



Date: February 2009

To: Plastics Industry Leaders, Designers, Molders, and Tool Makers

Intellimold™ FEA/CAE Closes The Control Loop

For years the sensor industry has continued to develop better and smaller transducers for pressure and temperature. But due to restrictions within the molding system (*design, material, machine, mold, and men*), this technology did not make as big an impact on process control as everybody had expected. Whether it was conservative mind-sets or wrong business models at processors, machine builders, and mold makers, it became obvious even in the mid-90's, that this sensor technology would find limited use for advanced process control.

For more than 16 years Intellimold™ has been one of the leaders using melt pressure and temperature transducers for closed loop process control for injection molding. ([Why Intellimold and Where is the Novelty](#)) At the beginning of the 1990's, a significant technology improvement was developed and patented by Milko Gergov and his company. An algorithm was used to create what is called a "soft sensor" ([SST Soft Sensors Technology Option](#)) we call the "Internal Melt Pressure", or simply the IMP. This soft sensor output to the process controller was the computed internal melt pressure that resulted from the physical measurement of pressure and temperature at two locations – nozzle tip and last place to fill. This created the deepest feed back from the material to use in our closed loop controller for injection molding.

The outcome was the first real-time closed loop controller for ***molding from the materials point of view using a soft sensor as feed back in millisecond timeframe***. Until that time all controls were based on machine measurements using position of the screw and hydraulic pressure sensors or trying to match the process to an "optimized" curve template. With the Intellimold™ controller, it was the first time the processor was able to directly input the suggested materials melt temperature and melt pressure processing data to actually control injection instead of monitoring it.



Now, in 2009, in continuation of our soft sensors experience **Intellimold™** (<http://intellimold.com>) is introducing a **technology breakthrough**. In alliance with an FEA, mechanical design, simulation and optimization software supplier, we are introducing a continuation of this sensor and control technology, and a significant step forward for integration of part design, material flow, and process control. Results from FEA non-linear package are created by using loading curves (pressure and temperature values) from Intellimold’s data acquisition output files. Selected critical areas of the part (boss structure, snap-fit, hole circumference, etc.) are assigned as soft sensors, or virtual transducers, for pressure and temperature. Computed data are outputted from FEA’s run time module and converted into voltage signals to the Intellimold Controller for real-time process and cycle time optimization.

Video to demo at:

[Stress levels with Intellimold injection load profile](#)

[Stress levels with Conventional Injection load profile](#)

[Temperature soft sensors](#)

This technology will give **unprecedented** advantages to create a **software for part analysis-to-machine control** that integrates and simplifies product design, mold design and process development based upon a material supplier’s recommended pressure limits for fill, pack, hold, and optimized temperature ranges.

FEATURE	BENEFIT
• only one nozzle and one cavity transducer required	• lower tooling and maintenance costs
• unlimited placement and size of virtual sensors	• no tool or part design constraints (texture, water lines, part size, etc.)
• ability to place “sensor” at center of part thickness	• de-molding and cooling time optimization
• control process based on critical part geometry stress levels	• optimized part dimensions and internal stress levels

Our goal is to construct and simplify a robust analysis of molded part manufacturing, from part design to actual production, using real-time data. We feel that **this new integrated technology development** will offer a simplified and



robust method for producing quality molded plastic, MIM, CIM, foam, compression, LIM, or other melt filling processes.

Demonstrations and information may be obtained by contacting Milko at (734) 477-9344 x109 at MGV Enterprises in Ann Arbor, MI, or via email at mgergov@mgventerprises.com.