S&P Global
Platts

METALS INSIGHT

Volume 13 / Issue 8 / April 19, 2018

Steelmakers campaign to win back shares in construction market

The growing construction industry is consuming more steel in tonnage terms, but market share has been lost since the global economic crisis to concrete and in some cases timber

Construction industry output ex-China was worth $6.6 trillion in 2015 and is set to grow to $8 trillion in 2028, of which $5.4 trillion will be in residential and infrastructure developments, according to IHS Global Insight and worldsteel data cited at worldsteel's Construction Conference 2018 in London this week. However, "the market share of steel in construction is under pressure... the structural steel market is falling and concrete is growing" in some countries, including Germany, said Terrence Busuttil, worldsteel's head of Construction Coalitions, a "steelconstruct" initiative with regional and national steel construction associations.

Where there is data available, the trend seems clear: in the UK, the average structural steel market share of all construction materials in 2005-9 was 71%, falling to 66% in 2016, according to the British Constructional Steelwork Association (BCSA). In the Netherlands, structural steel's share in the single storey market fell from 90% in 2005-9 to 80% in 2016, while its share in multi-storey constructions fell from 89% to 80% over the same period, says Bouven met Staal, a national association.

In tonnage terms, steel usage in construction – currently some 750 million mt/year globally – is increasing as the

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The "Active Classroom" is a zero-emissions building sponsored by Tata Steel built for use at Swansea University near Port Talbot, Wales. Designed for deconstruction, it features the first BIPV Co roof in the UK, made of Tata Steel's Colorcoat Urban steel with integrated solar panels and generates approx. 17 kWp of electricity. It also uses Acermetric/Matrix steel-framed panels and Coretinium wall panels. Photo courtesy of Tata Steel.

EDITORIAL COMMENT

Construction takes a massive 51% of steel output and the percentage is set to grow as rising populations and urbanization demand more infrastructure and homes. Steel's use in construction will grow faster than in other fields. The automotive sector, despite inroads from aluminum and the uncertainties of broader mobility changes, should continue to represent 15% of steel usage. The oil and gas sector may see steel usage fall from the current 8% of the total if there is an eventual move away from fossil fuels.

Still, not all is rosy in the construction camp, where, since the global economic crisis, steel has reportedly lost market share to concrete in nations including Germany, the Netherlands and the UK as well as in Russia and the Middle East. According to worldsteel, which held its second Construction Conference in London this week, this is partly due to funding cuts in promotion of steel as a sustainable, productive and cost-effective material.

Worldsteel's director general Edwin Basson stresses it may be time for steelmakers and associations "to do something similar to what was done with the auto industry" – referring to a concerted worldwide initiative to publicize the role of steel in construction. In recent years, a campaign to publicize ultralight automotive steel is thought to have won some market share back for steel against aluminum.

Collaboration is key as the construction sector prepares for new buildings to become emissions-free by 2050 at an operational level in line with the 2015 Paris Agreement. Steelmakers need to work closely with producers of other construction materials – formerly considered "competitors" – builders and downstream processors to improve overall efficiency and reduce the construction sector's carbon footprint, despite challenges posed in terms of the need to share information with other parties, delegates at the conference heard. The steel sector, which accounts of 7% of the world's CO2 emissions, clearly has a lot of work and promotion to do.

Zero-emission buildings represent "a multi-material challenge," according to Basson, who noted that insulation in smart buildings and cities may best be achieved by a combination of steel and concrete building solutions. "None of us have exclusive rights to any outcome... we have to find appropriate ways to collaborate and not to use materials inefficiently," Basson said.
— *Diana Kinch*

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construction industry grows, and the rate of growth has "sizeable long-term potential," said worldsteel's Basson. In construction, steel demand growth is expected to continue at a higher rate than the 1% per annum foreseen in overall steel growth over the next 20 years – this is still a striking contraction from the average 4% annual growth rate in steel consumption over the last 20 years.

