

AHEAD

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FROM A RAW MATERIAL
TO AN END PRODUCT
**STRONG TECHNOLOGY
PARTNERSHIP FOR THE
CHINESE MARKET**



Engineering Value

***Krauss Maffei
Berstorff***



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PREMIUM-QUALITY END PRODUCT

The ECOLIFE® window profile with a core of wood flour and recycled PO and a premium-quality outer layer of HDPE with an aluminum protective coating.

STRONG TECHNOLOGY PARTNERSHIP FOR PROFILE EXTRUSION IN THE CHINESE MARKET

KRAUSSMAFFEI BERSTORFF AND GREINER EXTRUSION EQUIP THE FIRST PRODUCTION FACILITIES FOR ECOLIFE® WINDOW PROFILES BY KET

Wood-plastic composites are a promising new way of replacing expensive plastics in part with renewable raw materials. And the WPC innovation prize for an innovative new application of this material combination for window profiles goes to a Chinese company under German management.

TEXT: ANNEMARIE PABST, ANDREAS WESELER, JOACHIM WEBER PHOTOS: KRAUSSMAFFEI BERSTORFF, ISTOCKPHOTO

The scene: The city of Bengbu, with 3.4 million inhabitants, around 1,000 km south of Peking in Anhui province. There, Kappes Environment Technology (KET), with its joint ventures Kaiteya Co. Ltd. and Anhui Kappes New Materials Technology Co. Ltd., will commence production of environmentally friendly window profiles at the start of 2014. With the protected brand ECOLIFE®, they hope to conquer the Chinese window market. KraussMaffei Berstorff is also involved. Another plant is currently being built in Shenyang, northeast China; there are also signed contracts for a fourth joint venture project in Chengdu, in Sichuan province.

KET is a unique company: a Chinese company with a strong German background. In 2007, Jörg Kappes and his Chinese wife Hong Gao Kappes decided to relocate to China after extensive market analyses, in order to set up their company there. With the support of five German shareholders and together with reputable German and Austrian industry partners, they had developed the prototype for their innovative window profile by 2012.

The special feature is that it is made of a coextruded wood-plastic composite (WPC), which is laminated with a thin aluminum coating at the inner and outer window surface, in order to protect the window permanently and reliably against driving rain and UV radiation. The window profiles meet strict Chinese requirements – including relatively high wind loads in high-rise construction. In 2012, ECOLIFE® was officially certified and approved by the Chinese ministry for construction. By 2013, KET had already achieved second place in the German WPC innovation prize.

KraussMaffei Berstorff made a crucial contribution as early as the development stage of ECOLIFE®. So, it is hardly a wonder that significant parts of the new production systems also come from Hanover and Munich. The bulk order includes material processing as well as further processing on KraussMaffei Berstorff's extruders.

The material is compounded at Kaiteya Co. Ltd. It consists of 50 percent wood fiber, which is mixed with recycled high-density polyethylene (HDPE) – obtained from, among other things, household waste, such as shampoo bottles – as well as various additives to form the innovative compound. This mixing process is performed entirely on the modular compounder with the ZE 130 R twin-screw extruder and a screw diameter of 150 mm.

This type of modular system is characterized by the fact that it combines individual components of compounders in functional packages. On-site, they simply have to be connected to the power, water and compressed-air supply. Then they are ready for use immediately. For the engineers at KraussMaffei Berstorff, this type of individually tailored compounding module is nothing new, but the KET system had particular requirements in two respects:



ENVIRONMENTALLY FRIENDLY MATERIAL

Window profiles produced using environmentally friendly methods meet the strictest requirements for high-rise construction.

First, an extremely high throughput of up to 1,500 kg per hour had to be achieved with a modular construction. In addition, this system had to have an even more compact design than all of its predecessors, in order to fit in the space available, including the limited hall height. The self-supporting design of the modules means Kaiteya only needs a lightweight hall, whose procurement costs are significantly lower than those of a conventional production hall.

