

Newsletter No. 3

Application example PRIAMUS Fill: body cover

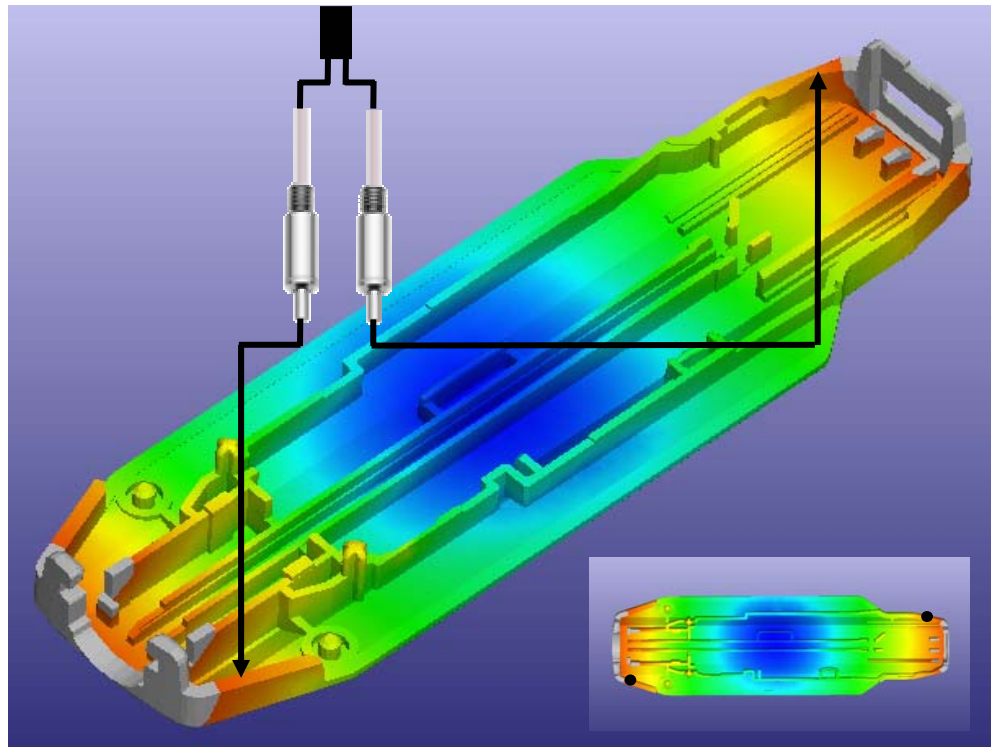


Fig 1:
Mold fill
simulation

Manufacturer: Lacey Manufacturing Ltd.
Bridgeport, CT 06610
USA

Mold: 8 cavities (hotrunner)

Problem: Fill differences at the end
of fill on both sides of
the molded parts

Solution:

1. One cavity temperature sensor on both sides of each molded part (= 16 cavity temperature sensors)
2. Build average values of both signals for higher safety
3. Automatic control and balancing of the fill period with the PRIAMUS Fill

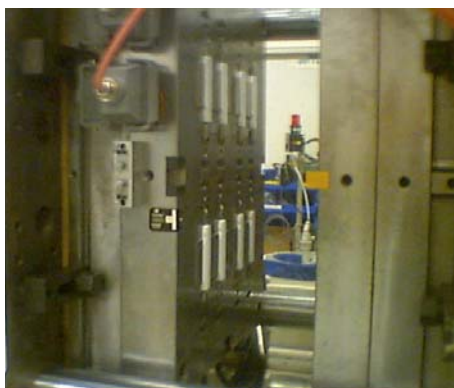


Fig 2: body cover (2 x 4 cavities)

