Cement

Cement is made by grinding together a mixture of limestone and clay, which is then heated at a temperature of 1,450?C. What results is a granular substance called "clinker," a combination of calcium, silicate, alumina and iron oxide.

The Vicat Group manufactures and markets various types of cement, based on the chemical composition of the raw materials that are used and the addition of complementary constituents (components) during the stages of grinding and refining. Each cement type has specific applications. These include residential construction, civil engineering structures, underground work and the production of concrete for harsh environments or in highly corrosive conditions.

The main types of cement produced by the Group, all of which comply with European standards, are:

CEM I (Portland cement) and CEM II (Portland compound cement): These are commonly used in civil engineering projects, industrial and commercial buildings, and in residential construction requiring the use of reinforced concrete. Some of these specially formulated cements are also used in subterranean (underground) work in harsh environments and in undersea projects.

CEM III (blast furnace slag cement) and CEM V (slag cement) : These release a small amount of heat during hydration and contain low-grade sulphates used for subterranean work in harsh environments and in sea-related projects.

CEM IV (pozzolan cement): This type of cement uses mineral substances of volcanic origin that have hydraulic properties. The Group manufactures and sells this cement only in Italy.

Prompt natural cement: For the last 150 years, the Vicat Group has been producing prompt natural cement, which sets and hardens quickly. It contains a natural agrillaceous limestone that performs exceptionally well with a high degree of resistance and minimal shrinkage. This cement is used for quick masonry work in water and in sanitation plants, for restoring and decorating heritage structures, and in ecological construction projects.

All of these varieties of cement comply with specific industry standards and norms. They are subject to stringent controls at each stage of the manufacturing process, thereby guaranteeing the highest level of quality. Moreover, the Vicat Group conducts research and development programs that further contribute to the optimization of its products.

Cement* may be broadly described as *"a material possessing adhesive and cohesive properties, and capable of binding materials like stones, bricks, building blocks, etc."* The principal constituents of cement used for constructional purposes are *compounds of* Ca (*calcarious*) and *Al + Si* (*argilleceous*). *The cements have property of setting and hardening under water by virtue of certain chemical reactions with it and are, therefore, called* '**hydraulic cements**'.

CLASSIFICATION : (1) Natural cement *is made by calcining a naturally occurring argillaceous limestone (i.e., 20-40% clay-containing limestone) at a high temperature and subsequently, pulverizing the calcined mass.* During calcination, silica and alumina, present in sufficient quantities, combine with the calcium oxide to form the corresponding calcium silicates and aluminates.

Properties : Natural cement possesses *hydraulic* qualities, but is *quick-setting* and of relatively *low strength.* Mortar made from natural cement and sand is satisfactorily used in laying bricks and setting stones. It is also used in large masses of concretes such as dams and foundations. After the discovery of Portland cement, the use and production of natural cement has been nearly dropped.

(2) *Puzzolana cement* is among the oldest cementing materials known. It was invented by Romans and used by them in making concrete for the construction of walls and domes. By definition, ***puzzolana cements*** *"are materials which when mixes with lime, without the use of heat, form hydraulic cementing materials."* Such cements consist, essentially, of silicates of aluminum, iron and calcium. Puzzolana cements are made by simply mixing and grinding : (*i*) *natural puzzolana* (which are deposits of volcanic ash consisting of a glassy material, produced by rapid cooling of *lava* (a molten mixture of silicates of calcium, iron and aluminium), and (*ii*) *slaked-lime.*

Properties : Puzzolana cements possess *hydraulic* properties. They are seldom used as such at present time, but are mixed with Portland cement.

(3) Slag cement *is made from blast furnace slag and hydrated lime.* The blast furnace slag (consisting largely of a mixture of calcium and aluminium silicates) is granulated by pouring it into a stream of cold water. It is then dried and mixed with hydrated lime, and then the mixture is finely pulverized. Slag cements are *slow to harden,* so an accelerator like clay, salt or caustic soda is sometimes added.

Properties : Slag cements *set more slowly than Portland cement.* They have *lower strength* and are *poor in abrasion-resistance.* Slag cements are used, to a limited extent, for making concrete in bulk construction, where strength is relatively unimportant.

(4) Portland cement is defined as *"an extremely finely ground product obtained by calcining together at about 1,500°C, an intimate and properly proportioned mixture of argillaceous (clay-containing) and calcareous*