Injection-Molding Testing
using the WaveBook™

the smart approach to instrumentation™

Plastic injection molding machinery is capable of injecting plastic resin into a mold and applying heat and pressure to it to produce plastic components at a very high speed. Precise timing of all pressures and temperatures is an especially critical factor for this high-speed process. Until recently, one major manufacturer of plastic injection molding machinery could only identify incorrect pressures, temperatures, or timing issues during product development or field service. What's more, the instrumentation they used was bulky and awkward to move.

Application Summary

At various stages in the injection molding process, a plastics manufacturer ensures that its plastic injection molding machinery is maintaining specified setpoints for heat and pressure. In addition, the manufacturer verifies that all changes in heat and pressure happen at a precise rate to avoid damage to the component being produced. If heat and pressure setpoints are incorrect, the end result could be a component that lacks tensile strength and/or uniform color or texture. Therefore, when designing a plastic injection molding system, it is necessary to verify that each step in the molding process meets specific, pre-determined criteria. For example, the heat and pressure sources must maintain their respective parameters for the time required in the mold. All moving parts (e.g., injection pistons and material source valves) must operate precisely within a specific tolerance. If any of these parameters are outside the specifications, the quality of the end product is compromised.

Plastic injection molding machinery consists of many moving parts, most of which are repeatedly subjected to tremendous heat and pressure. As the equipment ages, the internal moving parts begin to wear, resulting in increased vibration and a lack of precision. The condition of the plastic injection molding machinery affects the quality of the product being produced.

Potential Solution

Until recently, the particular plastic injection molding machinery manufacturer in question helped its customers monitor timing and process problems via a digital storage oscilloscope (DSO) and a digital voltmeter. Although the manufacturer's field service personnel found the DSO adequate for the job, it was difficult to transport to field locations. In addition, many of the field service personnel found that locating the source of the machinery's problem was a time consuming, iterative process because of the slow speed at which the process variable changed. This slowness made it very difficult to compare timing changes on the DSO's scope.

IOtech's Solution

The manufacturer's field personnel selected IOtech's WaveBook as the replacement field-test system because of its ability to collect data from up to eight sensors in one system at one time, thus saving them time in locating defective parts. In comparision, the DSO could only collect data from one sensor at one time. Also, the PC-based WaveBook enables field service personnel to clearly
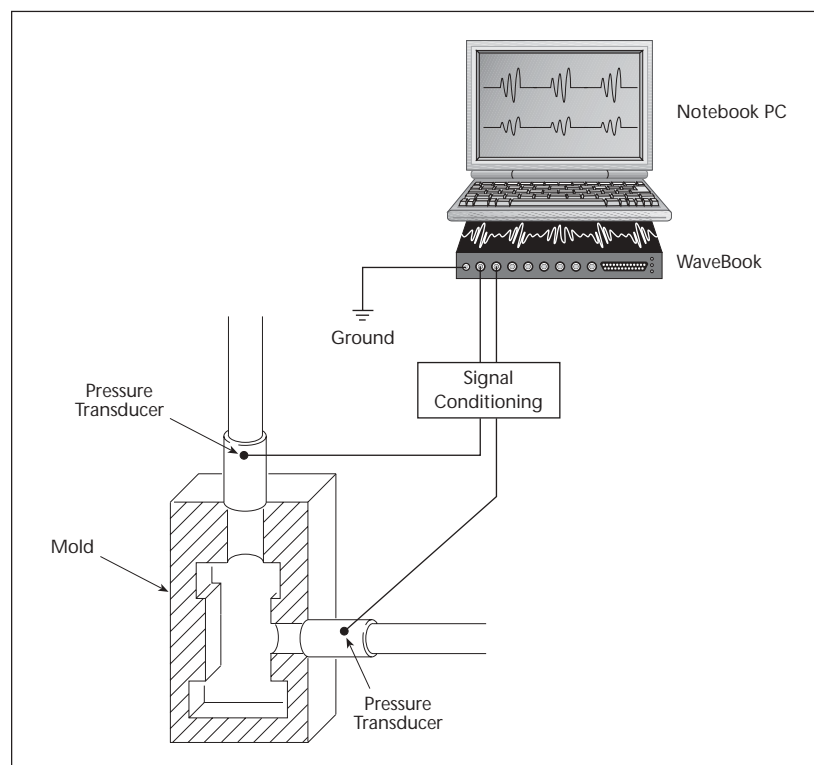

Field service set-up

display timing defects and easily compare them to the rise and fall of other process variables.

