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Technical Report

WITTMANN BATTENFELD HiQ Melt application software

WITTMANN BATTENFELD presents innovations in the area of HiQ application software packages: HiQ Melt Premium

In order to achieve optimally resource-saving production and to minimize scrap, viscosity fluctuations must be detected and any required counteraction taken as early as possible. Viscosity fluctuations may be caused, for example, by differences in fiber content due to batch change, or by variations in granulate quality. With the latest version of its HiQ Melt application, WITTMANN BATTENFELD has created a means to reveal deviations already at the metering point.

When it comes to application technology, machine setters today receive ample support from appropriate software packages. This starts with Quick Setup, already installed by WITTMANN BATTENFELD for a number of years as a standard component of the Unilog control system generations B8X and B8. This tool calculates a parameter setting proposal with process data based on just a few original data, for subsequent acceptance and confirmation. Viscosity fluctuations are then compensated during ongoing production by the already well-known HiQ Flow Premium program, but these fluctuations can also be checked by the two applications HiQ Melt Monitoring and HiQ Melt Premium.

HiQ Melt Monitoring

With the HiQ Melt Monitoring function already included in the machine's standard software package, it is possible to have both the mean dwell time of the plastic melt inside the plasticizing barrel as well as the screw volume utilization visualized.

These two values provide the machine operator with a good basis for the evaluation of the plastic melt quality during a given production process. With the help of a traffic light system, the qualitative presentation of the values quickly becomes self-

explanatory to the machine setter. Decisive quality factors are the resulting risks for the plastic material, and consequently for the finished product, too.

Typical error patterns, caused by too short dwell times when the plastic material is not completely melted, are weight fluctuations and striation in the plastic parts. This also leads to increased wear on the barrel, the machine's nozzle, the screw, the check valve and the screw tip caused by excessive shear forces.

Whenever dwell times are too long, the plastic material may be overheated, which could cause scorching inside the parts. Material sediments on the screw and corrosion along the entire barrel unit could be another consequence affecting the machine. Degradation products of the plastic material could lead to additional damage to the products and to the plasticizing unit.

The mean dwell time is calculated on the basis of the screw channel volume, the cycle time and the shot volume.

A screw utilization rate between 1D and 3D (D stands for the screw diameter) is regarded as ideal. If the utilization rate falls below 1D, this will lead to problems with the process repeatability and an excessive dwell time of the plastic inside the barrel (see above). These inaccuracies are due to the extremely short control section for the injection process as well as the short distance, which significantly more effect on the closing of the check valve. Here, improvements can be achieved, for example, by active closing of the check valve (HiQ Metering) and low injection speeds. With all-electric machines, these actions are normally more effective than with hydraulic systems. However, such solutions are no alternative to a correct screw design. Utilization above 3D is not recommended. From this metering volume upwards, the metering performance rapidly deteriorates more and more. The cycle times may become significantly longer, depending on the material processed, and the material homogeneity becomes unstable due to not fully melted parts in the melt, as already mentioned above. This leads to deteriorations in cost efficiency and quality standards, which can sometimes be substantial.

HiQ Melt Premium

Many users are facing the problem of a lack of information about the melting and flow behavior of the plastic material during production. This is why the target of the newly developed HiQ Melt Premium is to give machine operators a key figure which enables them to draw intuitive conclusions about the ongoing process. In HiQ Melt Premium, this key indicator is the melt flow index MVR (melt volume rate) or MFI as already known in practice.

The control system calculates the MVR on the basis of material parameters entered and a subsequent calibration phase. The Unilog B8X control system already proposes to the machine setter material parameters for a wide range of different materials. Most material manufacturers make the optimal parameters for their products freely available. HiQ Melt Premium is able to calculate the melt flow index from these parameters and subsequently use it for good-bad evaluation. Moreover, this makes it possible to compare the actual value with the specifications provided by the material manufacturer. Machine setters are thus informed of any viscosity fluctuations immediately during metering, which are also recorded. This enables them to respond without delay to any changes occurring. In the quality table, the MFI value can also be compared with any other actual values relevant for the process, and process changes have thus become time traceable as well.

