Standardized Production Concept Guarantees Quality

Quality, Efficiency, and Flexibility through Standardized Compounding and Extrusion Technology

To respond to different and rapidly changing market requirements as a medium-sized compounder, all production ranges must be compatible. To achieve this, a complete, globally standardized concept for flexible compounding was developed in partnership with a machinery manufacturer.

Consistently standardized compounding means that all peripheral units, like the feed units in the figure, also have the same design across all sizes and sites (© Akro-Plastic)

Increasing pressure on order lead times, consistent finished-product quality, growing product diversity, and global availability at competitive prices characterize the business environment of compounders. The key to meeting these challenges is flexible production. For this reason, Akro-Plastic GmbH, Niederzissen, Germany, in partnership with its sister company, the machinery manufacturer Feddem GmbH & Co. KG, Sinzig, Germany, has developed the standardized machine concept known as ICX technology (Innovative Compounding and Extrusion technology) (**Fig. 1**).

The FED 26 MTS to FED 82 MTS compounding machines (manufacturer: Feddem) are a series of identical machines in six different sizes. According to machine size, the suitable area of application ranges in graduated steps from production rates of 10 to 100 kg/h up to 1500 to 3500 kg/h. Thanks to the finely graduated application ranges, it is possible, for example, to operate an FED 72 MTS not just in the range between 600 and 2000 kg/h but also in the range of smaller machines, i. e. between 250 and 800 kg/h. The identical machine design makes it easy to scale up or scale down, which aids flexible line utilization. For efficient production capacities, machine size and throughput can be adapted to product volume demand. To fully implement a standardized machine concept, it is essential for both the extruders and peripheral units to be of identical design across all sizes and sites. This applies to all components from materials handling systems

and feed units to pelletizers with grading screen and filling units (**Title figure**).

Efficient Set-Up Times and Consistent Quality

To produce small product batches at high throughput rates, the set-up time required relative to the productive uptime of the machine increases disproportionately. Adaptive compounding lines make it possible always to operate in the most suitable extruder range, according to batch size. Production planning does not necessarily have to be geared to the maximum throughput of one extruder but rather to the maximum uptime of all extruders. The shortest set-up time, batch size, and the expected material loss determine machine capacity (tonnes/year). This highly flexible production capacity in combination with excellent user friendliness and optimum quality in turn governs the overall financial result of the company.

Another important element of standardized ICX technology is the achievable quality. This means not only the absolute quality values of the products but also their quality consistency. Just as standardized technology allows efficient machine utilization, so it is also a vital factor in quality consistency. Only standardized extruder geometry, i.e. the same outside to inside diameter (D_o/D_i) ratio and screw length to diameter ratio (L/D) of the twin screw across all machine sizes, coupled with standardized gravimetric feeding technology can ensure the required repeatability. Such repeatability is achieved with ICX machine technology not only from batch to batch but also when changing from one line to another. This can be seen in **Figure 2** with the example of the glass fiber content of a compound, as measured via ash residue. A processor's specification for the fiber content tolerance of a 30 % glass fiber-reinforced polybutylene terephthalate (PBT) compound is 30 ± 1.5 %. The actual value determined for a 132 t batch was 30 ± 0.03 to 0.27 %, i.e. only one tenth of the maximum permissible tolerance. With 25 production batches of the same material, produced on different lines, a similarly consistent figure emerged.

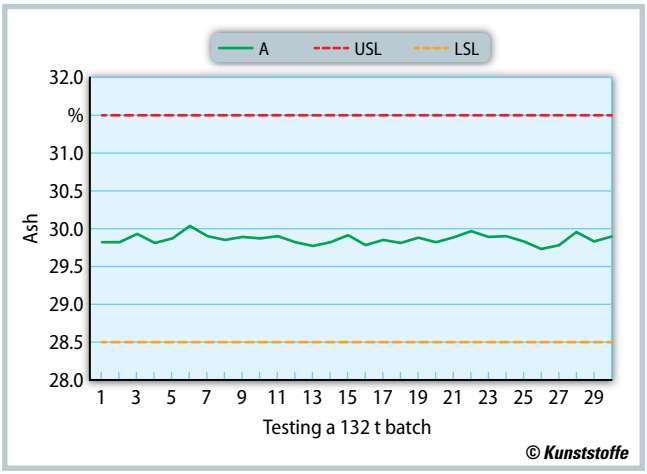

Fig. 2. Quality consistency as shown by the example of glass fiber content, A = ash, USL = upper specification limit, LSL = lower specification limit (source: Akro-Plastic)

Fig. 1. The machine concept is identical at all sites, whether in Germany, China or Brazil (© Akro-Plastic)

Global Production, Easy Maintenance

Thanks to the identical production concept at the Akro sites in Germany, China, and Brazil, internationally operating companies can be supplied locally with identical products, provided that the raw materials will support this. This concept can lead to considerable time and cost savings in material validation. It is important to note, however, that the need for global supply of identical compounds produced locally should ideally be communicated at the start of cooperation. Standardized machine series with their easier maintenance systems are also time-saving for compounders. In many cases, an additional time advantage is also gained through the associated reduction in spare parts stockage. The lower number of spare parts not only cuts costs but also make it possible to ensure that spare parts are always in stock. This not only benefits the production site in Germany but also foreign production sites, which can be supplied with spare parts immediately in an emergency, without having to initiate protracted order processes.

Even when the optimum balance is achieved between flexibility, quality, and time, price often plays a determining role in the purchasing decision. The standardized production approach makes it possible to operate cost-efficiently in all production ranges. The price is therefore the sum of all efforts and represents the added value customers expect. Here, the product determines the machine and not the machine the product. This method of operation has been systematically implemented in ICX technology. ■

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