Report on

Industrial Visit

One day

industrial visit in MP Birla Cement Factory,
Durgapur, West Bengal.

Department of Electrical Engineering

RCC INSTITUTE OF INFORMATION TECHNOLOGY

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INDUSTRIAL VISIT

An industrial visit was organized by the department of Electrical Engineering, RCC Institute of Information Technology, on Saturday, 28th May 2022, at MP Birla Cement, Durgapur. Forty-four students from the third-year batch of the electrical department along with two professors Mr. Sarbojit Mukherjee and Mr. Budhaditya Biswas visited the industry.

We started around 7:30 AM from the college premises and reached there by 12:15 PM. At the beginning we were given a short training on safety measures inside the industry premises and then eventually we learned about the history of the factory, the manufacturing processes, different working sections of the factory etc. We were divided into 2 groups each of 22 students. The company supervisors conducted the visit for each group at a time. They explained us different areas of the factory like the conveyor belts, the roller press, the loading and unloading sections, the silo(storage). There were different areas in the industry for manufacturing, storage, laboratory testing etc. The visit was about a couple of hours long.

OVERVIEW

The Cement Division of Birla Corporation Limited has 11 plants at eight locations, **Satna & Maihar (Madhya Pradesh), Raebareli & Kundanganj (Uttar Pradesh), Chanderia (Rajasthan), Mukutban & Butibori (Maharashtra)** and **Durgapur (West Bengal)**.

They manufacture varieties of cement like Ordinary **Portland Cement** (OPC), 43 & 53 grades, **Portland Pozzolana Cement** (PPC), fly ash-based PPC, Low **Alkali Portland Cement**, **Portland Slag Cement** (PSC), **Low Heat Cement** and **Sulphate Resistant Cement**.

The cement is marketed under the brand names of **MP Birla Cement PERFECT PLUS, RAKSHAK, SAMRAT ADVANCED, ULTIMATE ULTRA, UNIQUE, SAMRAT, ULTIMATE, CHETAK, PSC, MULTICEM & CONCRECEM,** bringing the product under the common brand of **M P Birla Cement**.

The cement plant at Durgapur, West Bengal

The two cement manufacturing units in Durgapur are Durgapur Cement Works and Durgapur Hitech Cement. Both the plants have a manufacturing capacity of 2.30 million tonnes per annum. Portland Slag Cement (PSC) is manufactured in this plant.

Manufacturing process

From the limestone quarry to the delivery of the end product, follow every step in the cement manufacturing process.

Step 1: Mining

The cement manufacturing process starts from the mining of raw materials that are used in cement manufacturing, mainly limestone and clays. A limestone quarry is inside the plant area and a clays quarry is as far from the plant area as 25 km. The limestone is excavated from open cast mines after drilling and blasting and loaded onto dumpers which transport the materials and unload into hoppers of limestone crushers. The clays are excavated from open cast mines and loaded onto dumpers which transport the materials and unload into open yard storage. Then it is transported by trucks and unloaded into the hopper of a clay crusher. They are three types of clay used in cement manufacturing, namely silty clay, Zafarana clay, and Kaolin.

Other raw materials are used to control the kiln feed mix design, namely sand, and iron ore. The sand and iron ore are transport from outside the plant (from different suppliers) by trucks and unloaded into open yard piles, called sand and iron ore piles.

Step 2: Crushing, stacking, and reclaiming of raw materials

The limestone is crushed in the first crusher called a jaw crusher and then fed into the second crusher called an impact crusher with mixing of clays to reduce particle size below 50mm. The discharged raw mix (limestone 70 %; clays 30 %;) is fed onto a belt conveyor and passed across a bulk material analyzer. The raw mix is fed into a circular storage unit called a raw mix storage.

Then, the mix is extracted transversely from the stockpile by reclaimers and conveyed to a raw mill bin called the raw mix bin for grinding.

