

Engine-Only model supplies the “heart” of an AAC panel plant for the South East Asia Markets



Fig. 1: China's construction industry is undergoing rapid growth with increasing urbanization and welfare standards

For many markets in South East Asia - particularly for China, which is by far the largest market in the region - the construction market outlook is very positive with autoclaved aerated concrete (AAC), also referred to as autoclaved lightweight concrete (ALC). AAC outperforms in the overall market, as contractors and developers are increasingly switching to AAC as the preferred building material. Increasing urbanization and welfare standards in China result in a large demand for new residential and commercial construction and therefore require an even more efficient way of construction than before.

The Chinese Market Overview

China's construction industry has seen rapid expansion since the country began to implement the reform and opening-up policy in 1978. The value-added output of the industry reached 5.57 trillion Yuan (about 816.6 billion U.S. Dollars) in 2017, compared with only about 13.9 billion Yuan in 1978. The average annual growth rate was 16.6 %, as per the National Bureau of Statistics (NBS) data. The value-added output of the industry accounted for 3.8 % of the country's GDP in 1978, while the proportion rose to 6.7 % in 2017. The number of construction companies saw fast growth, reaching more than 300,000 last year (Fig. 1). Taking commercial interest into account, builders and developers, focus more on cost-effective construc-

tion which requires fast, easily installed, recyclable, versatile and less labour-intensive building systems globally. This resulted with a switch from block-and-brick-based construction to prefabricated elements. The Chinese market follows this global trend as well and furthermore, the initiative is backed by the State Council People's Republic of China officially. The Council targets a 30% adoption rate of prefabricated solutions before 2020 and has urged efforts to develop related standards, promote integrated architectural design, create a strong building components industry, increase the use of green materials, and ensure project quality for prefab construction. Therefore, the switch from the well accepted AAC block to AAC panels is the natural choice.



Fig. 2: AAC panels are the perfect basis of a beneficial building system for modular, fast and eco-friendly constructions

Global Trend Towards AAC Panels

Using AAC panels is the perfect solution for structural, environmental and efficient construction. Mature markets (such as Western Europe, Scandinavia, Japan, Australia, etc.) have already long embraced the positive prospects of using reinforced AAC elements and shifted their attention towards fast, easy and commercially efficient building with AAC panels. Various AAC panel types constitute a wide array of products that together make up a very flexible and thus, a hugely beneficial building system (Fig. 2).

Aircrete Building System is an established modular construction concept that uses reinforced prefabricated AAC elements to create a customized building solution to achieve faster and more economical construction. It capitalizes on modularity of building that AAC elements have to offer. Precise product dimensions, ease

of handling, Super Smooth product surface and light-weight contribute to superior building technique with AAC panels. Depending on the design, high-rise buildings, complete houses, apartment blocks, warehouses, shopping malls, distribution centres can be built from standardized AAC floor, roof, wall and cladding (façade) panels.

Introducing the Aircrete “Engine-Only” Model for China and South East Asia

Within South East Asia, China consumes a very high volume of AAC products, majorly attributed to the growing population, rapid rate of urbanization and an increasing number of building construction projects. Further, the Chinese AAC market is anticipated to grow at a significant rate and register the highest CAGR during the forecast period of 2024. This growing demand and the global shift to an AAC panel-based

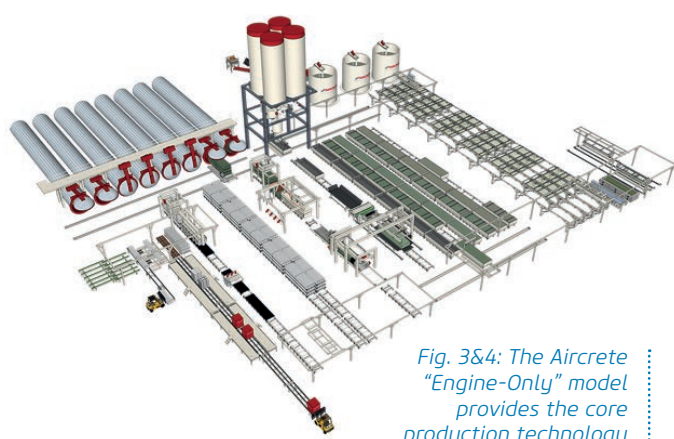


Fig. 3&4: The Aircrete “Engine-Only” model provides the core production technology

