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From design to production: comprehensive technological advancements in AAC plants

Over the past few decades, the production process of autoclaved aerated concrete has seen continuous refinement, leading to significant enhancements in product quality. Innovators across the globe have driven efficiencies at every stage of AAC manufacturing, from plant construction to day-to-day operations. These advancements have not only boosted productivity but also lowered energy consumption and costs, strengthening the competitive edge of AAC in the construction industry.

As Keda Suremaker deepens its engagement in the global AAC market, it has observed a growing trend: customers now prioritize not only the final delivery of AAC plants but also the entire construction experience and the efficiency of production processes. In response, Keda Suremaker is actively exploring new technologies and methodologies, aiming to harness its R&D and technical expertise to align more closely with evolving customer needs.

The concept of Building Information Modelling (BIM) can be traced back to the 1970s, with the development of computer-aided design (CAD) systems. However, the modern incarnation of BIM began to take shape in the early 2000s, as technological advancements in computing power and software capabilities allowed for more sophisticated modelling and information management.

Integration of BIM in AAC plant design

The integration of BIM technology into the design phase of AAC plants significantly enhances the efficiency and accuracy of the design process. BIM facilitates the creation of detailed and accurate 3D models, enables clash detection, and improves visualization, all of which are crucial factors for optimizing factory layouts and making informed decisions during the design process.

The use of BIM in creating 3D models allows for a comprehensive digital representation of (mechanical, electrical, and plumbing) systems. This detailed modelling ensures that all components are accurately positioned and integrated, minimizing the risk of errors that can occur during construction.

Fig. 1: The traditional 2D layout plans are somewhat lacking in the amount of information conveyed, compared to BIM models.

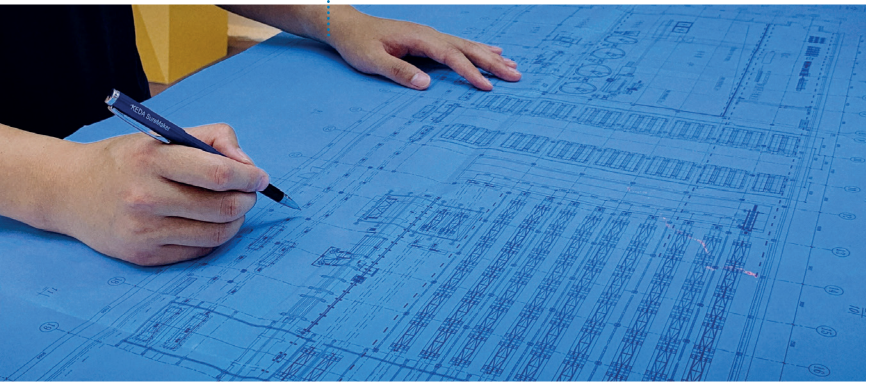

Fig. 2: One of the advantages of BIM is its highly visual representation.

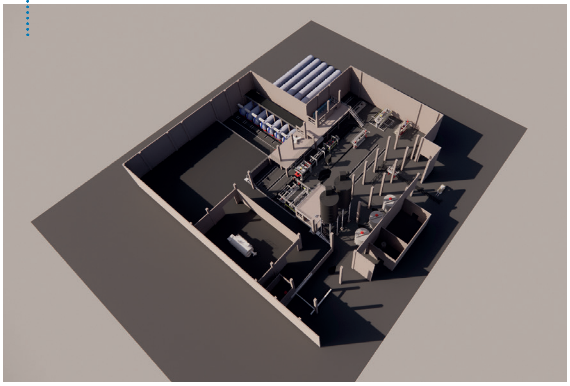

Fig. 3: At the design level, Keda Suremaker begins to utilize BIM models to avoid errors and rework.

These models can include everything from the layout of the production lines to the placement of machinery and storage areas. The ability to visualize the entire factory in three dimensions allows designers to ensure that all components fit together as intended and that there are no spatial conflicts.

