Aircrete Europe, 7575 ED Oldenzaal, The Netherlands

State-of-the-art AAC panel plant in the Americas goes into operation

Together with its local project partners Brayco and Pecam, technology partner Aircrete Europe successfully commissioned Brimax – another Aircrete Autoclaved Aerated Concrete (AAC) factory in Latin America – in April this year. Brimax is located in the proximity of Rosario, Argentina and is equipped with the latest Aircrete panel technology. The factory has an initial production capacity of 450 m³ per day and is capable of producing both AAC panels and blocks. It is a State-of-the-art AAC factory and is the first AAC panel factory in Argentina. The Brimax project is a direct response to the significant housing shortage Argentina is coping with at the moment and provides a sustainable and efficient housing solution to address this problem. This is in line with the global trend in the construction markets, were prefab building solutions are becoming the preferred building material of choice (rather than block- or brick-based building systems). This trend is driven by a need for faster construction, reduction of the complexity of construction projects and globally increasing labor costs. As a result, the project received significant attention and support from the Argentinian and Dutch government (fig. 1). Besides as the technology partner, Aircrete will stay involved as a minority shareholder in Brimax through the family investment vehicle Aircrete Group (fig. 2).

Argentina Market Potential

Argentina is the second largest economy in South America and the need for more efficient and sustainable construction is becoming a priority in addressing, amongst others, the large (affordable) housing need in the country. AAC is a proven solution worldwide and offers a great potential for Argentina's affordable housing deficit and other construction sectors. With the cost of energy increasing and environmental awareness on the rise, Argentina does not only need faster, better and more affordable building methods, it also needs those methods to be environmentally-friendly.

Phase 1 - Project Design

The project partners (Brayco, Pecam and Aircrete Group) met on the bauma show in Munich in April 2016. As of most of its turn-key greenfield projects, Aircrete Europe commenced the project with a Phase 1 approach, whereby part of the technical and financial works was prepared and, together with its local partners, a market analysis assessment was completed. From this assessment, it turned out that AAC would be price competitive compared to local construction materials alternatives while at the same time outperforms on other merits like weight, speed of construction and insulation capability. (See fig. 3 for a summary of the Aircrete Argentina Building Cost Comparability Study.)

Other items assessed during the Phase 1 - Project Design included identifying sources of raw materials and testing these in the laboratories in Europe, sample laboratory castings, customized formula design, production layout design, machines scope definition, automation levels, building system designs, product application identification and more.

Fig. 2: The products from the new state-of-the-art AAC facility in Argentina are marketed under the name "Brimax".

Fig 1: Argentinian Minister of Production, Francisco Cabrera, received representatives of the companies from Brayco (Iván Brajkovic), Pecam (Ricardo Griot) and Aircrete Group (Jop van Boggelen) respectively.

The result of Phase 1 was a customized and detailed engineering design of the project to be executed, allowing for a realistic and detailed plan and budget for the project. Aircrete Europe delivered the project as a turn-key supplier, assisting its local partners in every step of the project: from the plant engineering and machines design to equipment delivery, installation, and commissioning.

The majority of the equipment was manufactured in the Netherlands, where machines are fully assembled, wired and electrically tested before partly de-assembled and shipped. This allowed in return for minimal installation time on site with reduced performance risk during start up. As for every project, an optimized sourcing strategy resulted in the procurement of certain, less-core items locally (e.g. boiler, slurry tanks and silos). This approach ensures that the total investment budget is economically optimized without impacting the quality or performance of the plant.

AIRCRETE EUROPE

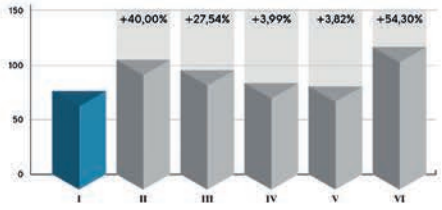
COST COMPARISON

AAC OUTPERFORMS TRADITIONAL BUILDING METHODS IN LATIN AMERICA

COMPARABLE METRICS	AAC 15cm	SANDWICH WALL 12cm + 12cm (hollow)	HOLLOW WALL 12cm + 8cm	HOLLOW WALL 18cm	SOLID WALL 15cm	SOLID WALL 30cm
Price (USD/m²)*	75,87	106,23	96,77	78,90	78,77	117,07
Thermal resistance (W/m²*K)	1,4	0,7	1,4	0,65	0,35	0,58
Weight (kg/m²)	110	75,87	260	285	250	515
Installation time (hr/m²)	2,48	75,87	3,7	3,00	3,00	4,25
Local building code compliant¹	✓	✓ ✗	✓	✗	✗	✗

