

# Cement makers coming of age

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THE development of cement industry in Bangladesh dates back to the early-fifties but its growth in real sense started only about a decade. Till 1990 about 95 percent of the country's demand for cement had been met through import. The country has been experiencing an upsurge in cement consumption for last 6/7 years.

The transition of traditional low rise building to high rise ones has pushed up the use of cement. Increase in demand for cement has soared up due to mainly the property sector boom and infrastructure development concentrated in Dhaka city and other major urban areas of the country. With the implementation of large-scale infrastructure projects, exhilarated pace of urbanisation, construction of apartment buildings and multi-storey shopping complexes in urban areas, and changes in the taste and economic condition to a large number of rural people, aspiring for modern houses the demand for cement has been gaining momentum by the day. Now Bangladesh's cement industry has become the 40th largest market in the world.

Till 2002, only one type of cement available in Bangladesh was Ordinary Portland Cement (OPC) which is made following the American Standard Method (ASTM). From 2003, various types of cement became available in Bangladesh which helped the cement industry provide differentiated and improved products to customers. The cement which is widely used from 2003 is the Portland Composite Cement (PCC) which is made following European Standard Methods (EN), called as BDS EN. At present, the ratio of production of PCC and OPC is around 95:5.

PCC gives equal strength and durability like OPC. The basic difference between them is in the manufacturing technology. Only 65-80percent of clinker is required to produce PCC while 95 percent of clinker is required to produce OPC. So, worldwide PCC has become popular which requires less clinker.

Although the current installed capacity of the industry is around 28.0 million tonnes a year, due to interruption in power supply and other constraints, effective capacity is around 20.0 million MT and current demand is around 18 million MT a year. The industry experienced 31.8 percent growth in 2010. In addition to some mega structures, many developers started a large number of new projects.

With the increase in demand, all the leading companies have expanded their plants, nearly doubling their capacities, presuming about 15 percent yearly growth in demand and foreseeing the future prospects. However, growth in 2013 was only 8 percent, the lowest in five years; political instability is assumed to be the main reason.

The cement industry, like most capital-intensive commodity industries, is cyclical in nature with respect to supply. Cement demand is closely linked to the growth of the construction sector. Hence, when the construction sector is strong, demand increases. As a result, the profitability rises, leading to capacity additions by existing players and the entry of new players. However, since it takes 2-2.5 years to build a cement plant, it is likely that before completion, demand could decrease or stagnate, or the capacity additions could exceed demand. This can lead to a fall in cement prices, and the industry could face a downturn, leading to reducing operating rates or shutting down capacities.

Multinational cement companies are facing intensive competition with local companies which are grabbing the top slot of the industry by operating in economy of scale and with deft marketing strategy. Multinationals bear high overhead costs regarding salary and infrastructure. On the other hand, local companies are more focused to keep the overhead costs low. Multinationals are concentrating on retaining their brand images. But some local companies are offering quality product with better services. Local companies are investing in backward linkages (captive power plants), have built big plants to reduce costs of production and have a fleet of covered van/trucks to carry the products right to the doorsteps of consumers. Quality-wise also, the local companies have made rapid strides. Local manufacturers have been pursuing more innovative and aggressive business strategy compared to multinationals. Local manufacturers seek to seize large market by reaching mass people through economies of scale while multinationals cater the needs of specific group of customers by charging high price.

Statistical data of per capita cement utilisation among some developing countries will prove the potential of the cement industry in our country. The present per head cement consumption in Bangladesh is about 83 KG, which is fairly low compared to India (174 KG), Malaysia (590 KG), Pakistan (131 KG),

Thailand (425 KG), Sri Lanka (178 KG) and Vietnam (408 KG). It is also observed that the real estate sector is booming by the day, the country's physical infrastructure needs to be developed to a great extent, the capital and other cities of the country needs civil construction with heavy structures, our rural areas are stepping towards a modern look with the improvement of the rural economy. In addition, although some steel structures have been developed in recent time, no direct substitute of cement has yet been developed.

In addition, the International Monetary Fund (IMF) indicated that Bangladesh's economy has become the 48th largest in the world. In line with this strategic vision, the government has undertaken massive programmes for infrastructure development in partnership with the private sector. As the government allows 100 percent foreign direct investment, the infrastructure sector offers an interesting mix of opportunities for overseas interest leading to high growth in cement industry.

Some governmental initiatives may give further momentum to the cement industry. In Thailand, Nigeria and even our neighboring country, India most of recent roads are constructed in RCC structure which gives much greater durability with only 10-15 percent higher cost. In our country almost all roads constructed in last 2/3 decades are of asphalt concrete structure which is very much susceptible to water and get damaged very quickly. If Bangladesh Government pays attention to this issue, durability of roads can at least be doubled or tripled with RCC structure which will also increase demand of cement.

