

CEMENT, AGENT OF ECONOMIC GROWTH

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ABSTRACT

Cement, its contribution in economic growth of nations is significant. Cement is the super glue of the construction industry; it is the binding agent that holds construction materials together. Cement is used in the production of concrete, concrete masonry units, mortar for binding concrete blocks. It is also used to bind other construction materials such as stones, bricks and many other materials used in the construction industry. When cement is mixed with coarse aggregate, fine aggregate and water, the end product is concrete used for construction of roads, bridges, buildings, retaining walls, embankment walls, dams and many more. The construction industry depends on cement in the production of construction materials. It is important to note that the construction industry is the major engine of economic growth of nations as compared to other sectors in economic development, such as agriculture and manufacturing services. The construction industry which is the most important sector in economic growth depends on cement in production of its construction materials. For this reason, it means that cement is the backbone of the construction industry and it is also an agent of economic growth of nations.

Keywords: Cement, Water, Sand, Gravel, Crushed Stones, Aggregates, Construction, Concrete, Blocks, Rocks, Mortar, Binder, Portland cement, Construction Industry, Construction Materials, Infrastructure, Economic Development, Economic Growth.

INTRODUCTION

Cement plays a pivotal role in concrete construction systems, it is one of the most important construction materials used in the construction industry as a binding agent. Cement is a fine powdery substance made of limestone, silicon and other materials, it is produced in cement production plants. When

cement is mixed with aggregates, and water, it sets, hardens to be used in binding construction materials such as concrete blocks, stones, tiles, bricks, rocks and many other construction materials. It is used for the production of concrete and mortar for construction. When cement is mixed with fine aggregate (sand), coarse aggregate (crushed stone or gravel), and water, its end product is concrete. When cement is mixed with water and fine aggregate (sand), its end product is mortar, used as binder of concrete blocks, bricks, rocks, stones and many other construction materials. Cement is very significant substance in civil engineering construction works, such as roads and highways. Hydraulic cement which is the Portland cement is the most commonly used cement worldwide for production of concrete as load bearing construction material. Cement is the key ingredient of the construction industry; it plays a vital role in economic development of nations.

Cement & construction

An Industry overview

What is cement & construction? **Cement:** Cement is a binder, a substance that sets and hardens independently, and can bind other materials together. **Construction:** construction is a process that consists of building or assembling of infrastructure. Indian Cement Industry, India is the second – largest cement producing country in the world after China. In India, cement demand emanates from four key segments: Cement Demand Housing Infrastructure Commercial Construction Industry sector. The construction industry is the second largest industry of the country after agriculture. It makes a significant contribution to the national economy and provides employment to large number of people. **Sumati Joshi (2013).**

The cement industry plays an important role in the economic development of country like India. Cement is a binding agent which is one of the important constituent for construction Industry. Historically, the growth rate of cement industry has remained higher than overall economic growth. **Shodhgagan (2011).** The cement Industry is bellwether for the U.S. economy – it is tied to construction, infrastructure, energy and many other sectors. **Edward Sullivan (2018).** In construction, the substance

that provides strength and stability for construction materials to make sure that the materials stay together and standing is the cement. Cement is the key component in concrete production because it is a water based element that is used to bind every other construction materials together. Concrete product is very important in construction because the concrete can be broken and crushed during site clearance and demolition and re – used, ideal product for recycling process of using materials. The concrete recycling is a good process of using the by – product for new construction and its cost effective.

Cement and concrete play a central role in the circular economy. But in order to fully unleash the potential of these sectors, which are essential to society, we need to define, develop and implement the right policy framework. Cement and concrete ensure that we have homes and offices, schools and hospitals as well as transport infrastructure. Concrete is in fact made up of cement, water and aggregates (gravel, crushed stones, sand, recycled concrete). And guess what: concrete as is 100% recyclable and can go back into concrete as a recycled aggregate or into other applications (e.g. road base.). Koen Coppenholle. (2015).