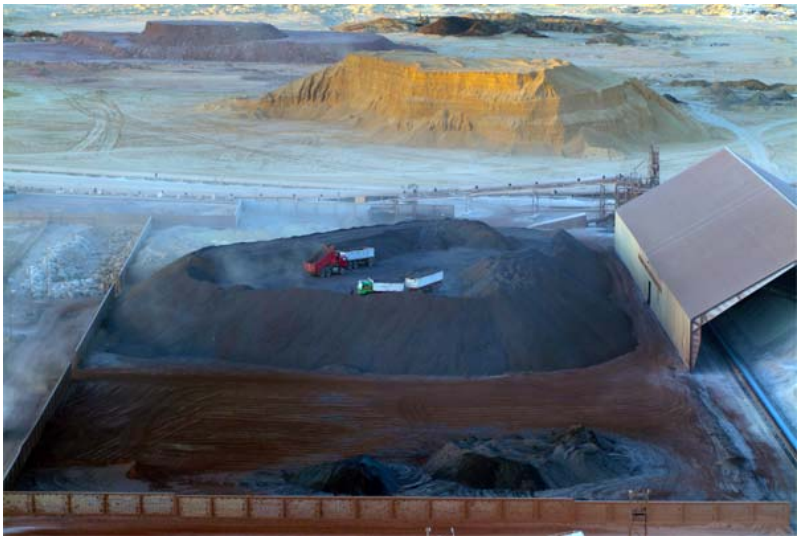
The other raw materials that are used in cement manufacturing, called additives, are high purity limestone, sand and iron ore. The high purity limestone is crushed in a lone in jaw crusher and then crushed more in a secondary crusher to reduce the size to completely pass through a 50mm sieve. Then, it is stacked by a limestone stacker into a longitudinal storage unit called the limestone storage stockpile. Finally, the limestone is extracted transversely from the stockpile by reclaimer and conveyed to a raw mill bin, called the limestone bin, for grinding.

Step 3: Raw meal drying, grinding, and homogenization

The raw mix, high grade limestone, sand, and iron ore are fed from their bins to raw mills, called air swept mills, for drying and fine grinding. The raw mill contains two chambers, separated by diaphragm, namely a drying chamber and a grinding chamber. The hot gases coming from a preheater (preheater / kiln system) enter the mill and are used in raw mills for drying. Then the drying materials enter the grinding chamber of raw mills for fine grinding. The grinding chamber contains a certain quantity of ball charge in a different size ranging from 30mm to 90mm. The hot gas and grinding materials mill outlet feeds to a separator which separates fine and course product. The latter, called reject, is sent to the mill inlet via an air slide for regrinding. The hot gas and fine materials enter a multistage "cyclone" to separate a fine materials and gases. The fine material, called raw meal, is collected from the multi-cyclone and then fed into an air slide for lifting called an Aeropol. The hot gases with very fine materials enter an electrostatic precipitator to separate the fine materials from gases. The very fine materials called preheater dust or electrostatic separator dust is collected from filters and fed into screw conveyors and are then mixed with the fine material in an air slide and transported to an air lift vessel via air slide. In the air lift, the raw meal is lifted to the silo by compressed air to the air slide and then stored and homogenized in a concrete silo. Raw meal extracted from the silo, now called kiln feed, is fed to the top of the preheater via an air lift called the Poldos for pyro-processing.

Step 4: Clinkerization

Cement clinker is made by pyroprocessing of kiln feed into the preheater-kiln system. The preheater-kiln system consists of a multi-stage cyclone



preheater with five stages, combustion chamber, riser duct, rotary kiln, and grate cooler. In the preheater, the kiln feed is preheated by hot gas coming from the combustion chamber and rotary kiln. Then the preheated kiln feed is partially calcined (made powdery) in a combustion chamber and riser duct and then completely calcined in a rotary kiln as well as heated to approximately 1400 C to form clinker components C3A, C4AF, C2S, and C3S. The main source of heat is natural gas. Natural gas is fired as a main fuel (100 %) in the main burner rotary kiln and a 95% natural gas and 5.0% heavy oil combination in the combustion chamber. The fuel is used to provide the heat required to convert the kiln feed into clinker. Hot clinker discharge from the kiln drops onto the grate cooler for cooling from approximately 1350-1450 C to approximately 120 C. In the cooler, the quantity of cooling air required for clinker cooling is extracted from the atmosphere by different cooling fans and fed into the cooler chambers and pressurized through the cooler plate and clinker bed. The cooled clinker discharges from the cooler into the pan conveyor and it is transported to the clinker storage. The clinker is taken from the clinker storage to cement ball mill hoppers for cement grinding. Part of the hot air extracted from the cooler is utilized as a secondary and tertiary air for combustion in rotary kiln and combustion chamber, respectively.

Step 5: Cement grinding and storage

Clinker and gypsum for OPC, limestone for limestone cement, and slag for slag cement are all extracted from their respective hoppers and fed to the cement mills. The ball mill grinds the feed to a fine powder in two chambers, namely the first and second chambers. The two chambers have a certain quantity of ball charge of different sizes from 17mm to 90 mm. The mill discharge is fed to a bucket elevator which takes the material to a separator which separates fine and coarse product. The latter is sent to the mill inlet for regrinding and the final product is stored in concrete silos.