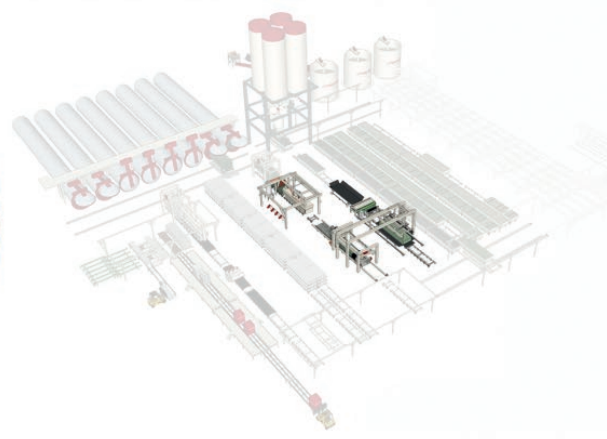
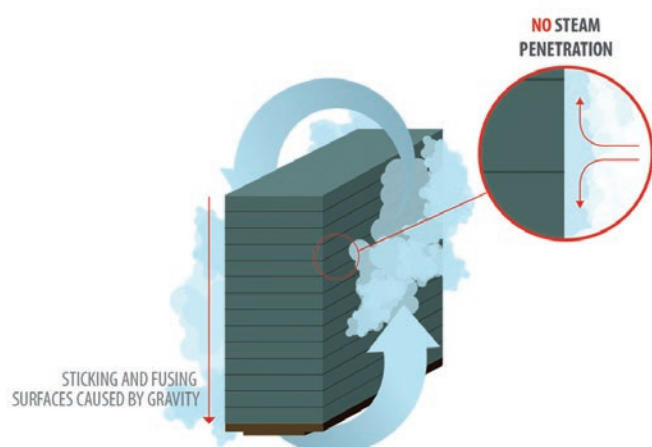




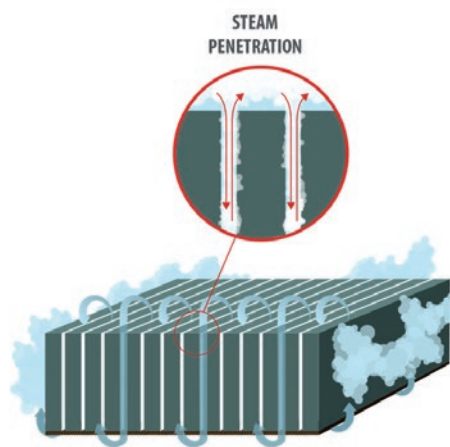
Fig. 5: The main deliverables from Aircrete Europe for the "Engine-Only" model

VERTICAL AUTOCLAVING



- Longer autoclaving time
- Damaged surfaces
- Sticking of products
- Separation of products required
- No steam entry
- Difficulties of thin product production

HORIZONTAL AUTOCLAVING



- Shorter autoclaving time
- SUPER SMOOTH surfaces
- No sticking of products
- No separation of products required
- Easy steam entry
- Thin product production possible

Fig. 6: Main advantages of horizontal autoclaving versus vertical autoclaving

AIRCRETE FLAT-CAKE	TILT-CAKE	
	with White Separator	with Green Separator
Positioning with crane	Tilting (°90)	Tilting (°90)
Cutting (Horizontal Cake)	Cutting (Vertical Cake)	Cutting (Vertical Cake)
		Back tilting
		'Green' bottom layer removal
Flat Autoclaving	Vertical Autoclaving	Flat Autoclaving
	'White' Product Separation	
	'White' bottom layer removal	
Packaging	Packaging	Packaging
4 STEPS	6 STEPS	6 STEPS

Fig. 7: The number of steps in Aircrete Flat-Cake-System are easy to manage



Fig. 8: High-Speed Cutting Frame with double wire cut for Super Smooth surfaces

building solution has increased the requirement for the unique Aircrete Europe Flat-Cake AAC panel technology. Just like China, many other countries in South East Asia are expected to follow this trend (or are already experiencing the same trend). For this reason, Aircrete has introduced its “Engine-Only” model, whereby the total investment is strongly reduced without compromising the quality of the final AAC panels and blocks.

