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New technology puts Aercon USA at pole position to benefit from green prefab construction boom

The construction market is one of the largest sectors in the United States with around USD 1.4 trillion worth of projects per year and providing employment to over 7 million people.[1] As already described in Aircrete Europe's article "Flat-cake technology will be a gamechanger for the United States AAC market" on page 10 in AAC Worldwide, issue 3|2020, the National Association of Home Builders in 2019 identified labor shortage as one of the main challenges the United States construction market is facing and this has been confirmed by numerous sources and experts. According to the Associated Builders and Contractors, the construction industry is impacted by workforce shortage of 650,000 in 2022.[2] Modular prefab construction, which is globally gaining market share over traditional ways of construction, is seen as a major contributor to solving the labor scarcity issue. Besides the advantage of faster construction with less labor required, modular construction also has a positive contribution to other challenges in the market. It is an eco-friendly solution with less waste, it improves the on-site safety for workers, it is more cost-effective, less exposed to supply chain disruptions and quality-control is easier to perform. Adding Autoclaved Aerated Concrete (AAC, or also known as aircrete) to the equation combines all these advantages with another solution to a major problem the construction market is struggling with: sustainability. (Fig. 1)

AAC in the USA

AAC has been gaining popularity for a long time in the United States, due to its green and sustainable characteristics which is increasingly important in today's construction world. Within the AAC market in the United States, thinner lightweight AAC panels have enormous potential. They provide a complementary solution for the existing building system (i.e. steel or wood structure) with a lightweight, prefab concrete shell, contributing to higher insulation values and improved fire safety at the same time. Steel/wood structure in combination with autoclaved aerated concrete panels is very popular in Australia and Japan, where it has already gained a massive market share in the local wall solution markets.

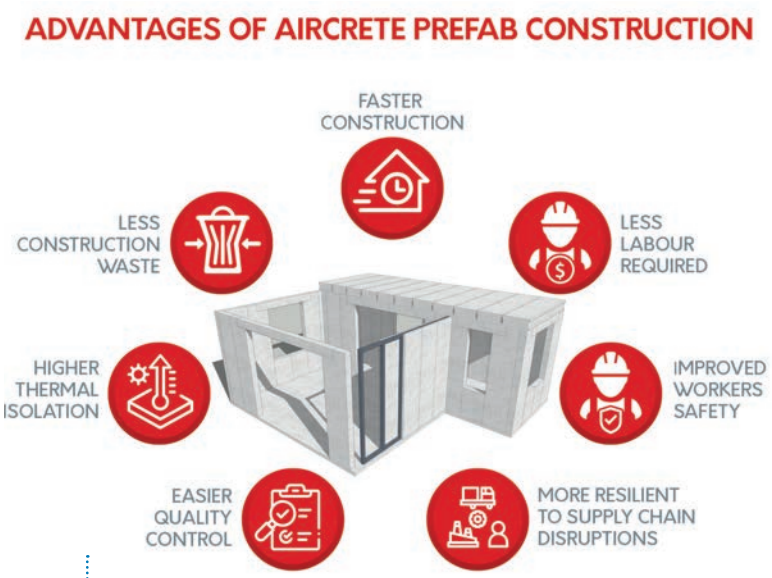


Fig. 1: The aircrete prefab system provides an integrated building solution to address today's large construction challenges.

In the United States, this system is becoming extremely popular, and many projects have been realized already. The AAC reinforced panels have predominantly come until today from Mexico, where 2 factories with flat-cake cutting technology have been supplying the United States, but due to the cost of transport, most projects have been in or around the south of the United States with the majority in Texas. The relative high part of transport cost due to the large distance has simply prohibited the product from growing in line with its big potential. Nevertheless, projects have been realized as far as Colorado and Chicago, underlining the opportunity AAC offers in the United States.

