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## TECHNICAL ARTICLE

### Intelligent software solutions to control viscosity fluctuations in the injection molding process

***The viscosity of a plastic melt has a significant effect on the part quality of injection-molded components. Viscosity fluctuations, which may be caused, for example, by different batches of raw material or by the use of regrind, can lead among other things to weight fluctuations, or in more extreme cases even to incomplete cavity filling. To counteract such eventualities, WITTMANN BATTENFELD has developed its HiQ packages.***

In times of Six Sigma and in the interest of optimized production processes, the deviations mentioned above are not acceptable, and appropriate countermeasures must be taken as early and as effectively as possible. One approach to solving this problem is to use the measurement values delivered by the injection molding machine to detect possible viscosity fluctuations and, where necessary, already counteract them automatically during the manufacturing process.

This is precisely where process engineering technology from WITTMANN BATTENFELD comes in. The application software programs in the HiQ packages developed by WITTMANN BATTENFELD deal more particularly with the detection, documentation and control of viscosity fluctuations. For example, conclusions concerning viscosity deviations can be drawn and appropriate responses derived from the torque during metering and/or the pressure-stroke diagram during injection. The HiQ packages deal with

- monitoring the melt quality during metering with HiQ Melt
- inline adjustment of changeover point and holding pressure level with HiQ Flow®
- active closing of the check valve with HiQ Metering

#### HiQ Melt

HiQ Melt is used to monitor the metering rate, which is independent of the mold inserted in the machine. The metering rate depends on the torque and the screw

speed, with the viscosity having some effect on the torque. Normally a lower torque and consequently also a lower metering rate is needed for materials with low viscosity than for materials with higher viscosity (with screw speed and melt temperature remaining unchanged). This is why a viscosity deviation can already be detected during metering. If the set metering rate tolerances are exceeded, an automatic preventive separation of rejects is possible.

### **HiQ Flow®**

Low-viscosity materials require less pressure to fill the cavity than higher-viscosity melt and vice-versa. If the changeover point and the holding pressure are not corrected, an increase in weight must be expected. The weight increase results from the lower compression up to the changeover point and the higher pressure conductivity in low-viscosity melt. The pressure conductivity up to the end of the flow path is relevant for the holding pressure phase and the pressure level to be set for it.

With HiQ Flow®, any viscosity fluctuations detected during the injection phase are actively corrected within the same shot. For this purpose, the integral of the injection process (injection pressure x cylindrical surface x stroke) is calculated for a certain segment of the injection curve. On the basis of a reference shot, both the changeover point and the holding pressure level are corrected depending on the injection performance of the current shot.

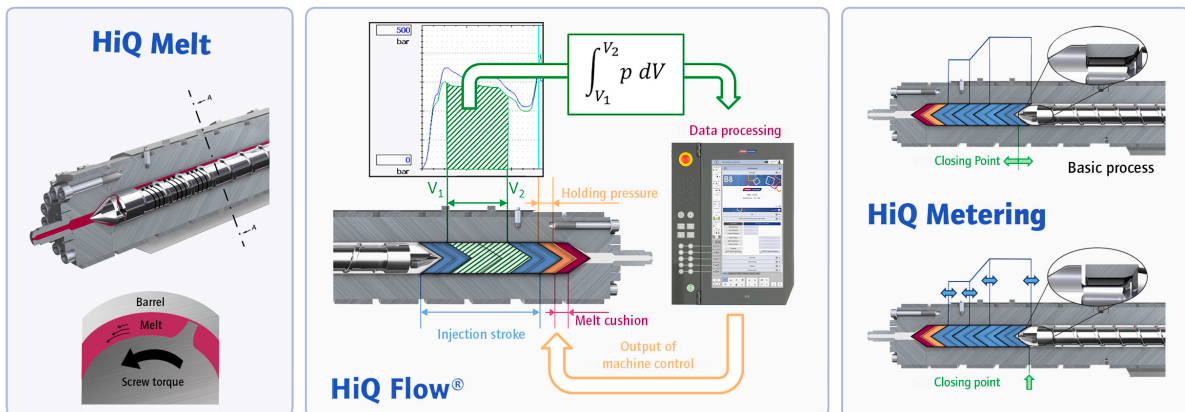
### **HiQ Metering**

The check valve is a mechanical locking device at the end of the plasticizing screw. It closes during injection and opens during metering. The closing behavior of the check valve has a significant effect on reproducible part quality.

The optional HiQ Metering function optimizes the closing behavior of the check valve, for example whenever

- viscous materials such as heavy-flowing types of PC are processed
- no decompression can be applied due to smear formation
- the injection speed must be kept low due to halo formation in the injection area

By targeted movements of the screw, the shut-off ring is released and brought into the “closed” position. In this way, a closed shut-off ring is achieved prior to “start injection”. Other program steps of HiQ Metering shift the injection profile and adjust the metering stroke to reach even better results.



**Illustration:** HiQ packages (Image. WITTMANN BATTENFELD)

### Information about the author

Patrick Pazour is engaged in process technology development at WITTMANN BATTENFELD and responsible, among other things, for the development of the HiQ packages.

### The WITTMANN Group

The WITTMANN Group is a worldwide leader in the production of injection molding machines, robots and auxiliaries for the plastics processing industry, headquartered in Vienna/Austria and consisting of two main divisions: WITTMANN BATTENFELD and WITTMANN. They jointly operate the companies of the group with eight production plants in five countries, and its additional sales and service companies are active with 34 facilities on all important plastics markets around the world.

WITTMANN BATTENFELD pursues the further expansion of its market position as an injection molding machine manufacturer and specialist for state-of-the-art process technologies. As a supplier of comprehensive, modern machine technology in modular design, the company meets both present and future market demands for plastics injection molding equipment.

The WITTMANN product portfolio includes robots and automation systems, material handling systems, dryers, gravimetric and volumetric blenders, granulators, temperature controllers and chillers. With this diversified range of auxiliaries, WITTMANN offers plastics processors solutions to cover all production requirements, ranging from independent production cells to integrated plant-wide systems.

The syndication of the various segments under the umbrella of the WITTMANN Group has led to complete connectivity between the various product lines, for the benefit of plastics processors with an increasing demand for seamless integration of processing machinery with automation and auxiliaries.

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