Cement is not important for all types of construction work as in steel structures you don't need to use cement as nut, bolt or welding are appropriate to join one member to another. While in concrete and composite structures you need to use a cementitious material for making structural member with low cost. Cement with aggregates makes a wonderful material for use. Iftikhar Hussain. (2017). In Ancient Rome, there was innovative development of concrete Revolution which contributed to complicated structural forms, the Pantheon dome, was built with unreinforced concrete. The majority of surviving buildings of the Roman Empire were built with concrete. The construction material, concrete, made it possible for the Romans to engage in new construction technologies such as the vault dome and the arch. Other structures such as the colosseum in Rome, Italy, with the classical orders, the Maison Carree at Nimes in France, one of the best preserved Roman Temples, the Pont du Gard aqueduct in Southern France, the Basilicas, the Roman

baroque architecture were all constructed with concrete, a product of cement. The concrete used in the construction of these great structures was made possible with the use of cement as a binding agent. The Roman civil engineering and public works such as the aqueducts, baths, circuses, amphitheatres, domes, dams, bridges, harbours, temples and theatres were constructed with concrete produced out of cement. The Ancient Romans produced concrete that is mixed with volcanic ash, for this, the concrete of the Roman Empire last longer than our modern day concrete which is a mixture of limestone and clay. The Roman concrete is more durable because of the inclusion of the volcanic ash that resists cracking on the concrete, according to researchers. The concrete of the Romans was produced with cement that is hydraulic based, it is different from the Portland cement that is used today worldwide. The modern day concrete produced with Portland cement used in construction of our infrastructures gets wicker with time and crumble down as compared to the Roman concrete that is based on hydraulic setting that makes it gets stronger with time. Scientists have found out the special ingredient in the Roman concrete that makes it durable, the ingredient is the volcanic ash in the mixture that makes the concrete gets stronger with time.

Ancient Romans built concrete sea walls that have withstood ocean waves for more than 2,000 years. Now, an international team has discovered a clue to the concrete's longevity: rare mineral forms during chemical reactions between the concrete and seawater that strengthen the material. Modern concrete uses a past of water and Portland cement, a fine powder made mostly of limestone and clay, to hold together small rocks. But it degrades within decades, especially in harsh marine environment. Instead of Portland cement, the Roman concrete used a mix of volcanic ash and lime to bind rock fragments. The Roman scholar Pliny the Elder described underwater concrete structures that become "a single stone mass, impregnable to waves and every day stronger". Alexandra Witze. (2017). One of the fascinating mysteries of Ancient Rome is the impressive longevity of some of their concrete harbor structures. Battered by sea waves for 2,000 years, these things are still around while our modern concoctions erode over mere decades. Now scientists have uncovered the

incredible chemistry behind this phenomenon, getting closer to unlocking its long – lost recipe. As it turns out, not only is Roman concrete more durable than what we can make today, but it is actually gets stronger over time. Modern concrete is typically made with Portland cement, a mixture a silica sand, limestone, clay, chalk and other ingredients melted together at blistering temperatures. In concrete, this past binds ‘aggregate’- chunks of rock and sand. But that’s not how Roman concrete works. Theirs was created with volcanic ash, lime and seawater, taking advantage of a chemical reaction Romans may have observed in naturally cemented volcanic ash deposits called tuff rocks. Signe Dean. (2017).

Cement is a water – based binder used to bind other building materials together. It is used in the production of mortar and concrete during the construction process. Concrete on the other hand, is a material used in construction, made by mixing aggregate (i.e. different types of sand and gravel), cement, small stones and water. The reason cement is one of the most common construction ingredients among others is its ability to hold the structure together. To get concrete, one mixes water, sand and gravel. When cement is mixed with water and sand, the outcome is cement plaster, yet when cement is mixed with water and lime, the result is mortar. The word cement has become such a natural part of construction vocabulary that even individuals who very remotely relate to modern construction processes make glib references to the substance. Paul Mugabi. (2010).

The water - cement ratio is one of the most important aspects when it comes to maintaining the strength of concrete. The ratio depends on the grade of concrete and the structure size. We generally prefer a W/C ratio of 0.4 to 0.6, but it can be decreased in case of high grade concrete, we reduced the amount of water and use plasticizers instead. W/C ratio affects the workability of concrete and thus should be taken into careful consideration. Also, if the ratio exceeds the normal value, segregation of the concrete occurs and the coarse aggregate settles at the bottom, thus affecting the strength of the concrete greatly. Rakshita Nagayach. (2015).

