

Signature Technology @ Mastercraft

Making good parts every time requires a scientific approach!

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Error-free production

During large-scale production, the mold cavity pressure is used for a continuous monitoring of the quality of the molded parts. If this quality fails to meet the required standards, an accept/reject flippergate or a handling device can be used to separate the defective parts from the batch. This integrated quality assurance system ensures the detection of flawed parts at the earliest possible stage of the production and as such is prerequisite to the implementation of "lean" production conditions. Moreover, this approach reduces the reject quota and helps achieve an error-free production. This in turn boosts the productivity of the machine as a consequence of an improved utilization and lower production costs.

Documented quality

The cavity pressure profile determined during the production process is a clear reflection of the quality of the parts produced and is therefore useful material for documentation. This way, random checks according to the statistic process control (SPC) based on cavity pressure measurement evolve into a 100 % quality assurance procedure. Cavity pressure measurement delivers the relevant data to certify of every individual injection molded part. It reduces the cost of part quality control and provides an automatic documentation of process data which is readily available for both producers and customer's even years after active part production.

Technology Explained

Direct cavity measurement:

Sensor comes into contact with the plasticized polymer material within the mold cavity and measures its pressure directly and without a transmission aid. These sensors can be installed in the drilled holes in the mold with or without an adapter.

Pressure/temperature sensors: Higher-level process monitoring requires the measurement of the mold cavity pressure and the temperature as both parameters are important for the production process. The combination pressure-temperature sensor measures the cavity pressure and the contact temperature in the same point on the molded part.

Indirect measurement: Indirect measuring behind the ejector is recommended for applications that do not leave enough room for a direct sensor. Adverse conditions such as friction, bending of the ejector pin, platen distortion, or contaminated drilling holes have a detrimental effect on the measuring results and the corresponding control or monitoring operations. Direct measurement is clearly desirable to indirect measurement of industrial processes.

Measurement near the gate:

The cavity pressure profile during the filling phase is measured when the melt-flow front has reached the sensor. A long-term result is acquired near the gate and in the vicinity of the largest wall thickness as thick areas take longer to solidify. Sensor positioning should take into account the fastest and the slowest melt setting points. In cavities with several gates, measurements should be taken from critical areas of the molded part.

Measurement away from the gate: The greater the distance from the gate, the later the melt-flow front reaches the sensor, the later the pressure is registered and the higher the filling level must be to actually allow pressure measurement. Consequently, data about the filling phase cannot be displayed until the sensor has been reached. Measurement on the edge of a molded part, i.e., away from the gate or at the end of the flow path, yields a signal only when the pressure rises suddenly during the compression phase. Measurement positions away from the gate are beneficial only for protecting components such as threaded spindles or core pullers from damage caused by pressure peaks or for monitoring specific quality problems at the end of the flow path.

Basic rules for accurate sensor positioning:

1. The cavity pressure sensor should be installed near the gate, where the pressure in the molded part is highest. The closer the sensor is positioned to the gate, the more detailed the delivered process information.
2. The sensor must be installed within the cavity and not in the gate. Sensors installed in the gate will fail to transmit signals and monitor the process during the residual cooling phase after the gate has been sealed or after the onset of shrinkage.
3. If possible, the sensor should be positioned at the thickest cross section of the molded part where the melt solidifies last and the duration of the pressure is most extensive.
4. The installation of a second sensor away from the gate for measuring large parts with a critical flow-path/wall-thickness ratio is recommended for acquiring additional part quality data.
5. Sensors must not be installed directly opposite the gate as they will measure an additional dynamic force component that will override and distort the cavity pressure signal.

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