In some ways, steel has been a victim of its own success in development in recent years, as light-weighting and the use of high-strength steels has accounted for a major reduction in tonnages required in applications including construction since 1975. "Steel is an industry particularly exposed to the concept of the circular economy, which is a blessing from a sustainability perspective, but has an impact on long-term demand," Basson said at the event, explaining that if high-strength steel enables a building's useful life to be extended from the current average of 40 years to 42 years, and so on for use of steel in items such as washing machines, with constantly increasing recycling levels, this effectively pushes new steel demand further into the future.

Of the 51% of steel which is used in construction, the bulk is rebar, which already enjoy a healthy partnership with concrete. It is the structural steel products including beams which are seeing market shares fall.

Collaboration initiatives

Under worldsteel's "contructsteel" initiative set up around a year ago, active collaboration to boost steel's role in construction is now taking place with companies including France's Saint-Gobain, a plasterboard and glass manufacturer that may in the past have been considered a "competitor" in the construction arena, as well as with major steelmakers including Tata Steel and ArcelorMittal. Also involved are steel construction development associations including the Netherlands' Bouwen met Staal, the UK's Steel Construction Institute, German associations and Russia's ARSS, sponsored by the country's major steel producers Evraz, OMK, Mechel, Severstal and NLMK.

Others are seeking involvement. "The Brazilians are knocking at the door," Basson said, noting contacts from the Brazilian Steel Institute and the Latin American Steel Association Alacero, while discussions are taking place with Chinese companies, supported by Chinese Steel Association CISA.

The worldsteel executive points out that constructsteel focused last year on studying efficient construction initiatives in the CIS. Focus has shifted to India this year, where there is a possibility of collaboration between Saint Gobain and Tata Steel. The US is not yet involved "but the door is open," he says. The initiative may be gaining pace: "Companies are approaching worldsteel... for instance cement associations. It's about promoting construction and the role of steel."

A drive for greater productivity

The construction industry is seen as relatively fragmented, with many operations at a predominantly local or regional level and a notoriously low rate of digitization compared to many other sectors. In the US, the construction sector has made only a 6% gain in productivity since 1945, far below other industrial sectors, according

S&P Global
Platts

METALS INSIGHT

Volume 13 / Issue 8 / April 19, 2018

ISSN: 2058-749X

Metals Insight is published fortnightly by Platts, a division of S&P Global, registered office: 20 Canada Square, Canary Wharf, London, UK, E14 5LH.

Officers of the Corporation: Charles E. Haldeman, Jr., Non-Executive Chairman; Doug Peterson, President and Chief Executive Officer; Ewout Steenbergen, Executive Vice President, Chief Financial Officer; Steve Kemps, Executive Vice President, General Counsel

to information presented at the worldsteel event by McKinsey & Company consultancy. Michel Van Hoey, Luxembourg-based senior partner at McKinsey, told delegates that the steel industry could foster productivity growth in the construction sector via greater use of software and off-site construction of parts.

Software may bring cost savings

Software seen as particular interest to steel's usage in construction is Building Information Modelling (BIM), which can integrate design, cost, schedules, warranties, product, technical and maintenance information in a 3D output and may result in 20% costs savings, according to Van Hoey.

Alex Small, BIM and digital platforms manager for Tata Steel Europe, points out that the company is currently working with BIM at the level of operational efficiency (BIM level 2) and that a level 3 stage is being developed that will involve functional efficiency including integration with the Internet of Things (IoT).

However, BIM has turned out to be "a minefield and time-consuming," for some, Small notes. For it to work efficiently companies need to be prepared to share information to create an optimum project that can advance, he said.

3D printing of components is also seen as having the potential to disrupt, but is still at a very early phase of development, Van Hoey said.

Offsite construction

Offsite construction, or pre-fabrication of parts that will later be assembled on site, was described by delegates as one of the main ways of boosting construction industry productivity.

