Blast Cleaning Process Improvements

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 differed from "If it's not broke, don't fix it!" type of attitude. Quality Control consisted 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 affect the 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 condition.
8. Movement of part through blast spray.

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 contributed to the intensity. A small steel strip is exposed to the blast on one side. That side is dented 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, the process can be observed over a time period. Inconsistent Almen strip reading will quickly alert the operator to a changed, or "out of control", process and corrective action can be taken.

Typical factors to check are the following:

1. Shot
   a. size
   b. shape
   c. hardness
   d. contamination (rust, oil, dust, sand)
2. Targeting
   a. wheel alignment (control cage, etc.)
   b. part placement
3. Exposure time
   a. conveyor speed
   b. spinner hanger rotation (blast spray may stop rotation if belts slip, etc.)
   c. cycle timer setting
4. Flow rate
   a. ammeter reading (may not be reliable due to calibration or wheel blade wear or mixture of sand, etc.)
   b. catch test
   c. shot flow meter
5. Wheel speed (belts slipping)

Although many people may think that the blast cleaning process cannot be quantified and therefore included into 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."