Step 6: Packing

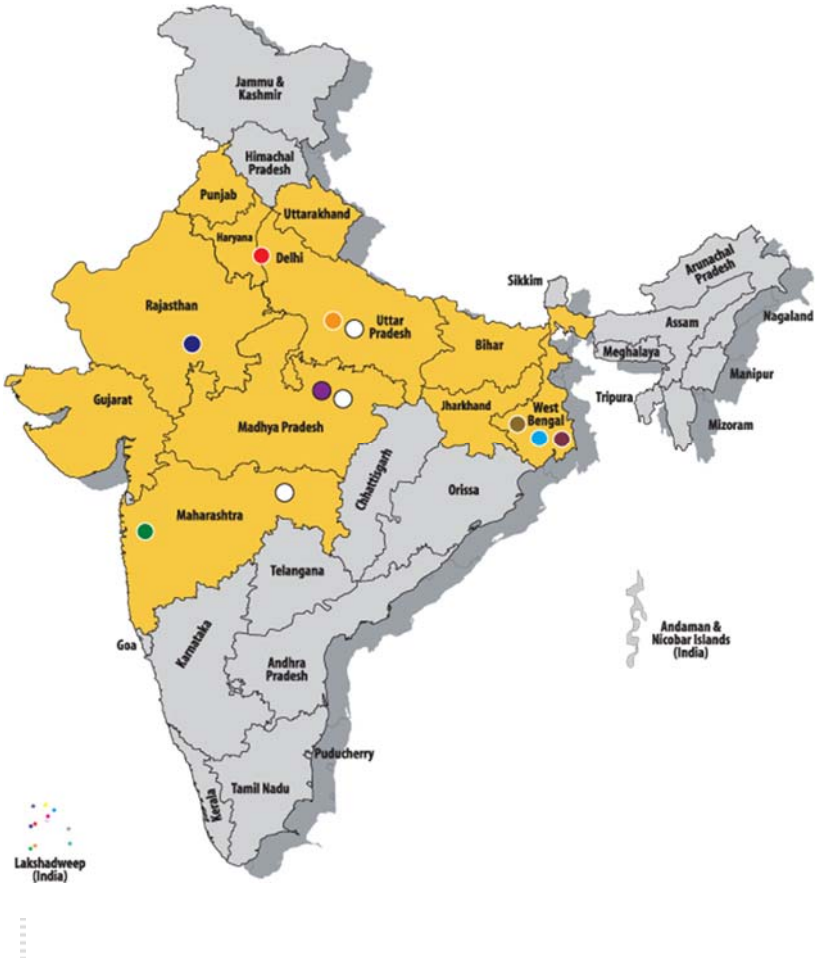
Cement extracted from silos is conveyed to the automatic electronic packers where it is packed in 50 kg bags and dispatched in trucks.

BCL Products: -

UNITS	PRODUCTS	BIS SPECIFICATIONS
Birla Cement Works Chanderia Cement Works	Portland Pozzolana Cement (PPC) Ordinary Portland Cement (OPC) 43 Gr, 53 Gr, SRC	IS 1489 (Part - I) 43 Gr - IS 269 53 Gr - IS 269 SRC - IS 12330
Satna Cement Works	PPC OPC (43 Gr.) OPC (53 Gr.)	IS 1489 (Part - I) IS 269 IS 269
Raebareli Cement Works Raebareli Hitech Cement Works	PPC	IS 1489 (Part - I)
Durgapur Cement Works	Portland Slag Cement (PSC)	IS 455
Durga Hitech Cement	PPC Composite Cement	IS 1489 (Part - I) IS 16415

MP BIRLA CEMENT PLANTS

Birla Corporation currently produces cement at eight locations through its 11 manufacturing units with a combined capacity of almost 20 million tons per annum. The production units have been renovated and modernised to ensure that the cement is at par with the best.



- SATNA (Cement Plant, Steel Foundry, Hospitals, School)
- CHANDERIA (Cement Plants, Hospital, School)
- DURGAPUR Cement Plants
- BIRLAPUR (Jute Mill, Hospital, School)
- KOLKATA (Corporate & Registered Offices, Jute Mill)
- NEW DELHI (Office)
- MUMBAI (Office)

STATE	TOWN	UNITS	OPERATIONAL CAPACITY (MILLION TONS)
Madhya Pradesh	Satna	Satna Cement Works	2.60
Rajasthan	Chanderia	Birla Cement Works / Chanderia Cement Works	4.00
West Bengal	Durgapur	Durgapur Cement Works / Durga Hitech Cement	2.05
Uttar Pradesh	Raebareli	Raebareli Cement Works / Raebareli Hitech Cement Works	1.24
Total			**9.89**

The visit helped us to acquire knowledge about the different processes of manufacturing cement, its raw components with their different compositions and their origin. We also got to know about the different machines with their specifications and workings.

Glimpses of the Visit