Since the beginning of 2022, Aercon is the only AAC producer in the United States that is able to produce these types of thin AAC panels. Aercon's factory is located in Haines City, Florida, and has been recently modernized with a major upgrade project to replace

[1] Assured Partners, Challenges the Construction Industry is Facing in 2022, 24 February 2022 [2] Associated Builders and Contractors, February 2022

the tilt-cake technology with the latest Aircrete flat-cake technology and production capacity expansion. The reason for this big modernization was that with the old tilt-cake technology, Aercon was predominantly producing AAC blocks and was unable to produce thinner panels (100 mm / 4 inch or thinner) (Fig. 2) in a reliable and sustainable way, whereas this was where the market demand increasingly was coming from. To provide an answer to this market trend and to future-proof their production facility, Aercon engaged Aircrete Europe as their technology partner to upgrade their factory (Fig. 3).

Fig. 2: Fully-cut green cake with 100mm thick products.

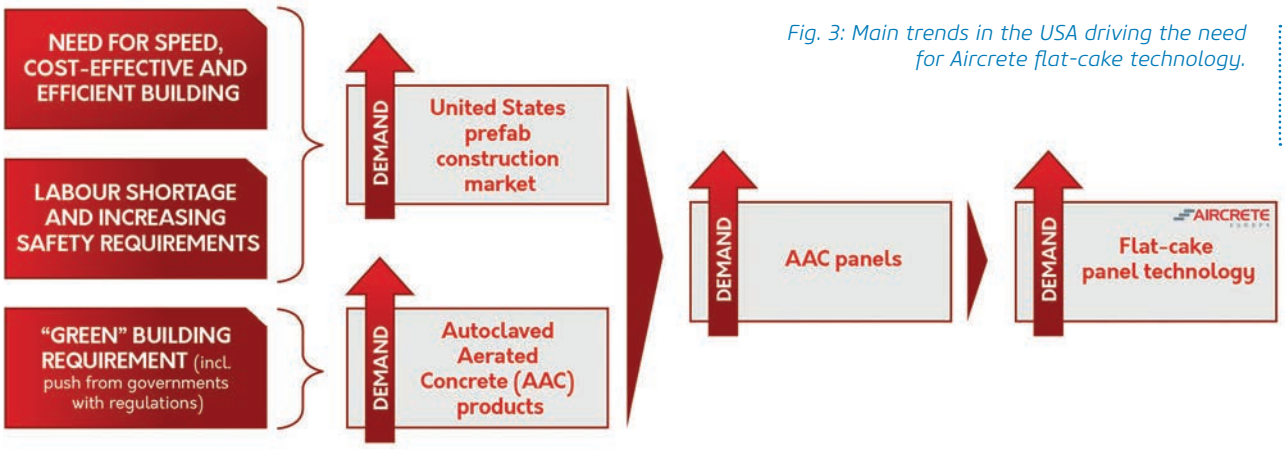


Fig. 3: Main trends in the USA driving the need for Aircrete flat-cake technology.

Joseph R. Graves, General Manager for Aercon Florida, LLC. commented "For years, it has been quite frustrating to see the overwhelming potential for the AAC panel market here in the North America and not have a method to effectively and efficiently produce them. Given the increase in demand for AAC panels and a change in the dynamics for more economically and environmentally friendly building materials here in the United States, we at Aercon Florida, felt it our obligation to the customers and the environment to make the necessary changes to meet that demand. Prior to our Plant renovation, we were not equipped to cater to the demand of the market with our outdated tilt-cake cutting technology as efficiently and produce panels for a market which predominantly demands 50-100 mm thick panels for partition walls and cladding applications. Now, with the installation of the latest Aircrete flat-cake technology and Aircrete 4.0 plant control system, it is our hopes to now benefit from the enormous growth opportunities and meet the demand of the market. With the introduction of new Aircrete Technology in our facility we will now be capable of producing panels in dimension that the market is demanding utilizing a more streamlined manufacturing approach. We will also be capable of producing AAC products with an exceptionally smooth surface, allowing us to sell a premium quality product, which will allow builders to save cost on-site due to minimal finishing requirements."

Fig. 4: Aircrete cutting line – vertical and horizontal cutting in action.

Project scope

The main objective of the upgrade project was to replace the old tilt-cake cutting line with the latest Aircrete flat-cake technology (Fig. 4). As an integrated technology partner with a large track record of complex modernizations, Aircrete carefully analyzed

Fig. 5: New mould unlatching and opening as well as brushing and oiling station.