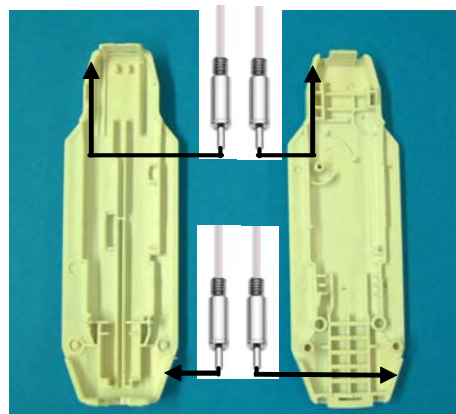


Fig 3: sensor positions

Both body covers (2 x 4 cavities) are gated in the centre by a hotrunner system. Because every single cavity is injected individually it is expected that all parts are filled at the same time. Due to the mold fill simulation (Fig. 1) it is also expected, that both ends of the molded parts are filled simultaneously, because the flow lengths and the wall thicknesses are almost identical on both sides. Comparing the fill rate of each single cavity by a fill study during production shows that the parts in reality are filled differently. It also shows that the rate of filling in each cavity changes permanently. The reason for this is the fact that any hotrunner system works as an open loop system. In other words: only the set temperature values of the hotrunner nozzles and manifolds are controlled without knowing what these temperature changes actually will effect in the process.

Optimum part quality however is not achieved by matching the set values of hotrunner systems, but finally by the control of viscosity and therefore of the flow behaviour of the melt.

The PRIAMUS Fill system first of all determines automatically with the help of cavity temperature sensors at which time the melt front reaches the end of fill in each single cavity. For this reason cavity temperature sensors are installed in each cavity near the end of fill (Fig. 3). Because of the central gating of the body cover part the plastic melt divides and fills the part in both directions simultaneously. In order to avoid misinterpretation by the automatic control system - e.g. in case of melt stagnation on one side of the part - one cavity temperature sensor is installed on both ends of fill. The average values of both signals are then used for process control (Fig. 2). As a result of this information the set temperatures of the hotrunner nozzles are automatically readjusted until every part is filled at the same time. In this way it is ensured that the compression in each single cavity, i.e. switchover to holding pressure, happens at the same time.

Switchover to holding pressure can be automatized by the use of cavity temperature signals.

Procedure

1. Setup of the system:
 - start communication with the hotrunner system
 - enter number of nozzles and manifolds
 - setup of data saving (all data or rejects only)
 - setup of data acquisition (measuring time etc.)