Note: Based on study for Argentina market.
*¹Based on Argnetina Ley 13059 / IRAM 11605, *Exchange rate EUR 1 /= ARS 16.0923 (14 April 2017)*

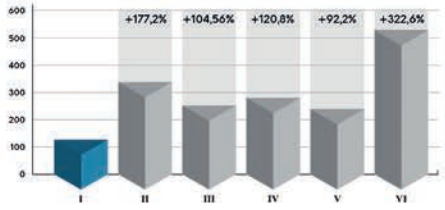
PRICE (USD/m²)



AAC is significantly cheaper per installed m² (material and manual labor). Process includes masonry product + labor, reinforcement, plaster & rendering + labor.

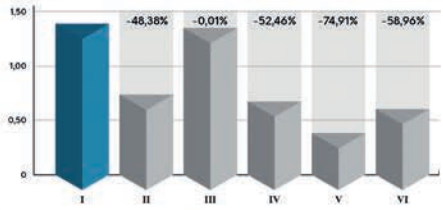
NB: prices exclude the savings in structural steel and concrete required

WEIGHT (Kg/m²)



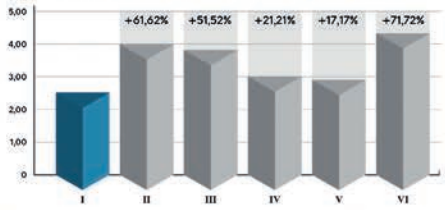
The lower weight compared to alternatives in the market allows for faster construction.

THERMAL RESISTANCE (W/m²*K)



On the thermal resistance, AAC outperforms most currently present alternative building materials in the market.

INSTALLATION TIME (hr/m²)



With respect to installation time per m² installed, AAC is the fastest available option in the market.

Fig. 3: Cost comparison study proves AAC outperform on price, weight, insulation capacity and speed of construction.

Structured planning during the preparatory phase (Phase 1) and coordinated execution during the construction phase (Phase 2) resulted in a successful project delivery.

Iván Brajcovic from Brayco commented:

"We were looking for the right partner that could assist us introducing high-quality AAC products in Argentina. From our Phase 1 assessment it turned out that AAC panels would fit in a wide variety of local building applications. As Aircrete Europe possesses both the relevant technology and process knowhow when it comes to producing AAC panels, we approached them for this project. The close cooperation between our people have been a determining factor in the success of building the plant and so far during the start-up phase."

The Brimax Factory

Aircrete Europe started the project by carefully analyzing the market potential and engaged in in-depth discussions with local stakeholders to confirm the relevant building application for Argentina. Resulting from that, the entire machine park was designed to meet those requirements. This built-to-suit approach makes every Aircrete factory different and unique.

The engineered layout of the Brimax facility is designed for flexible capacity upgrade to 1,500 m³ per day, with relatively limited additional investments (mainly relating to adding additional autoclaves, moulds and frames).

Sand and gypsum is grinded with water in a ball mill to produce sand slurry. The size of the ball mill is already designed for a future plant capacity extension. The lime and cement are loaded into the silos located in the mixing tower. Aluminum is dosed using an Aircrete Alu-Safe System for maximum safety and dosing precision. The plant is also equipped with a special Poromix-Additive dosing system to apply a special additive to optimize the AAC recipe by reducing raw materials and water.

The slurry is stored in 150 m³ large slurry tanks with planetary type agitators ensuring a homogeneous storage of the slurry. Using the Aircrete special slurry density measuring devices and dosing system, the slurry is transferred to the slurry scale.

The accurate and reliable Aircrete dosing and mixing system uses an intelligent software control system to measure with high precision. The Aircrete mixer (low speed mixer) ensures perfectly homogeneous distribution of raw materials in the mix and through its design is especially suited for the panel production, where the cake volumes can vary considerably.

Fig. 4: The special design of the moulds makes it is very easy to clean and oil the mould using the automatic Aircrete mould brushing and oiling system.

Due to the design of the moulds, where all four sides fold down, it is very easy to clean and oil the mould using the automatic Aircrete mould brushing and oiling system. The design of the oiling system with the special low-pressure spray bar with 63 individually adjustable nozzles ensures a huge reduction in oil consumption in comparison with conventional systems.

