Precast multi-storey car park.

Wagon loading shed 15m wide × 1km long, constructed using precast prestressed and steel composite technology.

The precast concrete industry in India

The growth of cement demand in India has been particularly impressive since 2000. The transformation of the country to a modernised 21st Century society and economy looks set to continue. There will be periodic blips, such as the knock-on impact of the current downturn in growth of the Chinese economy, but the long-term prospects are strong. The cement market in India is expected to grow at a compound annual growth rate of 9% during the period to 2019.

Martin Clarke, Cement & Concrete Associates, Wotton-under-Edge, UK

In India, the housing sector is the biggest demand driver of cement, accounting for about 67% of the total consumption. The other major consumers of cement include infrastructure at 13%, commercial construction at 11% and industrial construction at 8%.

To meet the rise in demand, cement companies are expected to add 56 million tonnes (MT) capacity over the next three years. The cement capacity in India may register a growth of 8% by the end of 2016 to 395 MT from the current level of 366 MT. It may increase further to 421 MT by the end of 2017.

Now second only to China in its consumption and production of cement, the 2011 forecast from the Cement Sustainability Initiative (CSI) projected India overtaking China by 2050. For cement of course we should read concrete. India and China are becoming the powerhouses of the world concrete industry. To the mix of issues we can add the huge growth in coal-fired power and hence the supply of pfa and bottom ash, the fairly recent discovery of the benefits of using locally produced blast-furnace slag cement and the widespread interest in the development and use of geopolymers. It is to these two countries that we should look for the next 50 years of progress across the board, including environment, technical and engineering developments. Such a position of leadership puts a responsibility on the Indian cement and concrete industry to avoid mistakes that could impact on its citizens and the economy.

It is vital that the concrete construction industry operates safely and adopts environmentally sound practices. Above all, concrete structures must be made of high-quality products and be designed and built to be safe, durable and adaptable. As a less centrally controlled society, this will be a major challenge for India compared with China.

The Indian precast concrete industry

Little is documented about the Indian precast concrete industry. The international production machinery companies occasionally write-up useful features about new factory investments but no one knows the size of the market, its recent growth record or its potential. Some sectors are well established. Concrete pipes using Hume spinning technology are perhaps the most established products, dating back nearly a century. Structural precast has been cast on-site by major contracting groups for 50 or 60 years, but the skills have been transient as the pool of expertise moves around the country. More recently there has been some investment in fixed-location facilities around the major cities to produce a range of structural and architectural precast.

In the manufactured concrete products sector, the growth in the supply of fly ash has led to a new generation of factories producing autoclaved aerated concrete blocks, also known in India as foamed concrete. That sector looks certain to expand, judging by the expected growth in fly ash production and the urgent need for the Indian industry


SRM University is constructing an 11-storey hostel building at Trichy in Tamil Nadu, accommodating a large column-free space at ground floor. To achieve the column-free area, innovative use of precast moment frames is adopted. The flooring is in the form of precast, pre-stressed hollowcore units.


Precast multi-storey car park.

to control its carbon footprint. Other areas – especially manufactured concrete products such as aggregate blocks, paving and roof tiles – are dominated by thousands of unregulated small factories producing a range of qualities. Occasional purges of unauthorised sites do happen but are temporary in their effect.

The Indian precast industry urgently needs organisation in all the main product areas. As countries develop, there is a natural trend to move from site mixing of concrete using bags of cement towards the use of ready-mixed concrete produced at fixed locations and also at mobile facilities. A secondary trend then follows whereby structural design and construction process efficiencies can be secured by replacing in-situ concrete with precast concrete systems. This can be most clearly seen in The Netherlands where the precast and ready-mixed markets are equal in size. Such a trend is in place in India although, uniquely, the Indian industry has the opportunity to accelerate the growth of precast ahead of the growth rate in cement demand.

Lessons from India

In recent years, the Indian ready-mixed industry has developed significantly in delivering a better quality, more consistent product. The essential ingredient behind it has been leadership and the role of the Ready-Mixed Concrete Manufacturers Association (RMCMA) and its members, stimulated by international collaboration and a shared determination to adhere to Bureau of Indian Standards Codes of Practice.

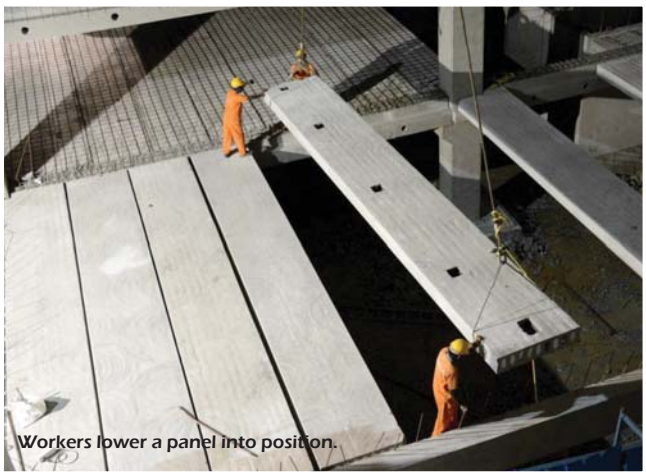
The RMCMA has moved on to develop its own certification scheme and quality manuals within the structure and policy guidelines of the Quality Council of India and with the co-operation of a stakeholder group including governmental, client, and professional groups. Progress has been impressive and continues, with the priority moving towards better site disciplines, especially those affecting durability and strength.

