

Parting Shots

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High Tech/Low Tech, Low cost measurements that pay big dividends!

I often encounter the attitude that goes something like this, "I can't afford those high tech instruments for my operation".

The opposite is true. If you think the price of instrumentation is high, consider the cost of scrap and inefficiency.

Instrument #1: Feeler gage. That's right, a feeler gage! Following are some of the critical items that can be checked with a feeler gage.

1. Toggle pin to bushing clearance. Using the feeler gage, you can measure the clearance between the pins and bushings. You can also identify excess bushing wear or egg shaping.
2. Cross head or guide bushing clearance.
 - Excess wear in the cross head will cause closing cylinder rod bushing wear and seal failure. In extreme cases, this will result in broken cylinder rods.
3. Rod to bushing clearance on the closing and shot cylinders.
4. Support Shoe clearance. There should be no clearance either in the locked or open positions. If excess clearance is found, adjust them. This will also identify non-uniform wear in the support plates. Unsupported platens cause premature wear of the die leader pins/guide pins, slides, tapered shut-offs and tie bar bushings.
5. Platen flatness:
 - Measure coining that occurs from dies that wear pockets into the platens. Use a straight edge and the feeler gage to check for excess wear. Correction could include welding and grind flat using a hand grinder or portable mill-

ing. Remember you're trying to maintain a shut off between two steel surfaces of .001 inch (.0254 mm)

Benefits include:

- Identification of causes of excessive flash
 - Identify source of hydraulic fluid loss
- Making needed repairs and adjustments

result in the following:

- Improved reliability of die shut-off
- Reduced die wear
- Reduce locking force to achieve an efficient shut-off
- Reduced porosity
- Reduced melt loss

Instrument #2: Hydraulic pressure gage.

1. Check the pressure developed by the pumps. Are they consistent? Do they unload at the proper time? Do they drop excessively during closing or shot sequences?
2. Does the accumulator pressure drop excessively during high usage sequences like shot and die close? If so, this may indicate the need to charge the accumulator. If the accumulator is a piston accumulator, this can indicate leaking seals.

Benefits of correcting include:

- Reduced cycle time
- Improved repeatability
- Higher quality castings
- Improved yield
- Reduced nitrogen usage
- Lower energy costs

Instrument #3: Tie bar strain gage. OK, this one will cost more and you won't find one in every maintenance person's tool box, but read on. *It is recommended that you purchase one for each tie bar so you can observe all four tie bars at once.*

1. Measure the tie bar balance. (This measurement should be taken using a squaring block or a reliable die that

is mounted in the center of the platen/die space.) The readout is the amount of stretch in each tie bar and is translated into tons of locking force developed at each tie bar.

- a. Do they repeat?
- b. Are they balanced?
- c. Do they reach the manufacture's specifications? Often I have observed machines locking at 45 to 50% of the original specifications.
 - i. Reasons for loss of lock up include:
 1. Blow-by in the locking cylinder
 2. Regenerative valve or circuit malfunctioning
 3. Inadequate hydraulic pressure
 4. Machine so grossly imbalanced that it binds
 5. Linkage defective
 6. Tie bars adjusted improperly
 7. Broken tie bar
 8. Machine locks past center
 9. Machine doesn't reach full forward stroke (Lost mechanical advantage)

2. Strain gages can identify serious machine wear, hydraulic valve problems, improper limit switch settings,

Benefits include:

- Reduced flash
- Improved yield
- Reduced melt loss

See free offer at the end of this article.

Instrument #4: Shot monitor

Most shops have one of these around. Not everyone uses them to the fullest advantage.

1. Measure the maximum fast shot capability

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- a. This is the basic information for developing PQ² capability
 - b. Test should be performed with a properly charged accumulator
 - c. Results should be fairly consistent from year after year
 - d. Acceleration to maximum velocity should begin immediately when actuated and reach full velocity within .5 to 1.5 inches depending on the maximum speed.
 - i. Slow acceleration can be the result of faulty directional or Pilot operated check valves.
 - e. Maximum velocity should be adequate for the product line of castings you produce. The machine tonnage is no indication of a required fast shot velocity. I have observed 2,500 ton machines making castings at over 200 IPS (5.08 meters/second). I have also observed 400 ton machines that could only reach 80 IPS (2.03 meters/second).
2. Measure the maximum slow shot capability
 - a. Maximum capability should be in excess of 30 IPS (.76 meters/second). 50 IPS (1.27 meters/second) would be a target.
 - b. This will also identify faulty valve performance
 3. Intensifier attributes
 - a. Maximum pressure
 - b. Rise time from the end of stroke until 95% of the intensifier pressure is reached. This is measured in milliseconds and should begin immediately. A delay of 60 milliseconds before starting can result in micro porosity.
 - c. Hold time for the intensified pressure. Pressure should maintain for at least 10 to 15 seconds. Pressure that drops off quickly indicates blow-by and wear in the shot system.
 4. Other hydraulic performance checks you can perform using a shot monitor system:
 - a. Connect the transducer(s) to other points in the hydraulic circuit to troubleshoot valve performance and timing. Symptoms would include pressure drops or lack of pressure at test points.
 - b. Examples include:
 - i. Pilot Operated check valves (accumulator check)
 - ii. Directional valves
 - iii. Pressure relief valves
 - iv. Pressure reducing valves
 - v. Accumulator performance
 - vi. Pump response
 5. Capability and repeatability studies:
 - a. By connecting a shot monitor to trigger automatically, you can perform capability studies. This has been proven to identify sporadic problems that created seemingly random scrap. We have observed anomalies that only occurred once or twice in 3 shifts. These could only be documented by 24 hour monitoring.

While this list is by no means exhaustive, it does list many of the critical items often missed when we are asked to improve quality and productivity.

For a free customized tie bar strain gage spreadsheet contact: Bob McClintic at RMcClintic@DrDieCast.com. **dcm**