

Global innovation, local application

As the world's leading producer and exporter of white cement, Cementir Group has set up an innovation programme to help encourage new solutions for the use of white cement-based products, and promote their aesthetic and structural properties in the Asia-Pacific region.

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Unlike ordinary cement, white cement is regarded as a high-end, value-adding product, suitable for various applications from aesthetic to structural requirements, for both renovation work and newbuilds. Despite this, white cement's global market of around 18Mt still accounts for less than one per cent of total cement consumption.

With production facilities in Denmark, Egypt, Malaysia, China and the US, and a production capacity of over 3Mta, the Cementir Group markets its Aalborg White® brand in more than 70 countries worldwide. In April 2018 the group acquired an additional stake in Lehigh White Cement Co.

In the Asia-Pacific region, Cementir runs two white cement plants with more than 1Mta production capacity selling in the Chinese, South Korean, Japanese, southeast Asian, Australian and New Zealand markets. As the largest white cement production and consumption market in the world, China accounts for 26 per cent of the global white cement market. Aalborg Portland (Anqing) Co (APAQ), Cementir's plant in China, was founded in 2004 with a production capacity of around 0.7Mta, making it the largest

white cement producer in the region. APAQ introduced Aalborg White Grade 52.5 high-strength white cement into China in 2010. By 4Q18 the China Cement Standard will segregate white cement into Premium Grade (>89 Hunter W) and Normal Grade (>87 Hunter W) product with the aim of raising the quality level of the country's white cement industry.

In Malaysia Aalborg Portland (Malaysia) Sdn Bhd (APM) is the sole white cement manufacturer with the only integrated plant located in Ipoh, Perak. The company started as Rock Chemical Industries Sdn Bhd in 1973 before it was acquired by Aalborg Portland A/S Denmark in 2000. In 2003 production capacity was expanded from 50,000 to 150,000tpa and just three years later the company had ventured beyond its home market to export to southeast Asia, South Korea, Japan and Australia. It is now the market leader in southeast Asia.

To meet the strict standards required by customers, Aalborg White cement plants in the Asia-Pacific region attach great importance to quality management from raw materials to finished products, as well as rigorous quality control of its production process.

Figure 1: at the Pacific Fair Shopping Centre in Gold Coast, Australia, glass-fibre reinforced concrete (GRC) bowl planters were made, using Aalborg White cement



Although not new by any means, colour is a critical quality control issue where brightness and tone consistency are of paramount importance. The whiteness of Aalborg White cement depends on the raw materials used and the manufacturing process. Metal oxides, such as iron and manganese, influence both of these parameters, making it imperative to select raw materials of the highest-possible standard. Colour also offers additional sustainability and safety features. Light or white coloured surfaces reflect sunlight more efficiently than dark ones. White concrete median barrier's reflectivity is almost 50 per cent higher than grey in wet weather. Furthermore, at night, white concrete median barriers enhance visibility compared to grey concrete, greatly improving driving safety when used on highways.

In Australia and New Zealand, precast concrete, including glass fibre-reinforced concrete (GRC), is widely used in precast façade panels as architectural elements in building construction, bases for modular

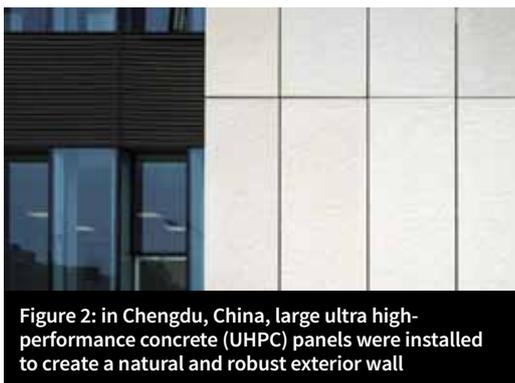


Figure 2: in Chengdu, China, large ultra high-performance concrete (UHPC) panels were installed to create a natural and robust exterior wall

bathrooms, in garden landscaping and furniture, and even in commercial underground pits. Some professional GRC producers specialise in supplying GRC garden ornaments and city furniture for the landscape and commercial industries. One example is the Pacific Fair Shopping Centre upgrade project in Gold Coast, Australia, where large amounts of GRC bowl planters were made using Aalborg White cement (see Figure 1).

In China the high strength and whiteness of Aalborg White cement created a new era of cement-based decorative building materials especially in the application of GRC and precast decorative concrete products, such as artificial stones and concrete pavements products. In 2014 Aalborg White cement was used for the first time on the in-situ-cast concrete building in Jiangsu Province of China, proving that white cement was the ideal material for a load-bearing structure, while also offering architectural properties. With the rapidly-growing Chinese market increasingly demanding architectural aesthetics, products such as GRC and ultra high-performance concrete (UHPC) are today's hottest cementitious building materials widely used for building façades, cladding, landscaping and city furniture.

