

# Broad Group's sustainable buildings making waves

BY E Jacqui Chan

The very idea that a 30-storey building could be completed within 15 days is inconceivable to many. But one company has managed to do just that.

In December last year, Broad Sustainable Building Co Ltd (BSBCL), a member of Broad Group started construction on a 30-storey sustainable hotel, known as project T30 by BSBCL, in China's Hunan province. By Day 15, the building was completed. The China-based construction company that specialises in sustainable buildings immediately became the talk of the town. BSBCL is known for its Broad Sustainable Building (BSB) technology, which was used in the construction of the building.

Since the first video of the construction was posted on YouTube in early January, several hundred million people have seen it but many still don't know the amazing facts, says Juliet Jiang, senior vice-president of Broad Group, in an email interview ahead of her presentation at the Green Building Index's International Series 2012 seminar on June 12. She believes BSBCL is creating history and dispelling preconceived notions about how we build.

What makes the feat even more interesting are the building's features. According to Jiang, the T30 building, which houses Ark Hotel, is earthquake resistant, energy efficient, environmentally friendly and has purer indoor air. It also adopts technologies superior to traditional building methods.

The sustainable T30 is earthquake-resistant up to magnitude nine, as tested by the China Academy of Building Research, five times more energy efficient and has 20 times purer air, with only 1% of the construction waste of a conventional building. The T30 is also 93% prefabricated or factory-made.

"BSBs require a lead time of about 40 days and can be constructed within 30 days. The foundation work is similar to that of conventional buildings," says Jiang, adding that the higher the building, the lower the cost due to economies of scale. "However, building a 30-storey hotel with 700 beds from ground breaking to opening in 48 days is definitely a miracle!"

Jiang reveals that part of the reason why the T30 was built in 360 hours was to avoid the rainy season.

Innovation is ingrained in Broad's DNA. The group was founded in 1988 by brothers Zhang Yue and Zhang Jian, and started out manufacturing industrial boilers before making a name for itself in manufacturing non-electric air-conditioning systems.

Yue and Jian, who majored in fine arts and thermo dynamics at university respectively, initially developed an award-winning, pressure-free hot water boiler. Following its commercial success, the brothers came up with the idea of non-electric air-conditioning systems after observing the difficulties that arise from electricity shortage amid the rapidly growing number of air-conditioned high-rises in China.

By 1996, Broad commanded a 90% market share in the manufacturing of non-electric air conditioning systems in China, and in 1998, the company took its product international. The following year, Broad installed the world's first absorption technology cooling and heating system that uses waste heat from the flue gas of a gas turbine at the University of Maryland in the US. Broad went on to win three of the seven projects initiated by the US Department of Energy (DOE) aimed at finding solutions to California's energy shortages in 2001.

Today, Broad has significant market share in many countries in the area of non-electric air-conditioning systems, including the US (an estimated 45% market share), Australia (75%) and



The T30 building which now houses Ark Hotel



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India (55%). Its products have been installed in facilities built for the 2004 Athens Olympics, airport terminals in Bangkok, Thailand and Madrid, Spain as well as the Costanera Centre in Santiago, Chile.

## BSB technology

Before the turn of the century, Yue who at the time owned six aircraft, discovered that it would take eight trees 60 years to absorb the carbon emitted by his private plane during a trip from Changsha to Beijing. It shocked Yue so much that he sold off three of his planes and put the rest in hangars, to be used only when needed. These days, Yue travels mainly by commercial flights.

That was a turning point for the group to take the green and sustainable route even further. By 2003, Broad had developed a simple technology that produces clean air in line with its vision of "preserving life". After the Wenchuan earthquake in 2008, which claimed over 69,000 lives, Broad started developing sustainable buildings, and the following year, BSBCL was formed.

BSBCL unveiled the first version of a BSB at the Shanghai Expo in 2010. The company erected the six-storey, 21,527 sq ft Broad Pavilion using BSB technology on site at the expo within 24 hours.

According to Jiang, BSB buildings are sustainable in 10 aspects — energy conservation, material saving, durability,

recyclability of construction materials, no construction waste, earthquake resistance, recycling of sewage, no harmful materials, complete air filtration and no dust during construction.

BSB adopts at least 30 different energy-saving technologies and due to its prefabricated modules, has a design life of 600 years, compared with the 60-year lifespan of a similar building constructed using traditional methods, says Jiang.

Aside from multi-paned windows, external solar shading, LED lighting, power generation by descending elevators and water-conserving toilets, a key component of the BSB is its thermal insulation. For buildings in cold climates, BSB uses 35cm thermal insulation and five-paned windows, compared with the normal 10cm thermal insulation and double-paned windows.

In warm climates, BSB's thermal insulation is 15cm thick and windows are three or four-paned, while most buildings use 3cm thermal insulation or none at all. This effectively turns BSB buildings into a sleeping bag in the winter and a cooler in the summer, says Jiang. She adds that about 70% of energy saved comes from thermal insulation.

Another key component is its heat recovery fresh air system. The system is said to be able to recover 70% to 90% energy when exchanging indoor exhaust air with fresh air outdoors. This ensures fresh air indoors with little energy loss.

BSB structures also use 10% to 20% less steel and 80% to 90% less concrete. "The most revolutionary element about a BSB is its construction mode, which enables the BSB structure to be 93% factory-made, compared with the current world highest at 40%," says Jiang.

Items such as pillars, doors, windows, flooring, lighting, and even sanitary and kitchenware are placed on a prefabricated 3.9m x 15.6m main board with built-in lighting and ventilation shafts among others for factory shipment.

"One truck can carry 120 sq m main boards and deliver them to the construction site to be hoisted in place. All the workers need to do is to secure them in place. The high efficiency construction mode greatly reduces construction time. The on-site installation accounts for only 7% of the total construction hours of traditional construction methods," says Jiang.

## Purer air

Air quality detectors are placed in each room of a BSB structure, allowing occupants to check indoor particulate matter (PM0.3, PM2.5 and PM10), formaldehyde and carbon dioxide levels at any time and compare these with outdoor PM levels.

For the man in the street, detectors can be expensive, but Broad has lowered the cost through its groundbreaking research and development. "It's like putting a large computer from decades ago into a small mobile phone today," says Jiang.

A major challenge buildings face is achieving super filtration, which at present is not only more expensive than a building but is also a technology used only in surgical operating rooms and IT chip assembly lines. Super filtration is 100% filtration of outdoor PM2.5 and PM10 and 99.8% filtration of outdoor PM0.3.

Jiang says Broad has invented a low-cost super filtration technology and integrated it into the heat recovery fresh air machine. "It is a combined system with three-stage filters. The first stage adopts the traditional coarse filter and collects big particles. The second stage uses the Broad-invented "electrostatic cleaner", following the principle of "positive attracts negative" to filtrate 98% of PM0.3, PM2.5 and PM10, and the remaining PM is filtrated by high efficiency particulate air (HEPA) filters," explains Jiang.

## Big ambitions

Broad has big plans for the future. Yue recently told NEWS.com.au that he plans to build 20 BSBs a month in 2013 and up to 50 BSBs a month by 2014. As at December last year, there were 12 BSBs in China and Mexico, and two franchise partners in China.

Franchising is definitely on the plate at the moment as the group sets its sights on the Middle East where Jiang believes BSB technology will help with the housing crunch. The group is looking for potential franchisees there with the means to set up factories locally. ■