 550 MTD
APO Cement	-	1-kiln x 800 MTD
BCI, Davao	-	1-kiln x 425 MTD

SEMI-DRY PROCESS

Filipinas Cement	-	2-kilns x 425 MTD 1-kiln x 800 MTD
Universal Cement	-	2-kilns x 425 MTD
BCI, La Union	-	3-kilns x 425 MTD
Central Cement	-	1-kiln x 500 MTD

DRY (SP) PROCESS

Northern Cement	-	2-kilns	x 1,000 MTD
Floro Cement	-	1-kiln	x 1,500 MTD
HI Cement	-	1-kiln	x 1,200 MTD
Continental Cement	-	1-kiln	x 1,300 MTD
Republic Cement	-	2-kilns 1-kiln	x 425 MTD x 800 MTD
Iligan Cement	-	1-kiln	x 1,000 MTD
Mindanao Portland Cement	-	1-kiln	x 500 MTD
Fortune Cement	-	1-kiln	x 1,000 MTD

The wet process kilns are of the long, chain-curtain installed type. The semi-dry types are mostly of the ACL-LEPOL and MIAG Calcinator design. The SP kilns are of Humboldt; Polysius; and Wedag variety with kiln revolution at 1.5 to 3.0 RPM.

Cement mills are mostly of the 2-compartment, with side, center and twin-drive arrangements.

Raw grinding mills are mostly of the air-swept design for the dry process plants with side, center and twin-drive arrangements.

Clinker coolers are mostly of the Fuller reciprocating grate design.

Present kiln heat rate average for the industry is 1,116 kcal per kg clinker produced. The wet kilns are on the high 1,250-1,300 kcal; semi-dry on the 1,000-1,100 kcal and the SP kilns at 800-950 kcal.

Power consumption is on the 120-140 kw-hrs per metric ton cement produced, with the SP kilns representing the higher power consumptions.

D. Energy Conservation -

As part of national policy in energy conservation, the industry has been geared to convert to coal by the end of 1982. Plant energy conservation groups have been established in each of the plants.

Fuel and power consumption are presently being monitored by the Bureau of Energy Utilization, Ministry of Energy.

It has been estimated that the conversion of the kilns to coal firing would represent a savings of not less than 35% of present fuel oil cost.

One plant has successfully marketed slag-cement as part of energy conservation. Two other plants are going into pozzolanic cement manufacture.

E. Industry Rationalization Program -

In 1973, the government, recognizing the importance of keeping the industry viable created the Philippine Cement Industry Authority (PCIA). This is now the policy-making and regulatory body of the cement industry only. No efforts todate however has been made to also rationalize the concrete product group which is presently also overcrowded.

As part of the rationalization process, the PCIA in 1978 engaged the services of European consultants to determine the actual plant capacities. The plants were then given a re-rating program and up to 1984 to achieve final re-rated capacity.

No existing plant can expand its capacity without the specific approval of PCIA. Any new plants however, must be of the 1.0 million per year capacity with specific guarantees that 60% of the capacity will be exported.

The coal conversion program is PCIA mandated. After 1982, no plants will be allowed to operate unless the kiln is coal fired.

F. Codes -

The government started in 1971 to go on metrication and established the Bureau of Standards for the purpose. Philippine cement is now sold in the domestic market on 40-kg bags.

Cement standards of quality have also been set. This is however very similar to the ASTM specifications.

On concrete specifications, the industry has been exposed to the rigid standards for safety class concrete for nuclear power plant application. In addition to the use of ASTM Type II (moderate heat of hydration and sulphate resistant), local aggregates were subjected to other ASTM tests such as those given under C-227. Pouring temperature on this

safety class concrete is at 20°C.

Even on Type I application, the Magat Dam project is presently being poured on 0°C temperature at the insistence of the consultants engaged for the project.

Load and non-load bearing blocks are also to ASTM specifications

II. Concrete Products:

A. Ready Mix -

Ready mix concrete had its beginning in the Metro-Manila area and the US Armed Forces installations at Clark Air Base and Subic Naval Base in 1953. There are now no less than 16 ready-mix plants operating in Metro-Manila alone. Technology used are of American, French, Italian and Japanese.

Ready mix batch plants outside of Metro-Manila are installed to serve a specific need such as large infra-structure programs in the Visayan and Mindanao island groups.

B. Concrete Pipes and Blocks -

There are at least 21 concrete pipe and hollow block factories whose products are quality controlled. They are also located in the Metro-Manila area.

Extreme competition is experienced from small backyard block and pipe makers using crude facilities.

C. Prestressed Concrete -

This is now an overcrowded industry. The Philippine Prestressed Concrete, Co., Inc. is the pioneer in the manufacture of structural and architectural system components, having started operations in 1962. This was followed by Constress Philippines, Inc. in 1965. Since then other companies followed. There are now eight (8) large outfits in the industry and three (3) or more small ones. One of the latest to operate is CDCP.

There are two (2) systems used in the Philippines, namely (a) the post tensioning system and (b) the pre-stressed system. The two systems are basically the same in principle. Both systems are used in the production of building and bridge structural components such as beams, floor and deck units, columns, wall panels, foundation piles, etc.

The use of structural and architectural system components has gained such a wide acceptance that they are now used extensively in the construction of commercial/industrial buildings and bridges.

Technologically, the Philippines is probably the most advanced in this industry in our region, except

for Australia. The Freyssinet Post Tensioning System Philippines, Inc. is establishing a branch in Kuala Lumpur Malaysia.

D. Precast Panels -

There are at least three (3) concrete precast panel manufacturers, two (2) of which are engaged in the mass production of low cost housing.

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