Once casted into the freshly cleaned and oiled mould (fig. 4), the mix is additionally vibrated to eliminate air pockets and ensure the quality of end products and then transferred to the rising area.

The entire rising area is designed in such a way, that no complicated pits or foundation work was required which does not only reduce the investment costs, but also makes cleaning and maintenance easier.

Fig. 5: A close-up on the reinforcement area

At the start of the production the reinforcement steel mats are procured from the market, but there is sufficient space to install a dedicated reinforcement steel production line. The entire reinforcement preparation line is however already installed to ensure a perfect application of the corrosion protection and also insertion and positioning of the reinforcement in the product (fig. 5).

As for every Aircrete factory, the implemented Aircrete flat-cake cutting technology results in "Super Smooth" surfaces and higher dimensional accuracy of the AAC products, creating both esthetic and cost-efficient benefits relating to minimal finishing requirements.

Gabriel Pierre, CEO of Brimax, mentioned:

"I am very excited about the product quality that we are producing. The smooth surface of the product stands out from the rougher surface of competitive products and first feedback from our customers confirm their enthusiasm about this aspect as well".

Once the green cake is ready for cutting, the mold automatically opens from all four sides and the grabbing crane picks up the entire green cake, which is positioned on metal strips in the first section of the cutting line. After the cross-cut is made, the cake 'travels' through the High Speed Cutting Frame (HSCF) (fig. 6). In the HSCF, oscillating steel wires are pneumatically spanned in a paired position. On the strips the cake 'travels' through the HSCF on steel strips, where two wires, oscillating at high speed, make a precise cut that allow to reach for very high tolerances (the first cutting wire is followed by a smoothening towing wire). Thanks to this proprietary technology, the AAC products are cut with a "Super Smooth" surface. Since the products are cut in a flat/horizontal position, the openings between the products are created eliminating sticking problems (known from tilt-cake systems) and thereby allows for the production of the largest product portfolio, including very thin (cladding) panels. No separating nor green cake tilting machines are used in Aircrete plants reducing the handling of the product and thereby significantly lowering the risks of product damage. Once cut, the cake travels to the vacuum crane, where the top, front and end side crust are removed and 100 % of the rest material is mixed with water and used in the next cycle.
The cake leaves the cutting line already on an autoclaving frame, without mechanical handling of the cake. That means no back-tilting or further transfer of the cake is required (fig. 7). The curing frames with