2. Balancing the system
 - start-up the process
 - start balancing mode
 - wait until system is stable and balanced

3. Create reference
 - Save reference for future start-up's or for start-up on different machines

4. Start monitoring mode

5. Start control mode
 - Start production

Fig. 4: Start-up of the process: 8 cavities, unbalanced

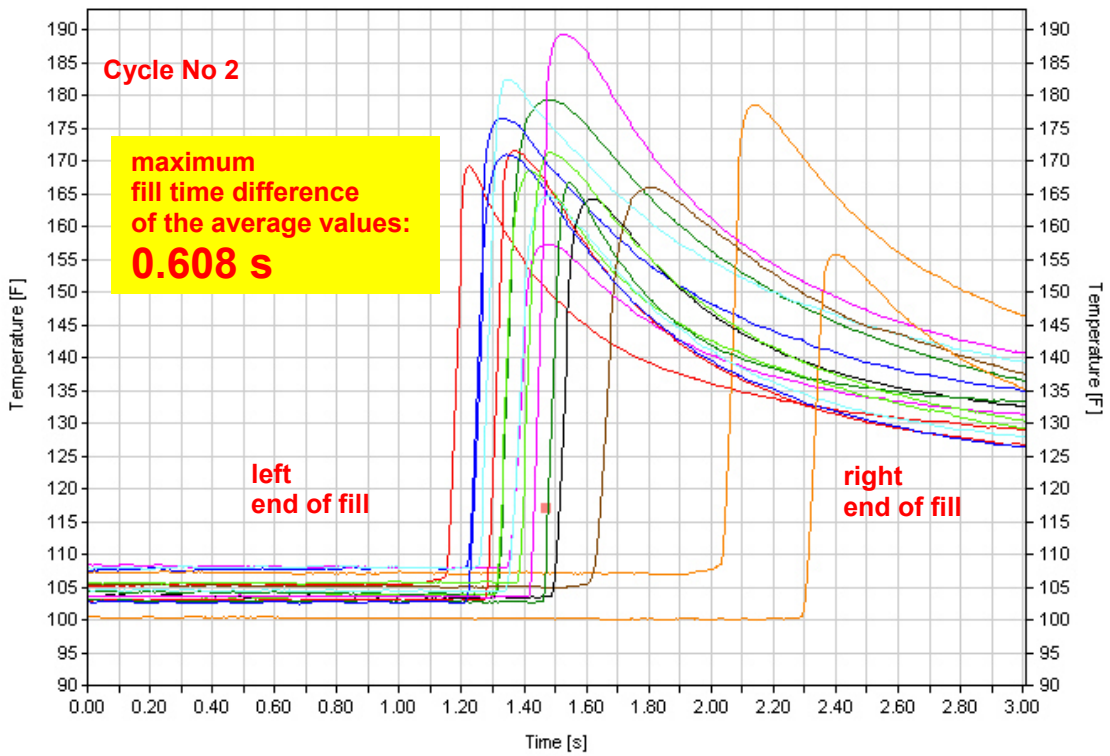


Fig. 5: Controlled process, balanced

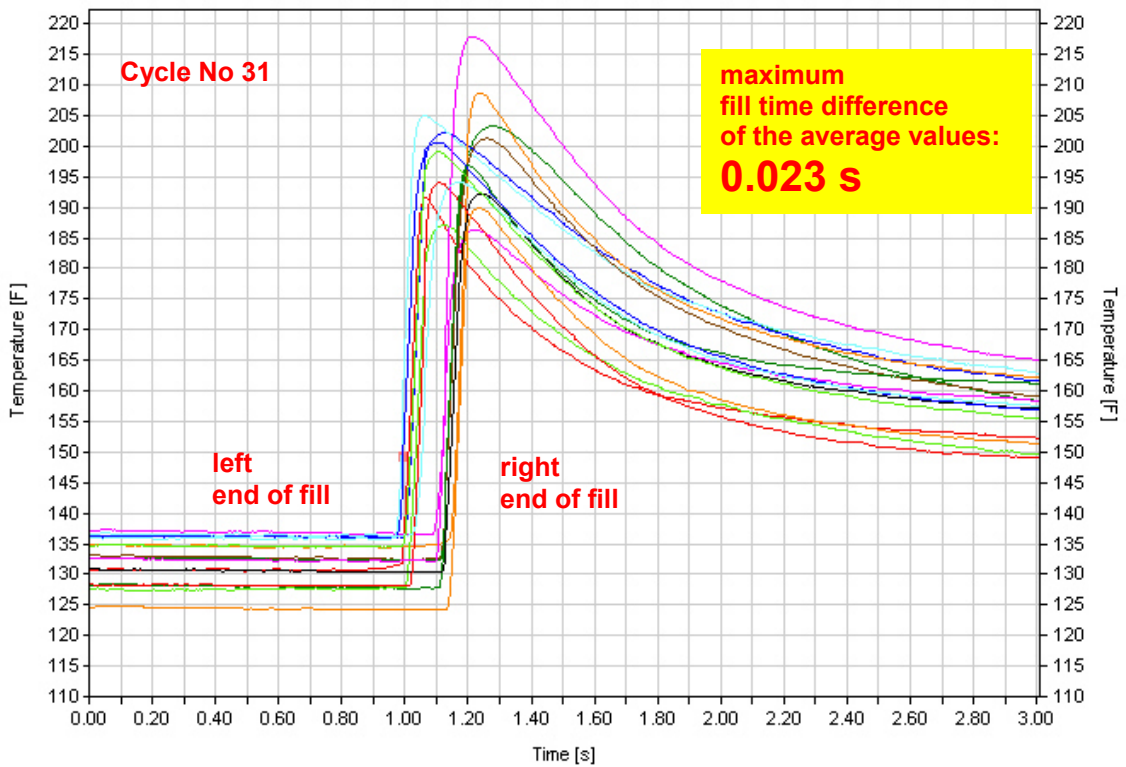


Chart of Maximum of Cav.T9 T1

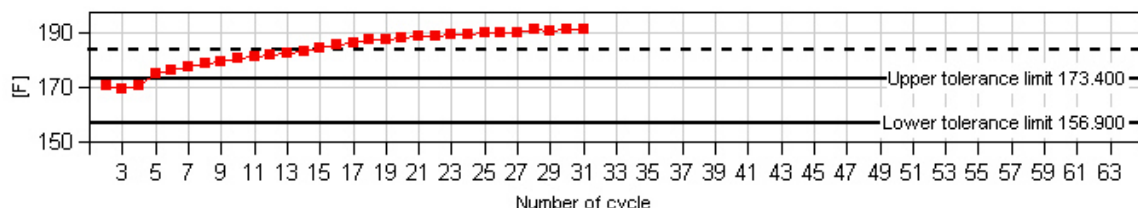


Chart of Integral of Cav.T9 T1

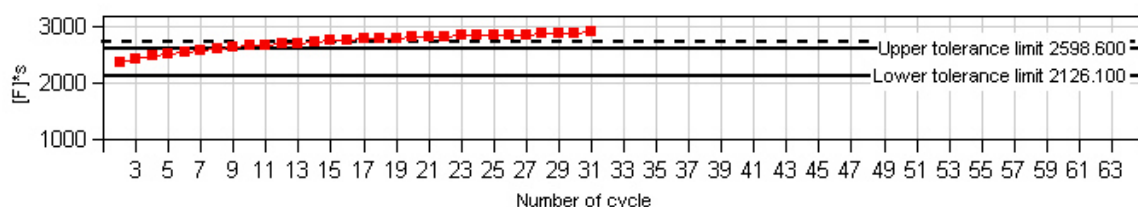


Chart of Mold temperature of Cav.T9 T1

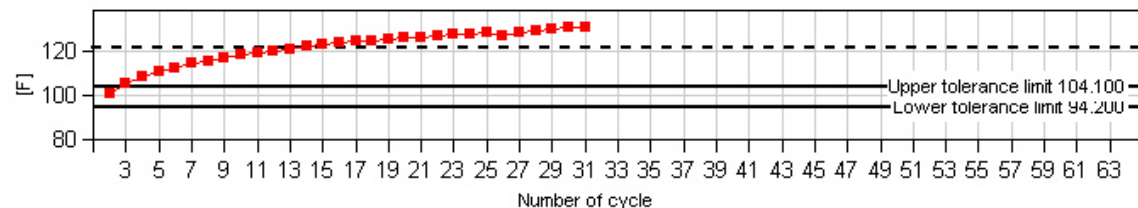
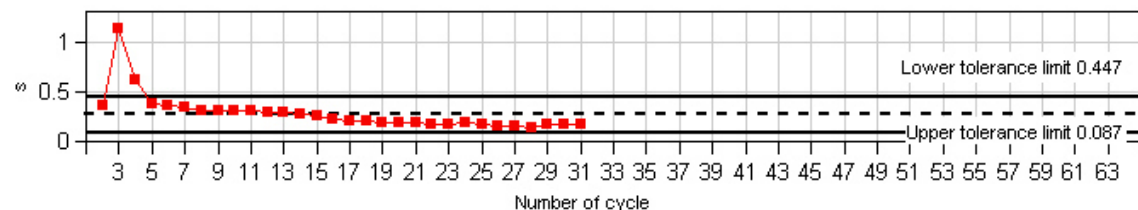


Chart of Time balance



