

# Non-Contact Fault Detecting On Cold Heading Machines

by:

Michael L. Wilhelm  
Vice President  
Helm Instrument Company, Inc.  
361 West Dussel Drive  
Maumee, OH 43537 USA

Achieving quality fasteners takes more than inspecting the pieces after they have been produced. Over the years we have seen an increased interest in techniques to monitor the process and stop the machines as soon as there is a deviation from the expected action.

Our latest development for in-process quality control is the TMG-1200 Monitor, **Figure 1**. This instrument detects, using a proximity sensor, the Front Dead Center (FDC) position of the ram on the machine. If an abnormal condition, such as a short or long misfeed; cracked or broken inserts, dies and punch assemblies; fractured or rotated transfer fingers; double hits or dropped slugs happens, it will cause this ram position to deviate on the very stroke. This will detect a fault whose output signal will cause the machine to shut down.

This concept very accurately measures the separation gap at the proximity sensor (within 0.001 mm or 0.0004") where a previous method was a load monitoring system.

That system put a transducer within the force footprint of each die, a time consuming installation practice. Our new system has the proximity sensor mounted on the frame and the sensor target mounted on the ram, **Figure 2**. This is a relatively simple installation. An abnormal condition that effects the FDC will produce a fault signal.

Because this instrument senses the separation gap with every stroke of the machine, (up to 1200 spm) it is able to also monitor the speed of the machine. It displays the value in real time. When the slowdown detection

Monitoring high-speed headers while running helps ensure quality parts by sending a fault signal to stop the machine when the variation of the ram position exceeds a preset range.



Fig. 1 — Helm TMG-1200 non contact fault monitor for all types of cold headers.

feature is set to the *ON* position, the unit will send a fault signal to the output when the rpm falls below a preset range.

Slowdown is a result of machine motor overload and represents a fault to be corrected. Slowdown protection can be set in incremental units of 1% in the range of -5% to -49%.

## Range of Applications

A single monitor has two output displays and can monitor in either a single or double mode configuration. The single mode is for single stroke, single

die machines. For this applications the screen display is limited to one channel only.

The double mode is for single stroke, double die machines (such machines that perform work with two punches acting in one stroke). In this case detection is made for two punches at the same time using one sensor without requiring external timing.

A multi-mode is for multiple slide or progressive headers. Detection is performed using two sensors. With one each installed at the left and right sides of the slide, fault detection is made based on the inclination of the slide. Applications of this technology also include boltmakers and nutformers.

## Monitoring Modes

To fully understand the simplicity, yet flexibility of this instrument it helps to review the ways in which the detected values are displayed.

The choices on the monitor display panel are either **Trend** or **Adaptive**. The device is capable of performing trend value detection and adaptive value detection. These detection modes are performed at the same time.

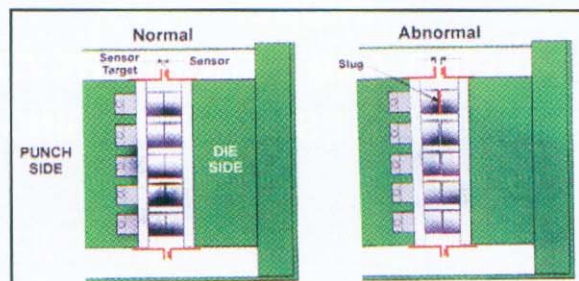


Fig. 2 — Frame mounted proximity sensors detect variations in ram position at front dead center.

**Trend Mode Alarming:** This type of alarming uses the benchmark method of setting upper and lower control monitoring limits, **Figure 3**. The user selects the desired monitoring limit between 10 and 500 microns (0.0004" and 0.020") These values become the reference against which all subsequent values taken during the production run are compared. In this mode, the monitoring range is



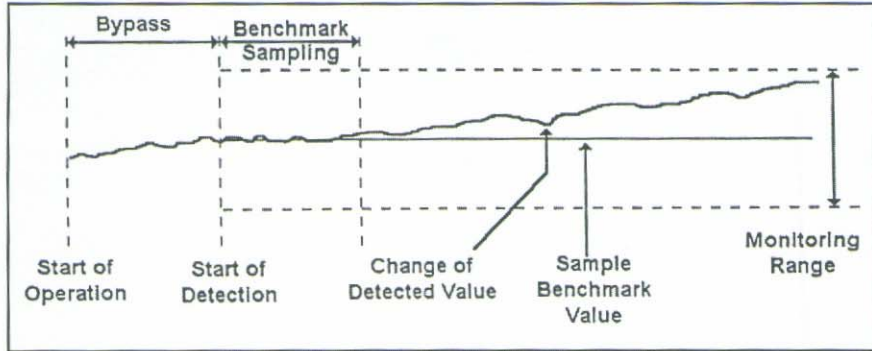


Fig. 3 — Trend mode alarming.

usually set wider than in the adaptive mode. This practice is to avoid nuisance alarms.