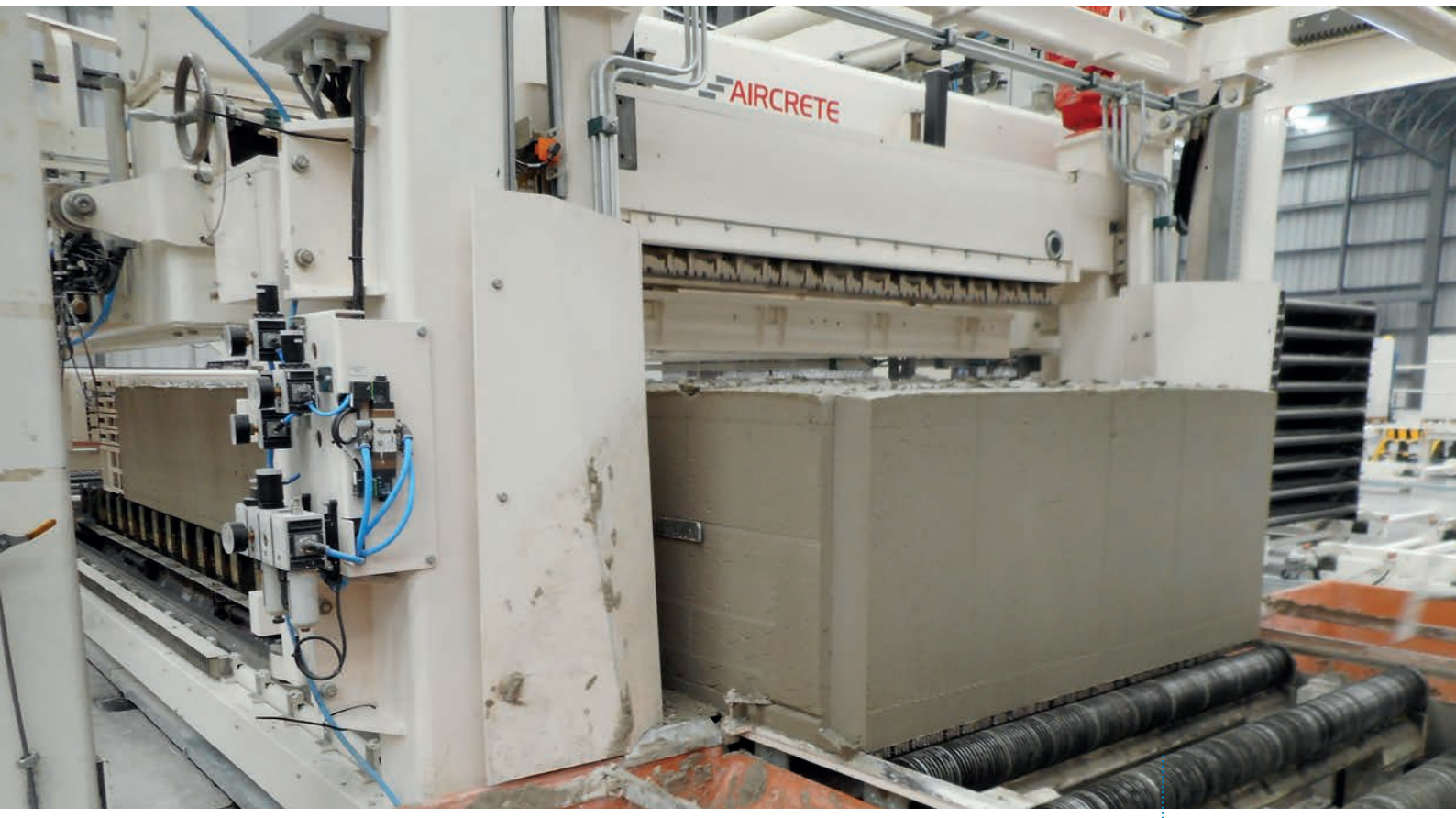


Fig. 6: The High Speed Cutting Frame ensures a "Super Smooth" product surface, no-sticking and high accuracy in dimensions

cakes are stacked and transported directly to the autoclaves where the cakes will be cured, hereby using the Aircrete Autoclave Control System with energy saving technology. In the first phase the plant has three autoclaves with each autoclave having a capacity of 81 m³ AAC per cycle. The autoclaves are equipped with special wheels with maintenance free bearings, so no autoclave cars are required. After the autoclaving the cakes are transported to the unloading area.

In the unloading area a manipulator takes the complete white cake and transfers it from the frame onto the tilting table, where two cakes are placed on top of each other and tilted by 90° onto the wooden pallets (fig. 8). The packs are then automatically transported by a conveyor system to the quality inspection and sorting place. After this station the pallets are ready for final packaging.
Due to the large variety of panels that can be produced by the Aircrete plant, a very flexible and individual unloading system for the panels has be installed to accommodate the market requirements.

Ensuring Quality

The reliability of the Brimax facility is ensured by an entire in-house developed plant automation

Fig. 7: No back-tilting or further transfer of the cake is required for autoclaving

Fig. 8: A close-up of the unloading area

(fig. 9). Staying up-to-date with global trends, the latest Siemens components were used (SCADA and S7-1500 series PLCs). Through remote access capabilities, immediate and ongoing support can be provided by Europe-based engineers, that can remotely access and troubleshoot potential issues. As Aircrete control systems are designed on plant level, ensuring a flawless integration of all production areas into one system. Besides central reporting and full tractability using RFID technology, the control systems feature recipe management modules and can be integrated in ERP systems. Especially worth mentioning is the fully automatic Raw Materials Module which is responsible for precise and automatic operations of the mixing tower and the Autoclaves Control System which automatically controls the critical autoclaving process including steam transfer and condensate reuse. All integrated systems ensure continued high-quality production as well as cost savings.

Aircrete Building System

Brimax is a State-of-the-art AAC plant and the only AAC factory in Argentina that is capable of producing AAC panels. Brimax is capable of producing a large variety of AAC elements, including: partition panels, thin (50 mm thick) cladding and façade panels, load-bearing wall panels, roof and floor slab, lintels and also block products (regular blocks and U-blocks). The product densities range from 350 kg/m³ to 700 kg/m³, allowing for producing a range of products to address both sound and insulation applications.

The complete product range allows for the introduction of the Aircrete Building System (ABS) (fig. 10) in the Argentine market. ABS is a modular and complete building system from diverse AAC products that is used and growing in demand to address (affordable) housing shortage projects. Projects based on an AAC panel-based building system are being implemented in Europe, Africa, Australia and South America for decades. An AAC panel-based building system is almost completely made from prefabricated AAC elements and ensures that perfect standardization is achieved throughout the supply chain.