Fig. 6: New curing frame manipulator and automatic stacking pin manipulator.

the full plant layout to make a thorough assessment of how the production flow could be optimized and what other equipment had to be replaced. As for all modernization projects, Aircrete always tries to optimize the budget for the client by creatively analyzing what part of the old machinery can be re-used and/or refurbished and still fit into the new layout. See another example of this successful value-adding approach in the article "New automatic unloading line for AAC blocks for Bauroc in Latvia" in the next edition of AAC Worldwide.

Besides the completely new flat-cake cutting line (see detailed description below), the mould logistics were upgraded to match the new plant layout. This included a full set of new casting moulds, automatic mould latching and unlatching, mould opening and closing as well as a new mould brushing and oiling system. The big advantage of the Aircrete mould, compared to the closed tilt-cake moulds, is that all four sides can open, therefore making the entire mould flat and allowing for very efficient cleaning and oiling, which is also extremely compact compared to the original machine (Fig. 5).

Three existing manipulators were modified at Aercon to handle the curing frames and flat-cake autoclaving. Hereby the old tilting manipulator was converted to a frame handling manipulator, and the old platform manipulator was converted to a frame buffer manipulator. The biggest conversion was the old autoclave manipulator, which was modified with

Fig. 7: New tilting table for packaging purposes and automatic pin de-stacker on the right side.

a new gripper to handle flat autoclaved cakes versus the tilted cakes (Fig. 6). The big advantage of flat/horizontal autoclaving in combination with flat-cake cutting, compared to the previously installed tilt-cake cutting system is that there is no bottom waste as well as no product sticking after the autoclaving process.

Anticipating an acceleration in product demand, followed by the possibility to make thin panels in the future, the capacity of the factory was also upgraded at the same time by commissioning the fourth autoclave including an additional buffer line. Due to the Aircrete flat-cake technology the existing white separator was not required anymore and was replaced by a special tiling table with u-profile fixing device, allowing the existing packaging system to be reused (Fig. 7).

A new pin stacker and de-stacker were installed to increase the level of safety for the operators and to ensure an effective and safe handling of the curing frames throughout the plant. Of course, a full set of new curing frames with the appropriate conveyors and brushing and oiling system was also supplied. To further optimize automation, safety and process control, an automatic cake hardness and temperature measurement device was installed (Fig. 8).

In addition, a programmable pattern milling CNC machine was installed in the after-treatment area to be able to produce panels with all types of patterns. A solution very popular for 50 mm / 2 inch cladding applications as it provides the panels with esthetical and premium appearances.