HiQ Melt Premium is an indicator of the melt quality and thus minimizes scrap. The resulting increase in efficiency leads to a reduction in costs, facilitates early detection of material variations, and thus improves productivity. With its HiQ Melt Premium software, WITTMANN makes yet another contribution to sustainability in the use of plastics and thus demonstrates its strength in the area of Smart Machines.

The new HiQ Melt Premium software was introduced at the K 2022 trade fair as part of a renewable material processing demonstration. On an all-electric machine from the EcoPower series designed as an Insider cell, bio building blocks were manufactured from Fasal with an 8-cavity mold supplied by Bioblo, Austria. Fasal is a compound produced by Fasal Wood GmbH, Austria, consisting of wood flour and post-industrial polypropylene from Borealis. Here, the sprue was passed directly to an integrated granulator, where it was ground and subsequently returned to the process.

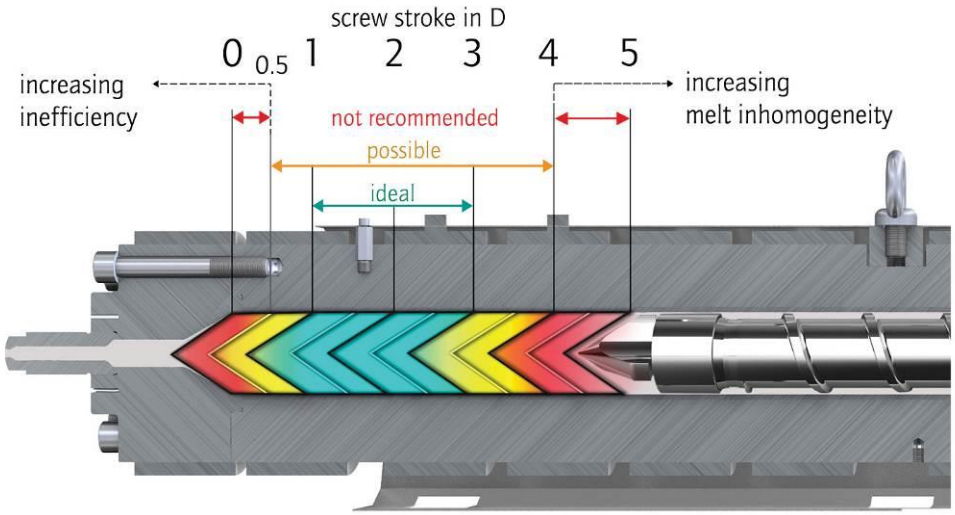

Fig. 1: HiQ Melt Monitoring – recommendation for stroke utilization

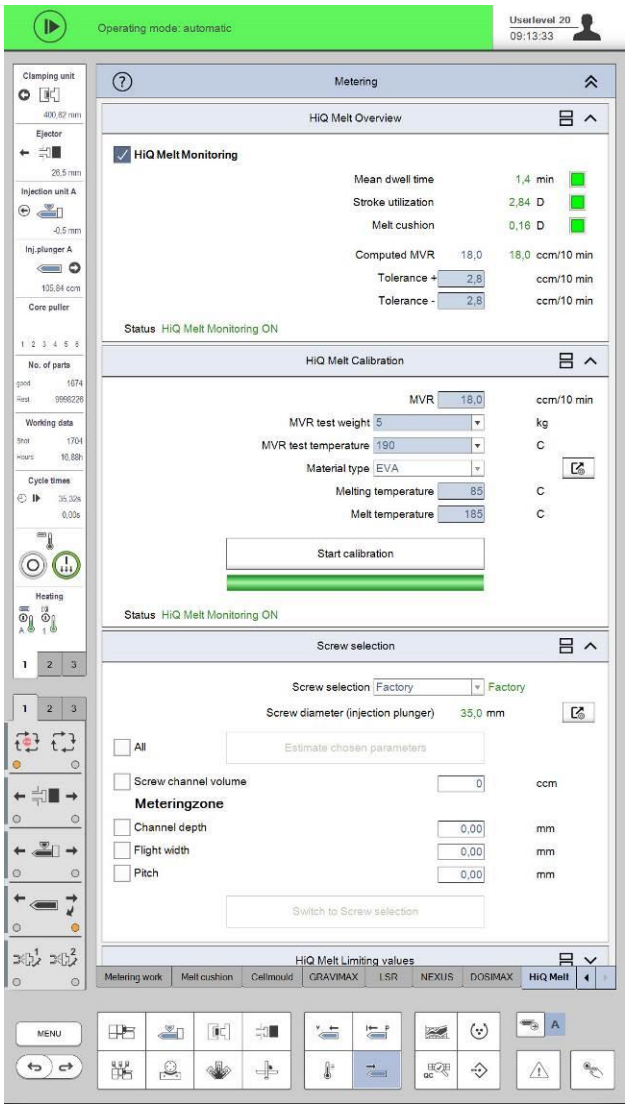

Fig. 2: Ideal conditions for perfect melt preparation

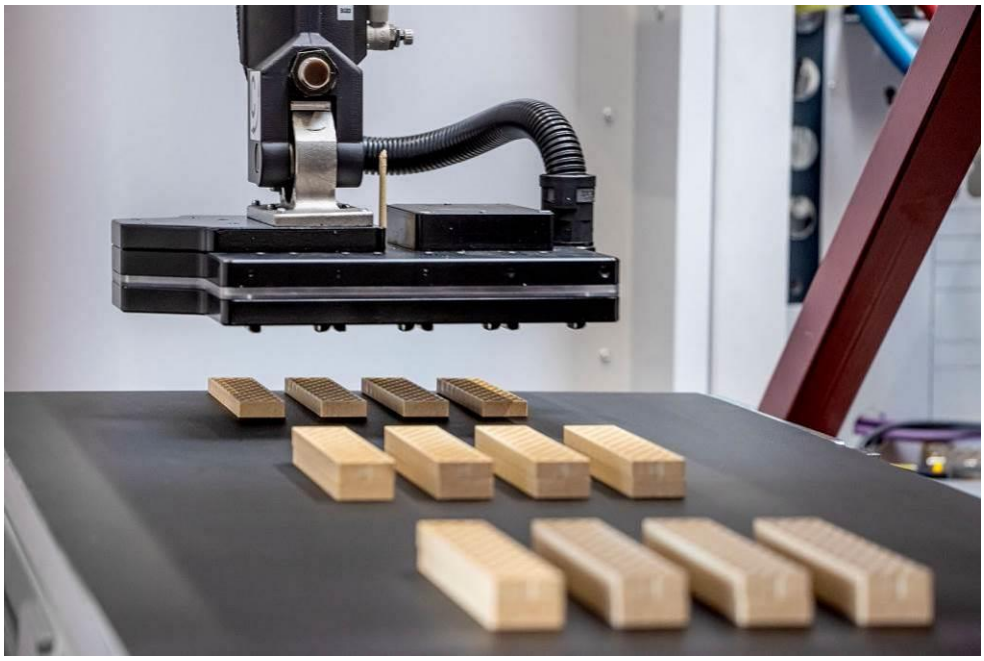

Fig. 3: Demonstration of the HiQ Melt Premium software by the production of bio building blocks from Fasal

Fig. 4: WITTMANN S-Max granulator for sprue grinding

The WITTMANN Group