The fully automatic modular system for Bengbu covers the entire process from raw material supply to bagging of the finished compound. The completely preassembled system combines all machine components – so there are no interface problems. System set-up and run-in can thus be carried out in the TechCenter in Hanover. The employees and later operators are trained under production conditions in Hanover. This means expert support of the system is guaranteed from the outset and local production can begin without delay.

In the next production step, the compound is extruded into a high quality window profile with a WPC core and provided with a coextruded coating of pure HDPE. To do this, Anhui Kappes New Materials Technology Co. Ltd. will install three complete extruder combinations for coextrusion from KraussMaffei Berstorff – combined with

tools and downstream units supplied by the partner company Greiner Extrusion. The profile produced in this way is then coated with a thin layer of aluminum, on the inside and outside, in order to make the window resistant to extreme weather conditions. This technology stems from a German laminating system manufacturer.

With its modern, durable and good-value system, which saves energy both in production and in use, KET first intends to tap the Chinese window market. A market that, with the equivalent of EUR 19.5 billion per year and an annual growth of 8 to 10 percent, is one of the biggest in the world. Further production facilities near Peking and Chengdu are already being planned. In addition to the successful market launch in China, Kappes is already planning to expand to the global window market. Initial talks in this respect will be held in spring 2014.

Detailed product information: The compounder module

The modular compounder is equipped with a ZE 130 R twin-screw extruder with a screw diameter of 150 mm. In this extruder, with its output of 1,500 kg per hour, gravimetric metering devices supply thermo-plastic and any additives, which are melted down in the front section of the 50-D long processing unit. A ZSFE side feeder then meters the wood flour – which for energy reasons is not pre-dried.



4. PROFILE PRODUCTION WITH COEXTRUSION CONCEPT

Processing the WPC pellets into a coextruded WPC profile

5. PREMIUM-QUALITY END PRODUCT

ECOLIFE® window profile core of wood flour/recycled PO mixture, premium-quality outer layer of HDPE with aluminum protective coating

3. ECOLIFE® PELLETS

WPC pellets prepared for extrusion

The extruder has two venting devices to extract humidity, which can be as much as 12 percent. In addition to atmospheric venting, a water ring pump ensures that the high volume of steam is extracted. The 6-D long venting port with special WPC inserts guarantees efficient and safe humidity extraction together with the high free screw volume.

From the extruder, the compound melt is transferred to a melt pump that routes it into the underwater pelletizing unit with gentle pressure build-up and without a temperature increase. The underwater pelletizing unit is also specially designed for processing WPC. A connected cooling coil conveyor not only supports cooling, but also drying of the material so that it can be bagged with a starting humidity of less than 1 percent.

Extrusion

Two combinations of twin-screw extruders of size KMD 90-32/WPC with the KME 38-30 B/R single-screw extruders are used. Due to their lighter and more flexible mobility, the single-screw extruders are designed as pillar versions. The window main profiles are produced on these combinations. The window side profiles are produced on the extruder combination of KMD 75-26/WPC with KME 38-30 B/R.

The KraussMaffei Berstorff extruders in the 32D series offer many advantages, such as constant material feed, careful material preparation and high pressure stability of the screws when manufacturing semifinished products. In addition, they are an optimal solution for processing ready-to-use compounds. High screw torque – coupled with a long processing unit – produces the highest possible output rates. The special screw geometry is gentle on the material and delivers a homogeneous melt at an optimal temperature, even when melt pressures are high.

In WPC processing too, the trend towards coextrusion remains strong. The pillar combination used in Bengbu enables flexible production. The models can be moved quickly and they enable different injection from different positions. They are light to move and can be placed in different lines quickly and without any conversion effort. The control system for the coextruder is integrated in the main extruder.

KraussMaffei Berstorff ensures maximum wear resistance through a special processing concept, tungsten carbide welding of the screws and bi-metal lining of the barrel bores. The machines require minimum maintenance and offer a significantly increased service life – depending on the formulation.

FROM A RAW MATERIAL TO AN END PRODUCT – EVERYTHING FROM A SINGLE SOURCE



2. MODULAR COMPOUNDER

Modular compounder with the ZE 130 R twin-screw extruder



1. STARTING COMPONENTS

Wood fiber, post-consumer waste of e.g., plastic bottles, various additives