A fault condition carries the measurement to be outside the preset monitoring range. This alarming method reflects changes over time (loss of lubrication, machine heat up/cool down, changes in material hardness etc.) that can cause the measurements to go outside the limits. This will cause the machine to be shut down.

The display bar on the TMG system indicates the amount the detected value has deviated from the reference value.

**Adaptive Mode Alarming:** Here the concept is to compare the current sensor to target displacement with a predetermined number of strokes of the machine, **Figure 4**. This has been termed the stroke to stroke "rolling average" method of control where the alarming is based on a calculated average of the previous strokes.

Monitoring limits for adaptive mode alarming are selectable from 1 to 99 microns (0.00004" to 0.004").

Adaptive value detection is charac-

terized as the alarming method that ignores slow changes in the process while recognizing sudden changes, such as punch abnormality, short sizes etc.

Machine stop is initiated as soon as these sudden faults are detected.

### Counting

Just as the detection of each stroke enabled the measurement of the speed of the machine, that feature can also be utilized to provide counting of the production runs. Three counter displays show on the face of the monitor.

**Preset** shows the setpoint of the 8-digit preset counter that determines the length of the current run.

**Parts counter** shows how many parts have been made so far in the current run.

**Batch counter** is a 3-digit unit that counts the number of times that the preset counter has counted up.

### Conclusion

Monitoring cold heading type machines has been made simpler with an instrument that is simple to install and to use. This protects the tooling and the

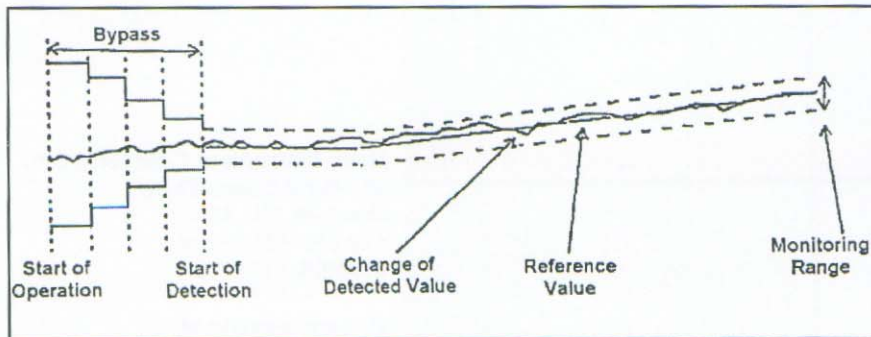


Fig. 4 — Adaptive mode alarming.

machine and makes fewer rejected parts.

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### Summary of Features

- Detects separation gap within 0.00004" (0.001 mm) at speeds up to 1200 spm.
- Three detection modes in one standard system — no extra modules or sensors are required for different machine types.
- Adaptive learn and Trend analysis operating modes — each with high and low alarm function.
- Bar graph display shows positive or negative deviation between sensor and target.
- Alarm limits are automatically adjusted. No complicated programming required.
- High and low deviation setpoints are displayed at all times.
- Includes three separate parts counters: preset, batch and actual.
- Built-in alarm detects decrease in rpm for early indication of problems with machine motor.

### Automatic Quality Control

- Short and long misfeeds.
- Cracked or broken inserts, dies and punch assemblies.
- Fractured or rotated transfer fingers.
- Double hits and dropped slugs.
- Increase in machine motor load.

### Company Profile...

Founded in 1962 by **Donald F. Wilhelm, Helm Instrument Co., Inc.** is a leading designer and manufacturer of process control systems, force transducers and software for the metalworking industries. In addition to monitors for cold header type machines the company offers load cells and transducers, force modules for PLC integration, machine controls and automation systems, safety lights for personnel protection and signature analysis and production data reporting software.