Reducing errors and minimizing rework

Errors in construction can be costly and time-consuming to rectify. BIM plays a crucial role in minimizing these errors by providing accurate and detailed representations of the project. The use of clash detection, as discussed earlier, is a prime example of how BIM helps identify and resolve potential conflicts before they escalate into significant issues during construction.

By running clash detection simulations, project teams can identify interferences between structural, mechanical, electrical, and plumbing systems early in the design phase. Addressing these clashes in the digital model prevents them from occurring on the construction site, thereby reducing the need for rework. This proactive approach not only saves time but also reduces material wastage and labour costs associated with correcting errors.

Improved visualization

BIM technology enhances visualization by providing highly detailed and realistic 3D renderings of the factory layout. This improved visualization aids stakeholders in understanding the design and making informed decisions. For instance, a virtual walk

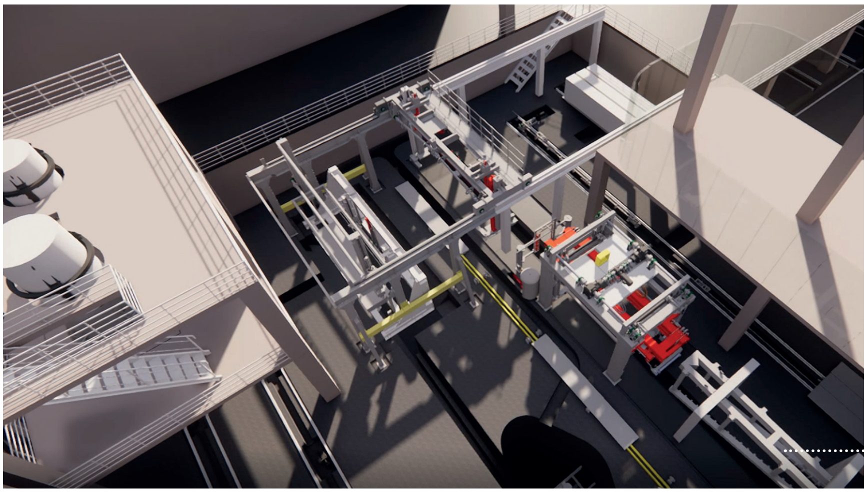

Fig. 4: The equipment positions of each section in the AAC plant can be intuitively represented through BIM, providing a foundation for future layout optimization and adjustments.

through of the factory can be conducted, allowing stakeholders to experience the space as if they were physically present. This capability is especially beneficial for AAC factory design, where the spatial arrangement of equipment and production lines is critical for efficient operations. By visualizing the factory layout in 3D, designers can ensure that workflow paths are optimized, safety standards are met, and ergonomic considerations are addressed.

Consider an AAC plant where the placement of autoclaves, mixers, and cutting machines must be carefully planned to ensure smooth material flow and minimize bottlenecks. By creating multiple layout scenarios in the BIM model, designers can simulate production processes and identify the optimal configuration that maximizes efficiency and reduces material handling times.

BIM technology is continuously advancing, enabling real-time design collaboration, construction progress tracking, and more, when it comes to the construction of AAC plants. At present, Keda Suremaker has already integrated BIM technology into the early planning and design stages of select AAC projects. This is expected to greatly enhance customer experience during the design and construction processes of AAC plants. Looking ahead, Keda Suremaker plans to explore broader applications of BIM technology, with aspirations to incorporate it into more AAC plant projects in the future.

Beyond software applications, Keda Suremaker has consistently adhered to the philosophy of providing tailored process solutions that align with the specific needs of different customers.

Fig. 5: Keda Suremaker self-engineered green cake separation machine.

AAC blocks are produced from siliceous materials (such as sand) and calcareous materials (lime and cement), which go through processes such as batching, mixing and pouring, pre-curing, cutting, and autoclaving to be turned into porous concrete products. For AAC panels, steel mesh reinforcement is embedded, creating reinforced porous concrete products. However, during the production process, siliceous and calcareous materials undergo hydration reactions during high-temperature autoclaving, leading to the finished blocks or panels sticking together. Therefore, separation of the finished products after autoclaving becomes necessary.