The control charts clearly show that the process is still in the warming up phase which is not completed yet. Nevertheless PRIAMUS Fill was able to control the time difference of the average signals in the 8 cavities in only 30 cycles from 0.608 seconds down to 0.023 seconds. This comes up to a significant improvement and results in considerably more uniform conditions in production.

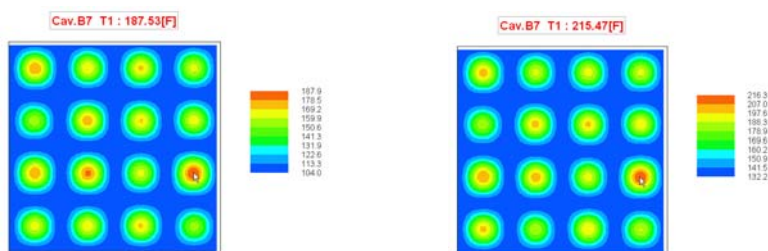


Fig. 7: The 2D-view shows that the maximum mold temperatures in the 8 cavities change clearly within 30 cycles (from appr. 187 °F to appr. 215 °F).

PRIAMUS SYSTEM TECHNOLOGIES AG
 Bahnhofstrasse 36
 CH-8201 Schaffhausen / Schweiz

PRIAMUS SYSTEM TECHNOLOGIES, LLC
 114 Barrington Town Square, #178
 Aurora, OH 44202 / USA

Tel. +41(0)52 632 2626
 Fax +41(0)52 632 2627
 www.priamus.com

Tel. +1 (330) 653 3813
 Fax +1 (330) 562 7535
 www.priamus.com