Borrowing technology from the shot peening industry, the blast cleaning of parts (casting, forgings, etc.) is deriving benefits from the Almen Test Strip. Historically, the cleaning process has suffered from “If it’s not broke, don’t fix it!” type of attitude. Quality control in blast cleaning often consists of subjective observation of the appearance of cleaned parts.

As in any process, blast cleaning is influenced by several important factors. If any of these factors change then the result is likely to change. The changes may not be detectable to the operator observer.

Factors that may affect the blast cleaning process may include the following:

1. Condition of part prior to cleaning
2. Attitude of part or blast spray (angle/distance)
3. Effective blast exposure time
4. Condition of shot/grit (size, hardness, contamination)
5. Shot/grit flow rate
6. Wheel speed
7. Wheel blade or control cage condition
8. Movement of part through blast spray (conveyor speed)

Monitoring and controlling each of these factors can help maintain the process. Additionally, by use of the Almen strip, the cumulative effect of all of these factors can be monitored with a simple test.
Developed for the shot peening process, the Almen strip was devised as a control test to determine the effect, or intensity, of the blast spray. Such factors as exposure time, shot size, shot hardness, impact angle, impact velocity, etc., all contribute to the intensity of the blast stream and affect the peening benefit. A small steel strip is exposed on one side to the blast. That side is indented due to the multiple impacts of shot and therefore stretches. When released from its holding fixture, the strip will bend. Measuring this curvature, or arc height, is therefore a measure of all of the process factors listed above.

The blast cleaning machine can benefit from this technique by periodically measuring the blast spray intensity. One or more Almen test strips are tightly clamped to flat Almen blocks that are attached to a dummy part. The dummy part is then exposed to the blast spray and the strips are removed and measured. By keeping a record or, better yet, plotting a statistical control chart (SPC), the process can be observed over a time period. Inconsistent Almen strip readings will quickly alert the operator to a changed, or “out of control” process and corrective action can be taken.

- Mount Almen strip onto special Almen holder
- Mount Almen holder onto dummy part
- Pass dummy part through blast cleaning machine
- Remove Almen Strip and measure its curvature
- Record curvature and compare to “Allowable Value”
- Repeat as required (once per shift?)

Ideally the Almen strip curvatures will be “identical” for each test. However, as the wheel blades wear, or someone substitutes a different hardness shot/grit or some other factor will cause the intensity of the blast stream, and therefore the Almen strip curvature, to change. This process is quite similar to taking your body temperature every day. Each day the reading should be “identical” to the previous. If it should go up or down then you know that something has changed and needs attention. The same practice applies to the blast cleaning machine.

Note: Once you acquire an Almen gage, be sure your operators are trained in its usage and can perform consistent strip readings. A simple test for operators, called an Almen gage Repeatability and Reproducibility Test (Gage R&R), can be performed in approximately 30 minutes. For a copy of “How to Perform an Almen Gage R&R, circle Bingo No. 3.

Typical factors to check are the following:
1. Shot/grit
   A. Size
   B. Shape
   C. Hardness
   D. Contamination (rust, oil, dust, sand)
   E. Quantity (hopper could be empty)
2. Targeting
   A. Wheel spray pattern
   B. Part placement
3. Exposure Time
   A. Conveyor speed
   B. Spinner hanger rotation
   C. Cycle timer setting
4. Flow rate
   A. Ammeter reading calibration
   B. Flow rate catch and weigh test
   C. Valve could be stuck or clogged
5. Wheel speed
   A. Belts slipping
   B. Tachometer reading (calibration)

Although many people think that the blast cleaning process cannot be quantified and therefore should be excluded from an SPC program, this just isn’t true. The Almen strip can provide a process measure. “If you can measure the process, then you can control the process.”

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Abrasive Blast Cleaning News 3 Winter, 1996