Worldsteel is collecting information in different countries on pre-fabricated construction which is very well-established in some countries, and in some construction segments, according to Basson, who noted that all lift installations now tend to use offsite fabrication. For some high-rise buildings and bridge projects, particularly in more developed nations, it is gaining popularity: Victor Buyck Steel Construction's 60-storey, 218–meter high Newfoundland residential block currently under construction at Canary Wharf in London has had "everything fabricated offsite" according to the company, whose Northern Spire bridge project in Sunderland, UK, involved the offsite fabrication of a 104–meter steel and concrete pylon which was shipped to the site from Ghent via pontoon.

Worldwide, however, up-take is still low. "Offsite construction is disrupting the value chain, but the industry is taking this up very slowly," Van Hoey said. According to Tata Steel Ltd chief of marketing and sales Prabhat Kumar, offsite construction occurs in just 2% of projects in India, despite proven advantages. For instance, a KEF Infra project at Meitra Hospital in Kerala reportedly achieved up to 70% savings in some areas via offsite construction. KEF Infra studies elsewhere in India have reportedly shown pre-fabricated construction can save up to 30% in cost and 50% in construction time.

Designing for deconstruction

Delegates at the worldsteel event agreed that construction design should now include elements for deconstruction, so that building components may be more easily recycled, and that this should involve introduction of a system of traceability or identification for steel components, to facilitate recycling and reuse.

"We have to bring traceability into the sustainability issue... This requires more investigation, so we can sell it to CEOs at an industry level," Basson said.

Olivier Vassart , head of ArcelorMittal global R&D construction, infrastructure and long products, says that the technology already exists to put an RFID tag (radio-frequency identification using electromagnetic fields) for tracking on each piece of steel... "although this needs to be requested by the market."

Others present suggested the use of blockchain technology or barcodes for individual steel product identification.

"There are no official guidelines yet on how to design buildings for deconstruction," Vassart said. "The market is not organized for this." He noted that tagging could allow buildings to be dismantled and rebuilt elsewhere, for instance in the case of World Cup stadiums that after the event they were designed for may gain little use.

"Clients ask: how can I build a building for deconstruction in the future?" said Sarah McCann-Bartlett, director general of the British Constructional Steelwork Association (BCSA). "We can – in 70 years' time we can deconstruct knowing exactly what properties the steel has... We are on the edge of a new tech revolution in steel fabrication."

Working with competing materials

"The fight is constant with concrete," according to Prof. Milan Veljkovic of Delft University. Indeed, concrete does have some "cultural" advantages over steel, particularly in southern Europe. "The biggest competitor is concrete and masonry, which dominates in most markets, is traditional with a well-established supply, seen as permanent, solid and secure," said Jonathan Cherry, managing director of Saint-Gobain Ecophon UK and Ireland, speaking at the event.

"Timberframe is also well established in Scandinavia and the US and also the UK, and is increasing market, looking to do high-rises up to 40 storeys. It is sustainable and a real competitor to steel," the Saint-Gobain executive said.

"We need to collaborate to promote steel, for instance, with drywall construction... there are opportunities for collaboration in external walls, panelization and steel framing."

Despite calls for collaboration, the steel camp is still anxious to point out its status

as a favored material in terms of cost and fire and corrosion resistance. Delegates presented research that showed that it can be 4% cheaper in the UK to build a majority steel frame building rather than a majority concrete frame building, and also quicker. Cement, which derives from sand, is less sustainably sourced than steel's raw materials, according to the European Convention for Constructional Steelwork, an independent industry body. According to AM's Vassart, steel is 53% more recyclable than concrete and the cost of dismantling a concrete building can be more than twice that of a steel structure simply because concrete is less easily recyclable and reusable.

Fire resistance: gaining an upper hand

In fire resistance, steel is reportedly gaining an upper hand, having made significant investments in this area since the late 1980s, including at the BRE Cardington test center near Bedford, according to BCSA's David Moore. However, certain myths about steel's performance in fires still need to be dispelled, he indicated.

"Steel does not melt in building fires," Moore said. "We know far more about steel in fire than any other material, for instance timber or cement," he said. "Fire is not a disadvantage for steel any more: it can be technically and economically solved... It is far ahead (of concrete) in terms of research and codes etc... However, the construction market is not yet fully aware of this." — *Diana Kinch*