Super Spacers® as part of "The Opus" dream project

Project developer Omniyat calls "The Opus" tower "the building that never sleeps". The magnificent arrangement of the vibrant building envelope pushes the limits of what is technologically feasible with advanced engineering evident in the end result. Edgetech Super Spacer® TriSeal™ are also installed in the massive 3D puzzle in downtown Dubai.

Zaha Hadid's vision: a floating cube that has been hollowed out from the inside

"We do not build nice, small buildings," Hadid told the British Guardian in 2013, referring to mundane, rectangular buildings. "The Opus" at the world's most popular architectural playground in the Burj district of Dubai, Zaha Hadid had the vision of a cube hollowed out from the inside for the 21 storey building and that is seemingly floating above the ground floor. And indeed, like an ice cube that is melting away under the hot desert sun, "The Opus" also leaves people in the building's interior with a free view of the breathtaking architecture of the surrounding area: of the Dubai Water Canal, the new opera house or the Burj Khalifa and the Dubai Mall. The construction work commenced in 2012 and the final work on the building envelope was completed in October 2017. When the interiors complete, it will accommodate a 5 star hotel, restaurants, office space and luxury apartments.

"The Void": An engineering masterpiece

After Zaha Hadid unveiled the spectacular design in 2007, the "Dream Tower" immediately landed on the top ten wish list of leading industrial companies. Daniel Zhang, Edgetech/Quanex Sales Manager for China, explains the fascination it held for architects and façade builders: "The Opus" was a Black-Box project. At the start no-one was able to say how the organic glass façade, based on Hadid's ideas, covering an area of some 6,000 square meters, could be made to completely appear as a flowing surface. The building as it now stands is an all-encompassing, engineering masterpiece. Each of the 4,544 glass units for the dark blue glazed void is a custom-made individual item, and what's more the vast majority of them consist of curved double-glazed insulating glass units with irregular shapes. This meant automated application was out of the question for our range of spacers. Nor could a rigid spacer be used, which does not bend without kinks and which certainly cannot be freely moulded. Only a flexible spacer was able to meet the requirements in terms of impermeability and appearance. In hot climates in particular, a warm edge must achieve outstanding levels of performance over decades in order to hermetically seal the space between the panes. Due to the thermal interaction between hot sunlight and shadows, strong mechanical forces permanently act on the edge compound due to the movement of the glass.

By day, the façade reflects the sky, sun, water and the futuristic architecture. At night, on the other hand, "The Void" that is illuminated with spectacular LED installations to connect the building with the pulsating metropolis. To this end, LEDs that can be individually controlled were installed in each glass panel. The transparent façades of the two rectangular reinforced concrete towers are made of double-glazed insulating glass with a UV coating and printed coloured layers of different sized dots. On the one hand, they imbue the façade with a unique vitality, on the other hand, they reflect the light and thus reduce the levels of solar input and glare. Teams from different specialist disciplines such as façade builder Alu Nasa, consultants from Koltay Façades in Dubai, Pilkington Glass, the insulating glass manufacturer Shennanyi and also the spacer supplier Edgetech have contributed their collective expertise to the realisation of the "Void". The lower end of the void is bordered by a freely formed glass roof over the multi-story atrium. At the upper end of the building, at a height of 71 metres, the towers are connected by a nearly 38 metre long, elegantly curved and earthquake-proof bridge, made of curved double-glazed insulating glass units, double curved aluminium frames and steel. This part of the building weighs 1,000 tonnes on its own. 3D modelling that is accurate down to the last millimetre of the primary and secondary steel construction, curved aluminium profiles, fastening elements and glass units constituted the basis for all suppliers involved in the project. More than 10,000 individually curved aluminium profiles were supplied from Denmark and the Netherlands, the glass units were produced in three factories in China, and ultimately the entire 3D puzzle had to be precisely pieced together on the construction site.

The perfect glass mix was a long time in the making

Even the selection of the right glass was preceded by a lengthy decision-making and modelling process. By contrast with flat panes of glass, no technical values exist in relation to the compressive strength, tensile strength and flexural strength for curved panes of glass. Due to the fact the glass curvature and glass thickness affect the flexural rigidity for their part, the solar thermal loads and the maximum energy absorption up to breakage, the minimum bending radii as well as the maximum bending angles for each insulating glass unit had to be calculated. In addition, the glass structure had to ensure that the solar input remained below a certain limit to prevent dangerous levels of reflected radiation that could lead to thermal breakage on the glass façades opposite. In the end, a mixture of a few flat and single bend glass units, as well as hot and cold-bent double-glazed insulating glass units was installed. Due to the fact that in a hot climate such as prevails in Dubai, the thermal load for glass is much higher than in more temperate zones, and the dark glass units also absorb a great deal of energy, the glass should be as tempered as possible - a process that had not yet been industrially tested for curved insulating glass units up to this point in time. Chemically tempered, hot-bent glass was too expensive. Therefore the insulating glass manufacturer Shennanyi developed a technology specifically for the combined hot bending and tempering of the glass whereby the insulating glass units are heated to 700°C, tempered following the moulding process and cooled

with the aid of compressed air nozzles to increase their breaking strength. The units consisting of 8 mm Low-E (coated on the inside), a 16 mm cavity between the panes, 6 mm clear glass, a 1.52 mm PVB colour laminate and once again 6 mm of clear glass were constructed by Pilkington China. In order to save costs, the number of hot-bent elements was reduced to a minimum and as far as possible cold-tempered tempered insulating glass was used, and thus one which could be manufactured economically.

About Edgetech Europe GmbH

Edgetech's Super Spacer® flexible foam-based spacer systems act as energy-efficient warm edge spacers in insulating glass windows. They significantly reduce energy loss to the outside, largely prevent condensation and also contribute to the lifespan of a window.

Edgetech Europe GmbH, located in Heinsberg Germany, is a fully-owned subsidiary of Quanex Building Products Corporation, a leading global provider of energy-efficient components such as window and door profile systems, flexible insulating-glass spacers, edge seals for photovoltaic modules, wooden floors and ceiling profiles, as well as window and door grilles, with its head offices in Houston, Texas. Based on turnover Edgetech/Quanex is the world's largest manufacturer of spacers. Edgetech Europe GmbH is a sales location for the markets in continental Europe and one of the three worldwide Edgetech production plants, with a total of 450 employees and 16 extruders. You can obtain additional information about the Super Spacer® systems and the Warm Edge Technology of Edgetech here: www.superspacer.com.

The_Opus_01.jpg
Some 6,000 square metres of curved, tinted glass provide "The Opus" in Dubai with its unique form. ©Zaha Hadid Architects

The_Opus_02.jpg and The_Opus_03.jpg
LEDs that can be controlled are integrated in each glass panel. ©Zaha Hadid Architects

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