Within the Aircrete “Engine-Only” model, solely the core cutting technology and the process know-how is provided from Europe. (Fig. 3&4). The remaining elements of the plant are realised in cooperation with local Asian partners. This model offers a joint AAC panel production solution with a state-of-the-art panel technology in its core with an attractive investment level (Fig. 5). Several such dedicated AAC panel plants, using the Aircrete “Engine”, are currently being constructed in South East Asia at the moment.

The heart of an AAC Plant that comes with Aircrete “Engine-Only” model: the Aircrete Cutting Line

Especially for low density ($< 300 \text{ kg/m}^3$), the ultra-thin reinforced cladding panel production and super smooth product surface, the process technology of the AAC plant plays a significant role. The cutting process is often seen as the “heart” of the process as this is where the shape, tolerances and surface quality of the final products are defined. In the unique flat-cake cake production technology, the green cake is cut vertically in a flat position thereby preventing any sticking problems after the autoclaving process (Fig. 6). By using this system, there is no need for an extra separating machine or splitter to separate the hardened products layer by layer, which reduces the risk of breakage. Researches revealed that gaps left by the cut in the cake, reduce time and the energy consumption of the autoclaving process due to the easy spread of heat. Experience also shows that production losses and breakage are very low with the Aircrete Cutting Technology.

A further advantage of this system is that the amount of handling is reduced. The system produces no bottom (or bed) waste layer, which needs to be removed (Fig. 7). More modern tilt-cake systems have a back-tilting system whereby they can remove the bed waste in the green, as well as a green separation machine. However, all of this additional handling, increases the risk of damaging the green cake, which is still very soft and vulnerable at that point in time. Plants using this system consistently achieve waste rates of less than 1%.

This characteristic Aircrete Cutting Technology is based on the proven double vertical long cut wires, the horizontal vertical moving cross cut wires and the horizontal moving of top and or middle cut wires. For the top and bottom cutting also the profiling knives can be used.

The key factor of the system is the High-Speed Cutting Frame (Fig. 8&9) with double wires in the vertical long cut to produce Super Smooth surface and precise thickness panels (40 mm). This development opens new applications for faster and better building with Aircrete products, namely the Aircrete Building System. The stability of the process offers a relative long open time between cast to cut. This is an essential advantage where production flexibility is requested (Fig. 10).

In order to ensure that the integration is done as smoothly as possible, the “Engine” is supplied as a “black-box” meaning that there are basically only four interfaced. In this case it is the input-side of the mould, where the mold is inserted from the pre-curing area and the output-side of the mould, after this has been cleaned, oiled and closed. On the other side is the input-side of the empty cooking frame and then the output-side of the cooking frame with the finished cut cake. The entire Aircrete scope comes with its own advanced control system and the entire “Engine” is fully erected and tested in Europe before shipment. Next to the cutting line, the typical “Engine-Only” package also includes the special Aircrete slow speed



*Fig. 9: Close-up view of
Super Smooth thin panels
just being cut by the Aircrete
High-Speed Cutting Frame*