It is very important to note here that in addition to encourage proper Water –Cement ratio in concrete mixing, the concrete needs to be tested to ensure its workability. The fresh concrete should go through a slump cone test to make sure the concrete is workable. Fill – up the metal cone with concrete in three stages, tap each layer with metal rod to compact, and then pull off the cone vertically after the top of the apparatus is struck off flush the concrete to the top of the mould. After a careful lift up vertically, of the testing apparatus, the concrete will slump at various shapes. The slump is then categorized as true slump, shear slump or collapsed slump. If the slump is a collapsed slump or a shear slump, the concrete mix is not a workable concrete, the mix has excessive water, too wet for the concrete. A workable concrete mix will not collapse; this is considered as a true slump. Concrete slump test is a requirement to make sure or determine the consistency or the workability of the concrete. The concrete is usually mixed at the construction site as work progresses or the concrete can be produced at the laboratory. The slump test of the concrete is usually executed at each batch to determine the uniformity of the quality of the concrete at construction time. The test is very simple and it is low cost and it produces immediate results, it is used worldwide.

Slump is a measurement of concrete's workability, or fluidity. It's an indirect measurement of concrete consistency or stiffness. A slump test is a method used to determine the consistency of concrete. The consistency or stiffness indicates how much water has been used in the mix. The stiffness of the concrete mix should be matched to the requirements for the finished product quality. The concrete slump test is used for the measurement of a property of fresh concrete. The test is an empirical test that measures the workability of fresh concrete. More specifically, it measures consistency between batches. The test is popular due to the simplicity of apparatus used and slump procedure. The slump test is a measure of the behavior of a compacted inverted cone of concrete under the action of gravity. It measures the consistency or the wetness of concrete. Haeeb Jamal. (2017).

Water – Cement ratio is the ratio of the weight of water to the weight of cement used in a concrete mix. It is sure that the

strength of concrete is directly proportionate to the water cement ratio. Decrease in water cement ratio increase the strength of concrete to some extent, but an optimum ratio is to be maintained so that entire cement part of the concrete can take part in reaction, failing which the concrete will decrease its strength. More over for lesser W/C ratio the workability of the concrete will be affected. So that it is difficult to obtain finishing of your shape. On the contrary, if you increase the W/C ratio it reduces the strength of concrete. As to react the chemical reaction of cement it required a optimum amount of water. More than that, residual quantity of water will be in the concrete structure. In due course that water will evaporate from the concrete leaving pores in the concrete surface. This makes the concrete lesser strength. Yacob Alomer. (2016).

CONCLUSION:

Cement, the glue of the construction industry.

Any infrastructure around us in any community or city is provided by the construction industry. Road transportation systems, bridge, municipal sewage systems, civil engineering works, dam construction, office complex, housing and more, are products of the construction industry. Houses are built to provide shelter for people to live and go to work, office buildings provides people with working spaces, and roads, facilitates the movement of goods and services from one location to the other. All these infrastructures and more are made possible with the use of cement as a construction binding material. We must therefore recognize the fact that cement is a vital economic development construction substance and that without cement, the construction industry which is a major economic development force worldwide, will not function.

It is well understood that concrete is the most used construction material in the construction industry, including civil engineering works. Concrete is used for the construction of the following: precast concrete pipes, pavements, buildings, roads, bridges, overpass, poles, foundations, walkways, fence walls, fencing columns, dams, tunnels, concrete curb and gutters, airport terminals and runways, etc.

It is also well understood that no nation can survive economically without construction investment program because of its economic development capabilities, including employment generating potentials. If concrete is a major construction material in the construction industry and that the construction industry is a major economic development sector worldwide. Then it is also good to say or understood that cement is the most vital economic development construction material for all nations, because concrete is a product of cement. Therefore, the role of cement in the construction industry and economic development of nations is vital. Concrete is produced by mixing cement, water and aggregates (sand, crushed stones, gravels and crushed concrete), cement is the binding agent in the concrete. Cement, the binding agent is the substance that makes concrete which is used in construction worldwide. We should therefore, know by now the pivotal role cement plays in the construction industry both as a binding agent and economic development of nations. Cement is an agent of economic development.

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