Field service personnel were also impressed by the WaveBook's ability to record files greater than 2M samples. The timing or process variable defect is sporadic. Given the DSO's limited memory depth, field service personnel were seldom able to capture an entire process cycle. This forced them to engage in multiple captures, making it difficult to correlate events. Because the WaveBook uses its host PC's memory and disk storage, field service personnel are now able to collect data samples at a rate greater than 200 kHz for the duration of a process cycle time. Capturing the entire cycle makes it easy to scroll through process cycles to identify problem areas.

Finally, field personnel were pleased with the WaveBook's form factor. This compact unit fits into a briefcase or piece of carry-on luggage, making it much easier and more affordable to transport than a digital storage oscilloscope (DSO).

WaveBook
(3 lbs)

Digital storage oscilloscope
(26 lbs base unit;
49 lbs with shipping crate)
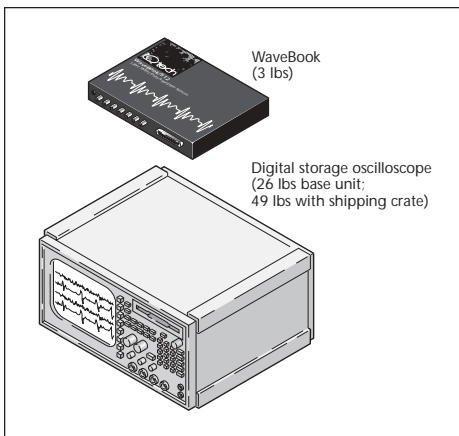
WaveBook/DSO comparison

Conclusion

The WaveBook simplifies testing and eliminates the need for costly, specialized instruments. Its high-speed data acquisition and 1-MHz streaming to RAM make it an ideal DSO replacement for plastic injection mold machinery test diagnostics.

WaveBook Series

The WaveBook™ series of portable and desktop digitizers offer multi-channel waveform acquisition and analysis for portable or laboratory applications. All WaveBook models include 8 built-in channels expandable up to 72 channels of voltage, accelerometer, microphone, strain gage, thermocouple, position encoder, frequency, high voltage, and other signal types. For applications beyond 72 channels, up to four WaveBooks can be combined within one measurement system, for a total capacity of 288 channels. WaveBooks are available with either an Ethernet or parallel connection to a PC.

Features

- PC connection via Ethernet, parallel, PC-Card, or PCI card
- 1 µs/channel scanning of any combination of channels
- Expandable up to 288 high-speed channels
- SYNC connection allows multiple units to measure synchronously
- Add up to 224 lower-speed thermocouple channels

- DSP-based design provides real-time digital calibration on all channels
- Single and multichannel analog triggering with programmable level and slope
- Digital TTL-level and pattern triggering
- Pulse trigger and external clock
- Programmable pre- and post-trigger sampling rates
- Sixteen 1-MHz digital inputs
- Operable from AC line, a 10 to 30 VDC source, such as a car battery, or optional compact rechargeable battery module
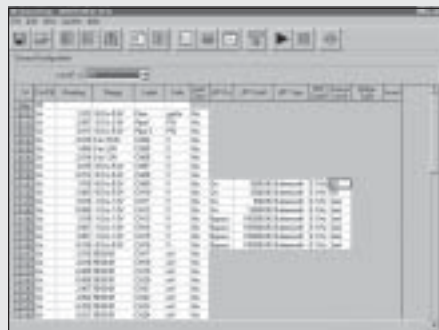
Using WaveView software's spreadsheet-style interface, you can easily set up your application and begin taking data within minutes of connecting your hardware, with no programming required.

Included Software

- WaveView™ for *Out-of-the-Box*™ setup, acquisition, and real-time display*:*
  - Scope mode for real-time waveform display
  - Logger mode for continuous streaming to disk
- eZ-Analyst™ for real-time spectrum analysis
- Export data in third-party formats
- Includes drivers for Visual Basic®, Delphi™, C++ for Windows®; DASYLab®, and LabVIEW®
- ActiveX/COM development tools

eZ-Analyst™, WaveBook™, WaveView™, and *Out-of-the-Box*™ are the property of IOtech; all other trademarks and tradenames are the property of their respective holders.