Furthermore, apart from Padma Bridge quite a few big infrastructural projects of Bangladesh government like Dhaka City Elevated Expressway, Dhaka-Chittagong Access Control Highway, Sky Rail around Dhaka City, Dhaka Metro Rail Transit, Dhaka-Narayanganj-Gazipur-Dhaka Elevated Expressway, and deep-sea port in Chittagong are in planning stage and will create huge demand of cement.

In addition, Bangladesh started exporting cement in 2003. The major export market is the northeastern states of India including Tripura, Meghalaya, east and western region of Assam. M.I. Cement Factory Ltd. is pioneer in this regard and its brand Crown Cement constitutes for around 40 percent of the export market. It has won National Export Trophy (Gold) for consecutive two years (2008-



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2009 and 2009-2010).

Myanmar is showing another prospective market for export of cement to boost up and develop the cement export; this industrial sector needs government patronization. To reduce production cost sufficient gas and electricity supply should be ensured.

Although a booming sector with great potentiality, cement industry has also some risk factors. Firstly, it is threatened by over supply resulting from huge capacity expansion by almost all leading industry players. Secondly, almost all raw materials of cement are imported, if the supplies of the same are cut-off due to adverse political cause or other disturbance, the industry may face serious challenges, even the risk of shut down. Exports also predict some problems in the future, especially regarding cement prices.

However, global demand for cement is rotating according to the growth of the construction sector in each region. High demand for cement had been observed in Europe and America during 1960-70. After 1970, cement demand shifted to India, Malaysia, Hong Kong, Singapore and South Korea. High Demand for cement continued in these areas till 1990. From 2000, Asian countries such as Bangladesh, Pakistan, Nepal and Myanmar are now enjoying high growth rates of cement consumption. The trend is expected to continue until 2035. We hope the cement industry in Bangladesh will grow for further two decades.

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## Ductile and fatigue properties of steel

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Industrial buildings are constantly subjected to vibrations from operating machinery. In a flyover the deck is subjected to the rolling load of moving vehicles where the bending stresses reverses rapidly. These load reversals will persist during the service life of the flyover. Further, moving vehicles below the flyover impart vibratory impact loads to the piers of the flyover. In both the cases these are dynamic loads. Earthquake ground movement imparts stresses beyond the yield strength of steel and sections of the building frame or flyover may undergo considerable 'plastic rotation' and form a 'hinge'. This plastic rotation absorbs most of the seismic energy and prevents a catastrophic collapse of the building or flyover. In a 'plastic hinge' type failure the building is damaged beyond repair, short of collapse. It should be mentioned that in forming a plastic hinge the load carrying capacity of the steel increases. Therefore, the ductile property of steel is the only and most important requirement for protection against catastrophic collapse.

The American Concrete Institute (ACI) code and our own Bangladesh National Building Code (BNBC) requires Ductility of steel measured as a ratio of Tensile strength to Yield Strength as a basis for ensuring safety in Earthquake design of structures. The European 'Euro Code-2' and the Australia-New Zealand ANZ Code prescribe Elongation at Maximum Force (EMF) as the measure for safe earthquake design. In reality both the approaches are similar. While the ACI and BNBC approach is 'stress' based the Euro Code 2 and ANZ approach is 'strain' based.

Industrial buildings and transportation infrastructure can fail, sometimes quite catastrophically, at the end of their useful lifetimes due to fatigue failure of the steel and concrete. Fatigue occurs due to cyclic loading of the structure. An industrial building or flyover can be considered to have a useful life between 40 to 50 years. Fatigue failure can also be quite sudden and without warning and the consequences can be very disastrous. The International Standards Organisation (ISO) has laid down detailed specifications for the fatigue testing of constructional steel. The prescribed limit for the successful test of fatigue strength of constructional steel is 5 million load reversals on an axially loaded steel specimen.

The Bangladesh University of Engineering & Technology has excellent facilities for the testing of ductile and complete tensile properties of constructional steel as per international standards and codes. It can conduct tests on 8mm to 60mm reinforcing steel bars. Unfortunately there is no fully fledged facility in the country to test the fatigue properties of constructional steel.

In conclusion, the 'ductile' property of steel remains inherently latent and 'unused' over the lifetime of the structure. If no major earthquake occurs during the life span of the structure the 'ductility' of the steel remains unchanged. On the other hand the 'fatigue' property of steel is 'used up' gradually over the service life of the structure. Both the steel and concrete become more vulnerable to failure at the end of the service life of the structure. This is one of the reasons, old buildings and bridges become more risky to use after its useful service life.

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