A SUBSCRIBER CALLS

1990161

We received a call from a subscriber explaining he was only achieving a 6A intensity in a suction blast machine that previously provided 9A intensity. We discussed: nozzle condition (he'd already replaced nozzles), hose quality (looked clean and smooth), air pressure (boosted from 90 PSI to 95 PSI), shot quality (he'd dumped shot and replenished with new shot), Almen strips (flatness and hardness okay), Almen gage (zero and span okay—balls and stem were round), dust collector (was okay, plus new shot wouldn't be dusty) and part condition (hardness was within range).

We then discussed method used for peening intensity measurement. The machine cycle consisted of a nozzle motion up one stroke and down one stroke for a fixed time interval. Variation of peening exposure times was incremental in 2-minute intervals. A graph of Almen strip arc heights for 6 cycles is shown in Figure 1. The abrupt change in arc height deflection led to another question: "What size of shot is being used?" It was a mixture of 75% of S110 and 25% of S170 regular hardness shot. Therein lay the answer.

Figure 2 shows what is happening with two sizes of shot. The lower curve is the S110 development. Naturally, the S170 curve is a higher intensity, but it is time-skewed for two reasons. First, if you were to properly present Figure 2, you would need to use S110 shot at 75% of the original flow rate to duplicate the number of S110 impacts per minute. Then a second presentation of S170 shot adusted to a 25% flow rate would be graphed. The trial of S170 would achieve a higher intensity, but at a much longer time period. From Figure 2, we can see that between three and four cycles are needed before enough S170 particles strike the Almen strip to increase its arc height above the S110 level.

Remember, effective peening is achieved when the largest and hardest particles, traveling at the highest velocity, strike the target at the greatest angle.

Furthermore, since peening saturation is (usually) coincident with surface coverage, you must consider how much longer it requires for larger shot to achieve coverage. There are approximately 1,700,000 shots per pound of S110 shot and only 520,000 shots per pound of S170 shot. Therefore, at a constant flow rate (lbs/min), it will require an exposure time of 3.3 times as long to achieve equal coverage.

It is unusual to peen with a shot "mix" for various reasons. Since only the larger shot is doing effective peening, the use of the smaller shot is really a waste of time. Also, it is unlikely that size control equipment (screens) are used to remove broken shot, since two sizes are involved. CAUTION: Broken shot can cause notches (read stress risers) and lead to premature failure.

It is not clear why an operating mix was being used in this application, but it is obvious that the mix ratio was not controlled and this is what contributed to peening intensity measurements that were not consistent.

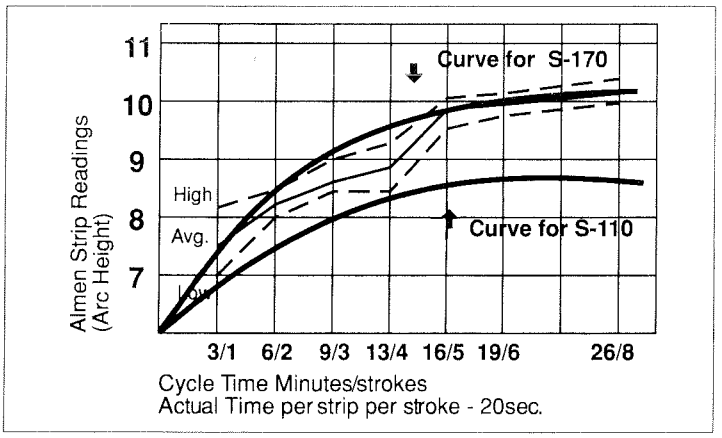

Figure 1

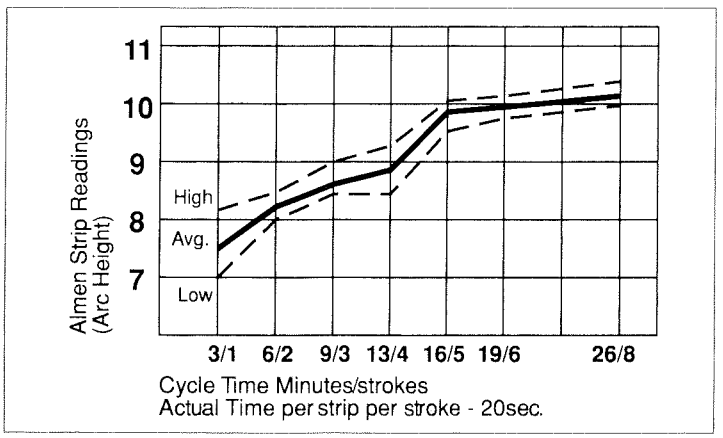

Figure 2