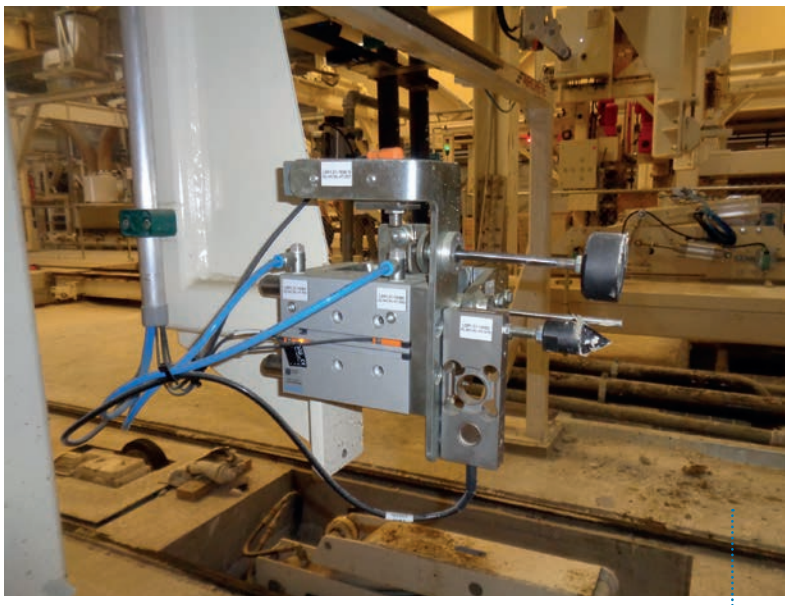
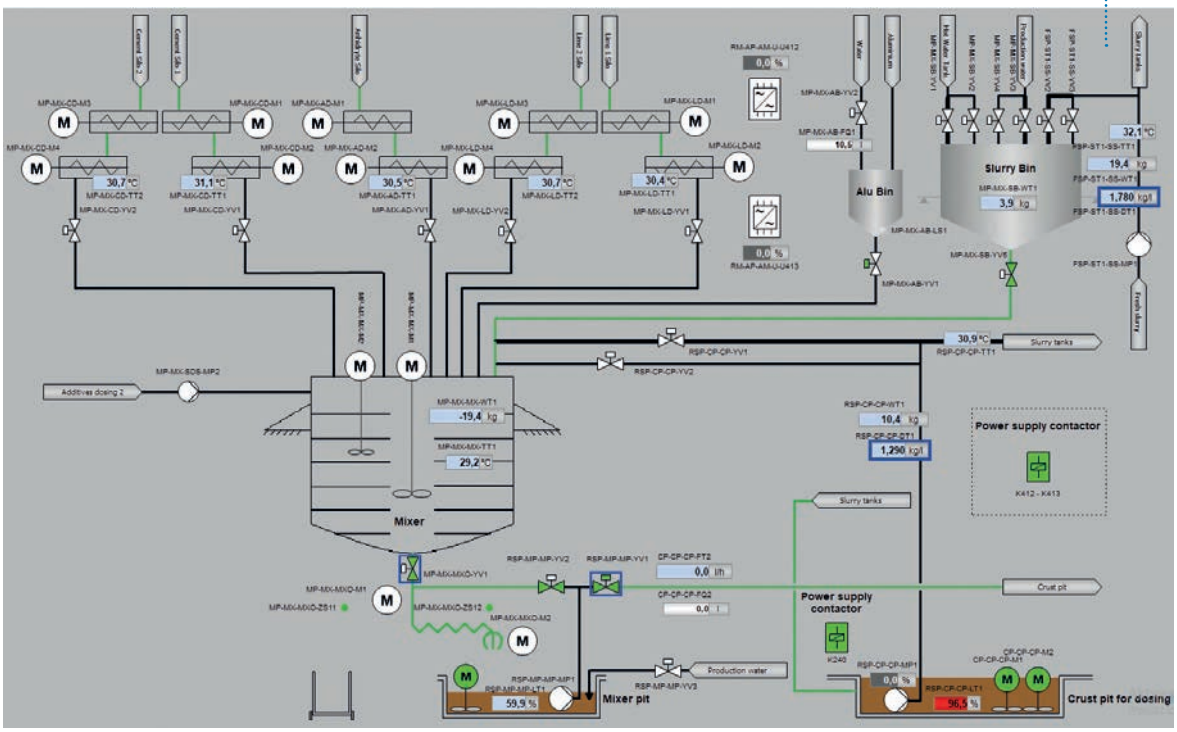


Fig. 8: Automatic green cake hardness and temperature measurement.

The Aircrete Europe YouTube channel is updated with innovative technology on a monthly basis. Check out the advantages of automatic green cake hardness and temperature measurement unit in this video!

Importantly, the old and obsolete Siemens S5 control system was replaced with a state-of-the-art Siemens S7-1500 control system with a new advanced SCADA visualization to substantially improve the human-machine-interfacing and ease of operation.

Fig. 9: Mixing plant process visualization screen example.



With the new Aircrete batching and dosing software, including advanced recipe control, and new autoclave control software, the process and quality control of the plant have been significantly improved (Fig. 9).

As for all modernization projects, it is critical to keep factory downtime to a minimum to reduce the production loss for the client. To support this, Aircrete makes use of special tools in the preparation phase. For the Aercon upgrade project, Aircrete converted the existing plant into its engineering software, using a 3D Plant Scanner that generates a high-density point-cloud model, combined with the engineered Aircrete equipment. Integrating BIM in this project made possible to identify possible clashes early in the project and to create a visual installation sequence and planning, which assisted discussions on installation logistics and installation process overall. This approach has proven to be effective in other modernization projects of Aircrete as well (Fig. 10).

Fig. 10: Utilizing point-cloud technology allowed for smooth projection of new equipment in the existing facility (above – implemented, below – during design phase).

