Reduce Your Cost of Blast Cleaning

Would you like to: Reduce your media costs? Extend your blade life? Provide SPC data to your ISO 9000 Program?

by Jack Champaigne

What if you could reduce your blast cleaning media costs by 10% (or more)? What if you could extend your blade life by a factor of two (or more)? What if you could monitor your blast cleaning performance in a SPC format that will detect abnormal conditions and avoid the chaos of unscheduled downtime? What if you could do all of the above for very little cost and time?

It's definitely possible.

One way of reducing your media consumption is to reduce the media flow rate. You may have been told to run “full motor amps” to get the most work out of the media. And, that is a true statement, it will get the most work out of your media. Unfortunately some of the “full work” of the media is only eating up your machine and not doing any beneficial cleaning of your parts. If you flood the surface of your parts with media you might not be getting effective cleaning.

You should reduce the media flow rate to the lowest possible value that doesn’t sacrifice the cleaning effectiveness that you need. Once you have determined this value (usually based upon motor amps) you should strive to maintain that setting. The table below shows typical motor amps for different horsepower motors. If you can reduce your “Working Amps” (Ammeter reading - No Load Amps = Working Amps) by 10% you are throwing 10% less shot and you automatically cut your media costs by 10%. Some blast cleaning operations need different flow rates; light cleaning for some parts and heavy cleaning for others. Again, you should determine the minimum amount of media for each blast cleaning condition. Throwing media is the same as throwing money, don’t throw more than you absolutely need.

<table>
<thead>
<tr>
<th>HP</th>
<th>No Load Amps*</th>
<th>Working Amps</th>
<th>Full Load Amps</th>
<th>New Load Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>4</td>
<td>10</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>25</td>
<td>9</td>
<td>25</td>
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<tr>
<td>50</td>
<td>1</td>
<td>53</td>
<td>65</td>
<td>59.7</td>
</tr>
<tr>
<td>75</td>
<td>1</td>
<td>81</td>
<td>96</td>
<td>87.9</td>
</tr>
</tbody>
</table>

*No load amps is example only and may not apply to your machine.

The most important factor in extending blade life is to keep the sand out of your media. Blades that could be expected to last over 800 hours will last less than 20 hours with just 4% sand left in the media. Analyze your media at least twice per shift and you’ll extend your blade life immediately. Sand is a killer, try to keep it under 0.5% of your media mix.

Is there any SPC format that will allow you to monitor the blast cleaning process? There sure is.

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And, it is simple to use and not very expensive. Some people start their SPC program by keeping a record of motor Amps, and this is a good beginning. However, this won’t tell you if the wheel targeting or hot spot pattern is correct. It also won’t detect problems with the media such as poor working mix. Another media problem that can occur is substitution of another hardness or different size of media, which can greatly affect your cleaning. A far better method of SPC control is to use a special test coupon that is blasted once during every shift. This blasted coupon reacts to all of the above conditions and will exhibit a slight curvature. This curvature is measured and recorded onto a SPC chart.

All of the following will affect the curvature of the test coupon:

- Targeting (hot spot location)
- Control cage wear
- Impeller wear
- Blade wear
- Media quality
- Wrong working mix
- Wrong hardness of shot
- Wrong size of shot
- Cleaning rate
- Exposure time incorrect
- Media flow rate (motor amps) incorrect

It isn’t practical to constantly monitor each of the above items. However, you can use a special test coupon twice a day and you will see any change very quickly. This coupon, called an Almen strip, is the answer to your prayers.

Developed for the shot peening process, the Almen strip was devised as a control test to determine the effect, or intensity, of the blast stream. A small steel strip, the Almen strip, is exposed on one of its sides to the blast stream. Such factors as exposure time, shot size, hardness and velocity all contribute to the dimpling of the surface and therefore curvature of the Almen strip. The side that is dimpled by the shot due to multiple impacts will tend to stretch. When the strip is removed from its holder it will curve. Measuring this curvature, or arc height, is therefore a measure of all of the factors listed above.