The WITTMANN Group is a globally leading manufacturer of injection molding machines, robots and auxiliary equipment for processing a great variety of plasticizable materials – both plastic and non-plastic. The group of companies has its headquarters in Vienna, Austria and consists of two main divisions: WITTMANN BATTENFELD and WITTMANN. Following the principles of environmental protection, conservation of resources and circular economy, the WITTMANN Group engages in state-of-the-art process technology for maximum energy efficiency in injection molding, and in processing standard materials and materials with a high content of recyclates and renewable raw materials. The products of the WITTMANN Group are designed for horizontal and vertical integration into a Smart Factory and can be interlinked to form an intelligent production cell.

The companies of the group jointly operate ten production plants in six countries, and the additional sales companies at their 36 different locations are present in all major industrial markets around the world.

WITTMANN BATTENFELD pursues the continued strengthening of its market position as a manufacturer of injection molding machines and supplier of comprehensive modern machine technology in modular design. The product range of WITTMANN includes robots and automation systems, material handling systems, dryers, gravimetric and volumetric blenders, granulators, temperature controllers and chillers. The combination of the individual areas under the umbrella of the WITTMANN Group enables perfect integration – to the advantage of injection molding processors with an increasing demand for seamless interlocking of processing machines, automation and auxiliaries.

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