Rick Zegger, Project Manager at Aircrete Europe, commented: *"Part of making this project a success was not only focusing on the Aircrete solution, but finding the optimal balance between installing the new equipment and re-using/refurbishing old equipment. In addition, the full commitment of the Aercon employees to cooperate with all stakeholders and understand how to operate the new equipment and the new production layout was instrumental. Long before the dismantling of old equipment and installation and commissioning of the new equipment, Aircrete was continuously onsite at Aercon to improve on-going activities, indicate bottlenecks in the non-modernized equipment that would affect reliability and to ensure that the new, shorter production cycle times would be met. This also resulted in a clear plan how to improve the non-modernized equipment during the plant modification. When the modification started, replacement parts were on site and manpower and tasks were properly allocated. During the installation the Aercon personnel were heavily involved in the process to already get familiar with the new equipment. During the commissioning, the training started, and software customizations were incorporated to fully tailor to the demands of the customer. This thorough preparation and great cooperation made Aercon hit the ground running from the day the factory was restarted again."*

Project preparation and implementation

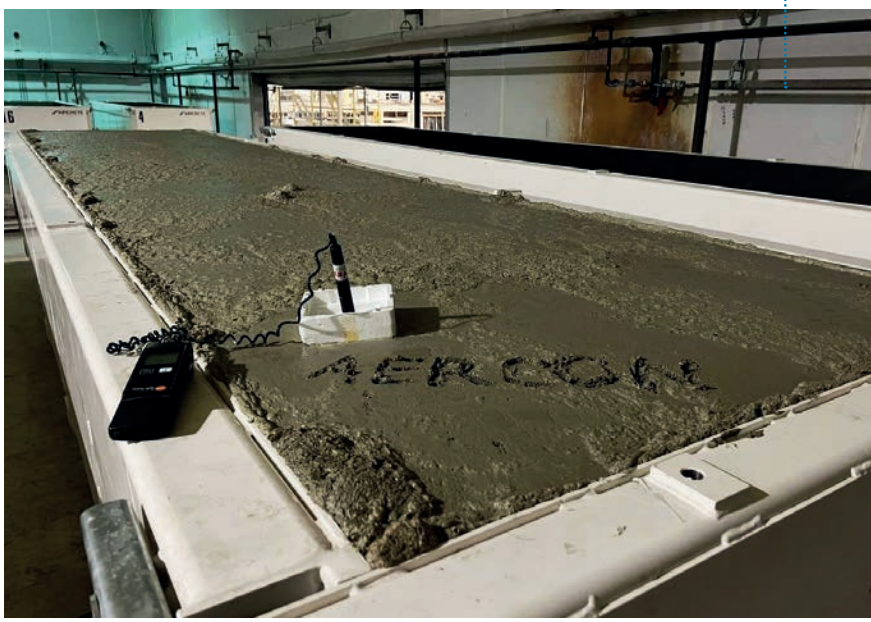
With an impressive track-record of designing and implementing complex modernization projects, Aircrete understands that thorough planning and coordination between all stakeholder's teams is fundamental to ensure a smooth installation with minimized downtime and production process disruption.

During the entire engineering and manufacturing phases, all teams intensively worked together to ensure the most efficient dismantling process of old equipment, the necessary civil works to adjust the foundations and the installation and commissioning of the new Aircrete equipment. Clear scope divisions and responsibilities were the basis of this successfully executed project, and, being a technology partner and not just a machine supplier, Aircrete ensured an extra team stayed on site after project completion to ensure a smooth ramp up of production and provide production process and planning support with respect to producing the AAC panels.

Ready for the future

The future of construction lies in green, sustainable and modular building solutions. With a modernized factory and being the first factory in the United States with Aircrete flat-cake technology, Aercon is ready to participate in this trend and the future looks bright. Besides the AAC panels from Mexico that have been serving the local market demand, the United States now have their own local source for the wide portfolio of high-quality AAC panels, an instrumental step to accelerated market growth in the short-term future (Fig. 11).

Fig. 11: "First cake" produced being carefully monitored during rising process.



Read more about the Aercon project (full version) and the unique Aircrete Flat-Cake technology by following this link. Simply scan the QR code with your smartphone!

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