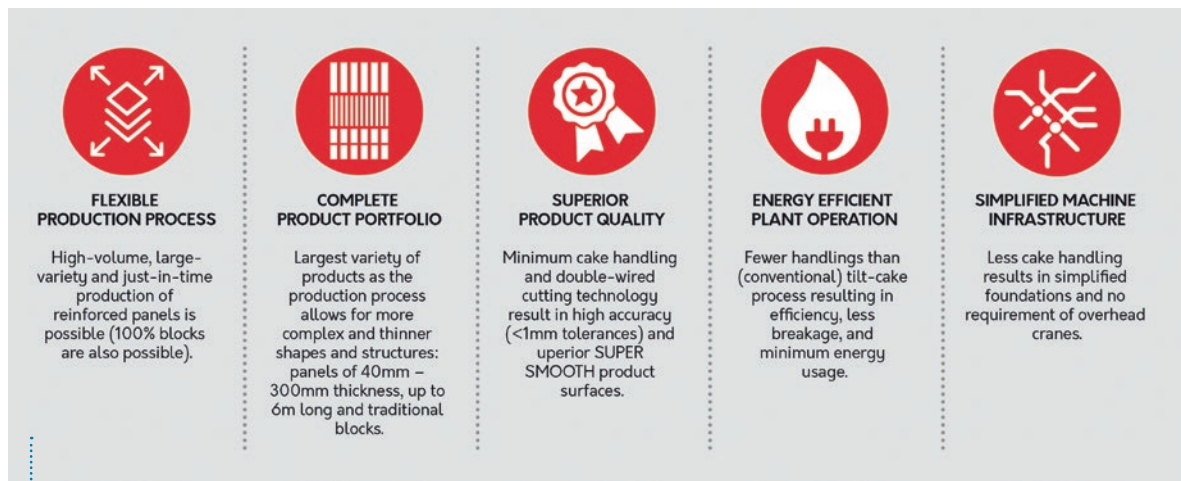


Fig. 10: Flat-cake is the superior technology for panel production

mixer. This is a special design with multi-paddle design, which acts as a shear-mixer with long fixed paddles on the wall of the mixer (Fig. 11). The main advantage of this mixer is that one achieves a very homogenic mix, especially with varying filling volumes in the mixer, which is the case in panel plants using a damming wall to shorten the mould (Fig. 12). In addition, the lifetime of the paddles is about 5-8 years, whereas with the typical high-speed mixers, these require to be exchanged after a few months.

Of course, Aircrete can also supply other core-technology, such as special unloading and packaging systems for the thin panels and the after-treatment lines, such as sawing and surface milling. Especially the surface miles cladding panels are continuously growing in demand (Fig. 13).

Conclusion

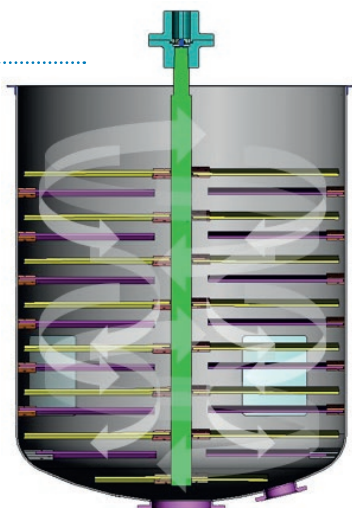
Plants equipped with Aircrete cutting technology are able to produce a very large variety of AAC products, including partition panels, thin cladding panels (40 mm) (Fig. 14) and load-bearing lintels, roof, floor, wall panels and blocks (TLMB standard). Furthermore, AAC panels produced on Aircrete technology

are characterized by a Super Smooth surface, which will minimize finishing requirements of installed AAC walls. These features of products are the key elements of the Aircrete Building System.

In South East Asia, the increasing demand towards AAC panels backed-up by the government initiatives (like in China) gives a perfect foundation towards promoting the Aircrete Building System. In order to implement this construction methodology for cost-effective and efficient construction, the right plant technology is required. With an understanding that a complete European plant is not economical from a CAPEX point of view in South East Asia – where there are good local partners – Aircrete Europe decided to introduce the Aircrete “Engine-Only” model. The Aircrete “Engine-Only” model is a robust, reliable and long-lasting production system that includes the core technology and services around the Aircrete flat cake system. This model uses the “engine” (or “heart”) from Aircrete Europe and the rest of the shell is made by local partners according to their own proven design.

AAC panel production comes with a totally different approach if compared to commoditized blocks, giving plant owners a unique competitive edge. The introduction of Aircrete “Engine-Only” model provides not only a high quality, efficient and affordable solution for panel production, but also an intensive support on AAC panel applications through the Aircrete Building System, helping to support the growth of the South East Asia region.

Fig. 11: The Aircrete slow speed mixer with multi-paddle design



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Fig. 12: A homogeneous mix and the filling of the mould is the key to achieving a good AAC cake



Fig. 13: Aircrete AAC panel milling and sawing line



Fig. 14: Super thin AAC panels are the future of exterior cladding