Aalborg InWhite

Aalborg InWhite is an innovation programme designed to promote new solutions for well-known applications, or completely new applications, of white cement-based products. Cementir wants to challenge the traditional way of looking at white cement as mainly an aesthetic and architectural building material. The company believes there is untapped potential to further develop the customers' business with white cement.

In 2017 a series of cutting-edge white cement application technologies were triggered under the Aalborg InWhite solution umbrella, fed by Cementir's global market knowledge, strong industrial network, and its research and quality centre based in Aalborg, Denmark. It leverages the unique technical characteristics of Aalborg White cement for emerging but rapidly-expanding applications, such as UHPC and GRC, which require high levels of chemical purity and the excellent mechanical properties of concrete made with advanced production technologies. Such technologies could help implement labour cost savings and simplify the

construction process, thereby fully supporting the megatrends in society, including:

- low specific weight per m²
- reduced thickness to enable more efficient use of the interior spaces of the building
- surfaces produced in a single process to avoid additional treatments
- modular and combinable for reuse of materials.

Below are three case studies demonstrating the use of Aalborg White Cement in different applications.

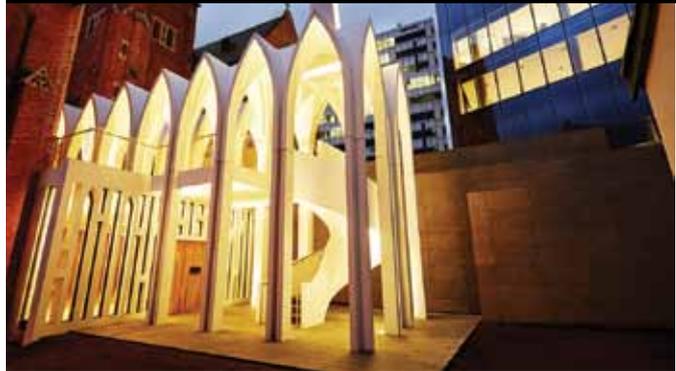
Case Study 1 – UHPC façade project in Chengdu, Sichuan Province, China

This project involved replacing the façade of the Chengdu Jingchuan office building. The architect chose light-coloured UHPC panels with a Brazilian rock finish to create a natural and robust exterior wall. The large panels, measuring up to 3m x 1.1m, were installed vertically to heighten the visual appearance of the building (see Figure 2). The high purity and stable Aalborg White cement mixed with pigment gives the façade a rich tone with numerous shades of white and beige to reach the desired visual impact.

Case study 2 – precast concrete application in Perth, Western Australia

Perth's Cadogan Song School, home to the internationally-renowned St George

Figure 3: the design of the Cadogan Song School in Perth, Australia, was inspired by cathedral lancet windows with a striking white precast concrete façade made using Aalborg White cement



Cathedral choirs, is a stunning two-storey, US\$4.8m white concrete precast concrete structure (see Figure 3). The building was designed by Palassis Architects and awarded the 2017 WA State Award of Excellence; the Concrete Institute of Australia 2017 National Award of Excellence and the Concrete Institute of Australia Kevin Cavanagh Trophy for Excellence in Concrete, the highest award that can be given to a concrete project in Australia.

The building's design was inspired by cathedral lancet windows with a striking white precast concrete façade using Aalborg White cement. The precast elements were developed and produced by Adelaide-based SA Precast and include lightly-textured, off-form white concrete curved beams for the rehearsal room, spires, lattice feature wall panels, U-shaped columns supporting the vaulted arches at the first floor and arches at the second floor to form a colonnade.

Case study 3 – GRC and UHPC innovative applications in Malaysia

At the ARCHIDEX17 exhibition, Aalborg White Malaysia, together with leading

precast concrete producers, developed a series of impressive white cement-based UHPC cladding and GRC furniture and architectural elements. The richly-textured UHPC panels with smooth finishes were achieved using silicone moulds, while 3D concrete engraving technology applied on the cladding demonstrated the versatile possibilities on a concrete surface (see Figure 4). Gold-coloured GRC circular cone pillars with GRC round bench seating in terrazzo finishes demonstrate the concrete's decorative abilities both internally or externally. ■

Figure 4: 3D engraving technology can be applied to ultra high-performance concrete (UHPC) cladding with impressive results