The blast cleaning process can benefit from this technology by periodically measuring the blast stream intensity. One or more Almen strips are tightly clamped to flat blocks that are attached to a dummy part. The dummy part is then run through the blast cleaning machine where it is exposed to the blast stream. The strip is then removed from its holder and placed onto an Almen gage to measure the resultant curvature. By keeping a record or plotting an SPC chart (statistical process control chart) the process can be observed over a period of time. Inconsistent Almen strip readings will quickly alert the operator to a changed or “out of control” process and corrective action can be taken.

- Mount the Almen strip onto the special holder
- Mount the Almen holder and strip onto a dummy part
- Pass the dummy part through the blast cleaning machine
- Remove the Almen strip from the holder
- Measure the curvature “arc height” of the strip
- Record the value or plot the data onto the SPC chart
- Repeat on a periodic basis (daily)

Ideally the Almen strip readings will be “identical” day after day. However, as wheel parts (blades, control cages, impellers) wear, the hot spot pattern may shift and the Almen reading will change. Other factors, such as substitution of shot size or hardness, or conveyor speed, will also cause the Almen strip readings to change.

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The nice part of the technique is that almost anything important that changes will be detected by the Almen strip readings. This testing procedure is quite similar to taking your body temperature on a daily basis. Each day's temperature reading should be close to the previous. If your temperature should go up or down by more than one degree then you know that something is wrong and you should investigate the special cause.

Note: once you acquire an Almen gage, be sure your operators are trained in its usage and can perform consistently accurate readings. A simple test for operators, called an Almen gage Repeatability and Reproducibility Test (Gage R&R), can be performed in approximately 30 minutes and should be done at least once a year by each operator. For a free copy of “How to perform an Almen Gage R&R” contact Electronics Inc.

If the Almen SPC readings go out of control then you should check the following:

1. Shot/grit
   - Working mix
   - Hardness
   - Contamination
   - Availability (hopper clogged or empty)
2. Targeting
   - Wheel Hot Spot Pattern shift
   - Part Placement
3. Blast Exposure Time
   - Conveyor Speed
   - Cycle Timer Setting
4. Motor Amps
   - Ammeter Calibration
   - Media Flow Rate
5. Wheel Speed
   - Speed Setting

Although many people may think that the blast cleaning process cannot be quantified and therefore should be excluded from the SPC program, this just isn’t true. The Almen strip can provide a tool for your ISO 9000 quality program and SPC program.

Attention: OEM’s and Government Agencies

The new media sensor from Electronics Inc. (EI) is available for evaluation by OEM’s and government agencies. This abrasive blasting flow sensor has an important advantage: The sensor is placed in the system at the nozzle where flow is most critical. The sensor detects density of media as it is discharged from the nozzle and this signal is then scaled to show the flow condition on the bar graph display of the Model MDS-1 shot flow monitor from Electronics Inc. For more information please call EI at (219) 256-5001 or 1-800-832-5653.

Above: The media sensor with nozzle
Left: The media sensor

Aphorisms For Our Time

- If at first you don’t succeed, skydiving is not for you.
- Money can’t buy happiness. But it sure makes misery easier to live with.
- Nothing in the known universe travels faster than a bad check.
- Vital papers will demonstrate their vitality by moving from where you left them to where you can’t find them.
- Always remember to pillage BEFORE you burn.
- If you are given an open-book exam, you will forget your book.
  (COROLLARY: If you are given a take-home test, you will forget where you live.)
- The trouble with doing something right the first time is that nobody appreciates how difficult it was.
- It may be that your sole purpose in life is simply to serve as a warning to others.
- Paul’s Law: You can’t fall off the floor.
- If at first you don’t succeed, destroy all evidence that you even tried.
- For every action, there is an equal and opposite criticism.
- Success always occurs in private, and failure in full view.
- To steal ideas from one person is plagiarism; to steal from many is research.

This Almen strip, photographed at a shot peening facility in South Bend, Indiana, has been mounted with four hold-down screws onto a standard Almen holder that has been welded into place on a pipe.