Argentina is one of the most urbanized countries in the region, with 92 % of the population living in cities. The metropolitan region of Buenos Aires alone has about 15 million inhabitants. The problem of increasing overcrowds in Argentina is in correlation with scarcity of affordable housing. There are many simultaneous governmental and international initiatives to address this issue of low-cost, affordable housing and improve access to formal housing throughout the country.

Fig. 9: The latest in-house developed plant automation helps to integrate all production areas into a single system

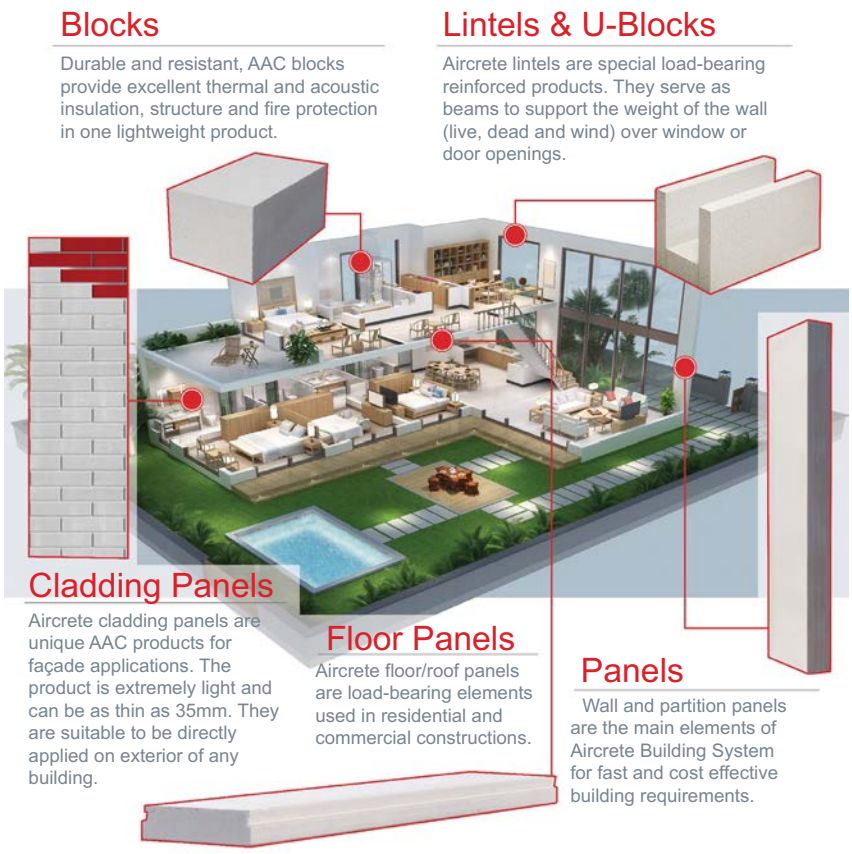


Fig. 10: In Aircrete Building System, the amounts and sizes of various AAC elements used in construction are optimized for the specific house design allowing for further cost savings.

Low-cost housing can only be achieved by the use of effective planning and project management, low cost materials, economical construction technologies and use of alternative construction methods. This is exactly what Aircrete Building System offers and there are significant opportunities in favor of such a system by building in weeks instead of months and reducing building cost to develop efficient housing projects. The Aircrete Building System is completely standardized with Super Smooth blocks and panels to allow for the optimization of increased speed, reduced complexity and optimized cost for a construction project.

About Aircrete Europe

Aircrete Europe is the technology and solution partner for AAC panels and blocks production. Being the long-term, exclusive project partner for its customers, they guide through all the steps of planning, building and operating an AAC factory. Their unique positioning comes from being a full technology partner not just a machine supplier, resulting in a far higher value service and customized solutions.
The organization constantly invests in innovation and process technology to optimize the production process and product quality. A dedicated team of production managers, mechanics, operators, chemists, mechanical, electrical & software engineers as well as business developers is ready to share their in-depth expertise covering the entire AAC value chain.

About Brimax

Brimax is the result of an ambitious project of two construction companies in Argentina together with the incorporation of European technological innovation in the construction sector; Brayco, Pecam and Aircrete make up Brimax. The new, state-of-art Brimax AAC panel and block plant is located in Fray Luis Beltrán, a province of Santa Fe in Argentina.

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