In traditional AAC production lines, this separation is usually performed after autoclaving, a method known as “white cake separation.” Due to the signif-

Fig. 6: Intelligent dual-sided synchronous separation improves production efficiency.

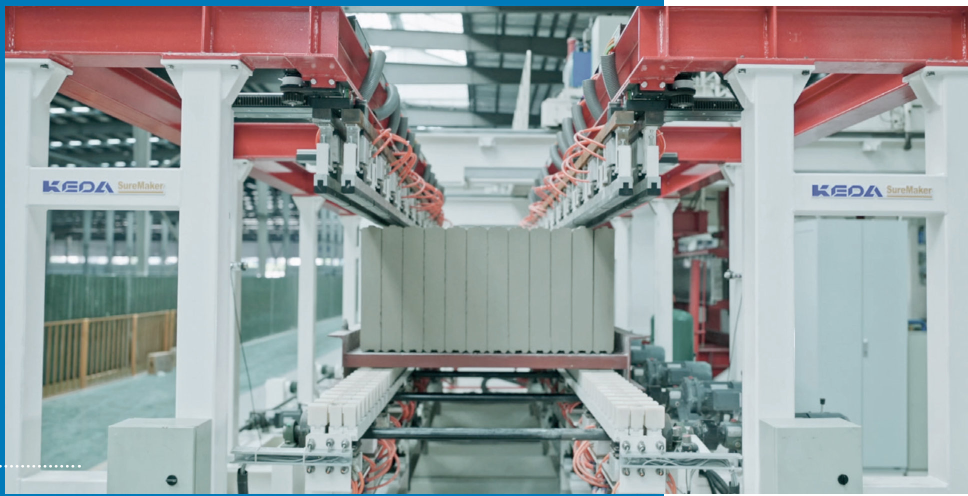

Fig. 7: After the green cake separation, the autoclaving time will be reduced, thereby decreasing steam energy consumption.

icant adhesive forces between the finished products, considerable force is required to split them apart, which sometimes results in damage - especially for thin panels that are particularly vulnerable during dry splitting. An alternative method involves separation of the semi-finished products prior to autoclaving, known as “green cake separation. In green cake separation, since the hydration reaction has not yet occurred, the semi-finished products are easier to separate, making this unique technique especially suited for thin panels.

Recognizing the unique requirements of the green cake separation process, Keda Suremaker has launched a newly self-engineered green cake separation solution. This solution adopts a vertical cutting - green cake separation - horizontal autoclaving workflow, with the process steps outlined as follows:

1. After the green cake is cut, it is rotated 90 degrees by a turning platform and transferred onto a base plate equipped with grates.

2. The base plate, with the green cake, is then lifted by a crane and transported to the conveyor rollers.

3 The motor-driven conveyor rollers guide the base plate to the separation station.

4. Once positioned, the green cake separation machine’s gripper heads automatically adjust to the preset splitting thickness. The dual-sided grippers then synchronize their actions to split the entire green body.

To complement this process, Keda Suremaker has developed a green cake separation machine specifically aimed at enhancing production efficiency. The key features of this equipment include:

1. Servo motor-driven operation, ensuring high precision and smooth action during splitting.

2. Intelligent dual-sided synchronous separation, significantly boosting efficiency.

3. Quick-change grippers designed to adapt different sizes of blocks and panels, allowing for flexibility in production.

Keda Suremaker’s commitment to innovation and customer-centric solutions is evident in its integration of cutting-edge technologies like BIM and the development of advanced process techniques such as green cake separation. By continuously refining its technological capabilities and offering tailored solutions, Keda Suremaker enhances the efficiency and quality of AAC plant construction. As the company continues to explore and implement new technologies, it remains committed to leading the market, providing clients with comprehensive, high-performance AAC production systems designed to meet the evolving demands of the global construction sector.

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