

Peening Gears to Customer Specs with Less Air, Equipment and Labor

By Robert B. Heaton

Key cost factors in peening normally involve capital equipment, air consumption, labor, maintenance and rework if parts fail to meet specifications. Any producer of a peening system has to consider these factors, at a minimum, in developing an efficient equipment proposal. Adequate testing facilities, in conjunction with coordinated engineering and manufacturing support, play an essential role in the process.

Consider one of Empire's recent jobs. As part of a high-volume heat-treating cell to produce transmission gears, our customer needed an automatic peening system to initially produce between 100 to 140 parts per hour. Later, the system would have to ramp up to twice the output when the cell reached full capacity. The gears, consisting of case-hardened steel, required a relatively high intensity (18 to 24 A) with 125 percent coverage. Most of the gears measured 5" in diameter by 2.5" in depth. However, others ranged from a minimum of 4.5" in diameter to a maximum of 5.75". Due to the potential of short production runs, the customer wanted a relatively quick part change over of not more than three minutes – including fixtures.

After reviewing the customer's system proposal that suggested separate machines based on two, six-station indexing turntables with four 5/16" nozzles each, we took a different approach. Our proposal not only reduced equipment costs, it also uncovered ways to conserve air, reduce labor and improve quality.

To cut capital equipment costs, we recommended replacing the two machines with a single, more robust system capable of handling immediate and future production requirements. Based around a twelve-station indexing turntable, this Empire system is equipped with a bucket elevator that lifts over 24 pounds of shot per minute to a vibratory classifier, which properly sizes the shot, and then to a pressure vessel.

To maintain non-stop production, we included a continuous-refill, dual-chamber blast system with devices to monitor shot levels in both chambers and automatically initiate refills, freeing the operator for other assignments. Closed-loop controls make it all work smoothly. Bottom line: The Empire approach cost 35% less than the system originally proposed in terms of capital investment



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while conserving a considerable amount of valuable floor space.

Our test lab found another way to lower operating costs. Reduce air usage. At 80 psi, the eight 5/16" nozzles (four each on two machines) initially proposed would have required in excess of 900 cubic feet of air per minute (cfm). Tests at Empire showed that eight 1/4" nozzles, requiring only 544 cfm at 80 psi, were more than adequate for the job at hand, netting an overall air savings (including blow-off) exceeding 25%.

Normally, labor costs associated with repositioning nozzles and replacing fixtures for size changes can be prohibitive. Consequently, our system includes process-parameter-memory capability through a programmable controller. The controller interfaces with a two-axis nozzle positioner to minimize setup times. Once stored, these instructions can be recalled with push-but-

ton ease through the operator's keypad. When the operator enters the appropriate processing number, the nozzles reposition and blast pressure automatically adjusts to maintain the prescribed relationships for on-spec peening.

The only remaining setup involves switching the quick-change fixtures with masking, a step requiring fewer than three minutes before production starts again. Closed-loop controls, including MagnaValve® equipment, monitor air pressure, part movement, nozzle movement and shot-flow rates. These features not only prevent off-spec peening, which results in less rework, the sensors also indicate the appropriate

fault to aid the operator or maintenance personnel in servicing the system and preventing repeated errors, thus reducing system down time.

Empire's methods guided the customer to big savings by lowering capital costs, conserving air, reducing labor requirements and improving quality.

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Empire's automatic peening system cuts capital costs, conserves air, and simplifies parts setup for a manufacturer of transmission gears.