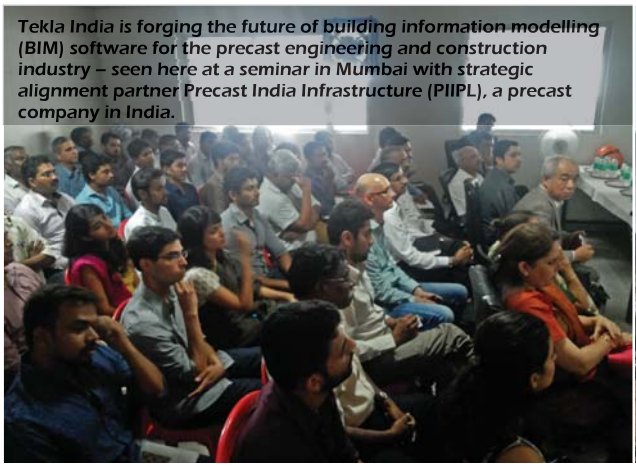
Such moves must be mirrored in the various precast and manufactured concrete product sectors – structural precast, flooring, architectural façades, masonry, paving, roofing, infrastructure products and so on. The problem is that the industry is not yet organised to do the work necessary to move ahead. Establishing such a structure is a top priority – challenging but necessary.

Leading the way is the Pre-engineered Structures Society of India (PESSI) formed in 2013. Together with the encouragement of admixture giants such as Chryso and BASF and the investment in training made by global machinery suppliers, the outlook for a national and regional structure is looking better.

The presence of whole-solution companies in India such as Nordimpianti, Spiroll, Weckenmann, Progress Group, Vollert and Prensoland is deepening and is forging a more optimistic outlook for precast in India. Perhaps the largest investment has been made by Elematic, which has set up equipment manufacturing facilities in India to supply local producers.


Construction of a hospital using precast.


Workers lower a panel into position.



Tekla India is forging the future of building information modelling (BIM) software for the precast engineering and construction industry – seen here at a seminar in Mumbai with strategic alignment partner Precast India Infrastructure (PIIPL), a precast company in India.

Residence at Shamshabad, constructed using precast prestressed methodology.

Safety

The precast and manufactured concrete products industry of India needs to show continuous and measurable improvement in three business areas – namely safety, sustainability and quality – if it is to maximise its potential for growth in volume and profitability. However, these three areas are not currently at the top of corporate agendas.

Much of the cement industry – both internationally and domestically owned businesses, driven by the Cement Manufacturers Association and stimulated by the Cement Sustainability Initiative's India section – is addressing the issue of safety. The CSI is a key body for future improvement in all aspects of safety, resource and land management and sustainability. However, the safety record of construction and unregulated manufacturing in India is poor. The concrete industry, both at the manufacturing and construction phases, must link in with its supply chains and engage with the Ministry of Labour and Employment.

Safety has to become the priority of every company in the industry. Unsafe practices must be stamped out and flouters of the law punished. The safety of all stakeholders must be secured, both upstream and downstream from manufacturing. This means the safety of: suppliers delivering to factories; production and yard workers operating plant and equipment; laboratory and office staff; neighbouring property occupants; drivers delivering product to site; contractors receiving product deliveries; construction workers installing the precast units; and of course the general public who use, live in or transit across the built structures. Occupational health risks must be minimised with the introduction of responsible controls of hazardous materials, emissions of toxins and dangerous dust. Accidents and near misses must be logged, reported and lessons learned. Statistical trends must be looked at and shared with others in the sector. A safe company is a win-win from the ensuing benefits of higher profitability, greater quality and a more contented and loyal workforce.

It is essential that the precast industry organises itself to define best practice, measure and share the results, and introduce safety training programmes across the sector. A complete change in approach is needed, with health and safety at the top of all agendas at all levels.

Use of precast prestressed concrete for a crematorium project in India.

Sustainability and the environment

India and its government are well aware of the pivotal position played by the country in tackling the sustainability challenge that meets its construction sector. Safety has already been identified as the key component of the social axis of sustainability but the environmental axis holds some extremely challenging issues. The main priority is the need to reduce the carbon footprint of concrete raw materials, products, transport, construction and finished structures. Resource depletion is also an issue, with regional shortages of sand a major problem. India needs to minimise its use of virgin materials by maximising the use of waste and by-product material streams, increasing recycling and reuse, and making product and structure designs as lean as possible. As in other priority areas, there is much experience in the rest of the world in these areas, which could be drawn upon by India. The Indian diaspora has a key contribution to make.

India urgently needs a cement and concrete sustainability strategy and roadmap. Key stakeholders should be brought together, possibly by the CSI, to formulate and implement this vital action. Measurement, target setting and reporting are all vital.

Raising the bar

Leadership is now urgently needed and it is heartening to see the formation of PESSI. It is hoped that an organisational structure can be extended regionally and along product group lines as the next phase in the development of an industry that will be the key to India's massive investment programme in housing and infrastructure. ■