Lab Demonstrates Blast-Equipment Solutions and Familiarizes Users with Current Technology

Increasing competition within manufacturing arenas underscores the importance of finding and harnessing opportunities to improve quality and reduce costs. Surprisingly, advances in metal finishing, even within mature technologies such as air blasting, remain untapped, usually because of limited R&D funding, inadequate physical resources or the "it works, don't fix it" philosophy. As a consequence, test blasting not only plays a pivotal role in proving new or unique finishing processes, it also uncovers more efficient approaches for tackling traditional jobs.

Empire Abrasive Equipment Company, a longtime provider of test blasting services and a major manufacturer of air-blast machines since the 1940s, completed its first formal test laboratory and demonstration room in 1987. (Previously, the company conducted test blasting in a designated area on the shop floor.) Last year, this 23,000 cubic-foot room underwent an extensive renovation including updated air-blast equipment supported by improved ventilation and sound attenuation systems. (Figure 1)

(Fig. 1) Empire's laboratory and demonstration facility (partial view shown) includes a variety of finishing systems for testing and educational purposes. The facility now supports eight fully functional systems.

Today's lab/demo room, tucked within Empire's Langhorne-PA headquarters, plays multiple roles. First, it serves as a testing center and proving ground for both new and improved finishing processes. Next, it provides a hands-on experience for educating distributors and customers of Empire products as well as new company hires. Finally, it gives current and prospective customers a broad sampling of the state-of-the-art equipment in air-blast technology. The room contains 15 pieces of equipment ranging from portable blasters to a robotic blast system and includes two centrifugal disc machines. Eight systems stand ready for action, supported by tools for analyzing surface results and measuring media quality to ensure sound science.

The room's first function, test blasting, unfolds in a number of ways. It starts when customers supply sample parts along with a finishing specification that normally lists the size and type of blast media to be used. Specifications range from straightforward (white metal clean, for example) to complex. Once preliminary tests establish that blasting can produce the desired results, a dialogue begins with the customer to sort out all the essentials necessary for a quote. In some cases, a standard blast cabinet or one with some automated features such as a nozzle oscillator and powered turntable provides the solution. Most applications, however, present bigger challenges, which bring the experience and resourcefulness of Empire's engineering team into play.

(Fig. 2) Robert Heaton, product support manager (right) and Dan Herbert, product manager, put a piece of custom equipment through its paces prior to shipping. Test blasting demonstrated the ability of this single system to process a long list of customer parts to spec and on budget.

Robert Heaton (Fig 2), who has handled testing for over 20 years during his 36-year career in the air-blast industry, points out that some solutions found in the lab can represent quantum leaps forward. One example involved a firm using 16 oscillating suction blast guns, loaded with aluminum oxide, to clean new aircraft castings within a blast cabinet in batches

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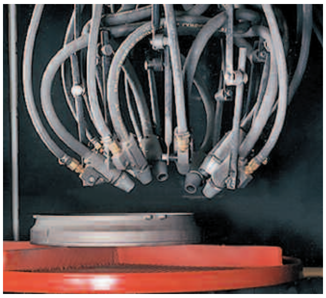
of 5 to 10 work pieces per cycle. Mr. Heaton reported that each cycle in the customer's existing system consumed up to three hours, mainly because the oscillating guns spent much of their time retracing the striped pattern they had left on previous passes. "When the customer saw our rotary head (Fig. 3) do the same job in fewer than 10 minutes per side, with no striping, they were amazed with the rotary head's performance," he said.



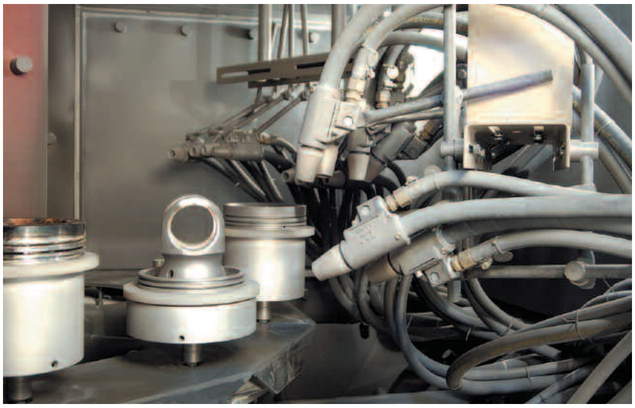
(Fig. 3) Rotary blast heads provide broad coverage while conserving compressed air. Available with up to nine guns, these rotating heads improve efficiency in many in-line, turntable and batch air-blast systems.

Another customer, involved with peening turbine blades, got a similar wakeup call. The company was using six 3/8" pressure nozzles, operating between 60 and 80 psi, to achieve specified intensity on the root sections of small turbine blades. Using an accepted Almen Sub-Strip Arc Height evaluation procedure, the Empire lab demonstrated that the same job could be performed at a mere 14 to 20 psi using only four 1/4" pressure nozzles, leading to an order for a 36", 12-station, indexing turntable machine. Put simply, the previous system spent most its time and energy missing its targets. In both these cases, lab work uncovered glaring opportunities to conserve compressed air and reduce wear on equipment.

Lab work finds smaller opportunities too, as demonstrated in the rebuilding of truck-engine pistons. Here, a company familiar with air-blast technology was using bicarbonate of soda in a pressure-blast system to clean pistons prior to rebuilding. While bicarbonate works gently, it also works slowly and recycles poorly. To boost efficiency, the company converted its existing system to glass beads—a more aggressive, reusable abrasive—and added recycling equipment. Unfortunately, this tougher approach underestimated the individuality of used pistons; trying to clean the dirtiest and cleanest (Fig. 4) in a single pass proved counter productive because of excessive part damage.

(Fig. 4) Lab work and number crunching found improved tactics for cleaning pistons. Less pressure and more expensive media reduced per-unit costs by 30%.

Some hard number crunching and dedicated lab time showed that complete cleaning of only 95% of the pistons in a single pass, accompanied by a switch from glass beads to more expensive ceramic media, reduced per-unit costs by over 30% with the proper equipment (Fig. 5). Rework on the dirtiest pistons (5%) proved more economical than increasing the rate of damage to the other 95%. In addition, the ceramic media produced few, if any, of the sharp-edged fragments that contributed to substrate damage when glass beads were recycled.



(Fig. 5) Blast system coordinates movements of 16 blast guns, oscillating vertically and horizontally, with spinning stations on a rotating platform. Eight guns oscillating vertically clean the sides and skirts of pistons. Guns sweeping horizontally clean tops and interiors.

Beyond advancing the science of air blasting, Empire's laboratory and demonstration room offers visitors hands-on experience. For example, a central test cabinet, piped to deliver either suction- or pressure-blasting, gives customers a flat playing field for comparing the two approaches. Other machines demonstrate numerous paths to automated blasting, starting with timers and stroke counters and moving up to programmable and robotic controls. To help finishers evaluate current technology, eight distinct systems—including baskets blasters, manual cabinets, rotary head systems, cell machines and robotic systems—are available for test drives (Fig. 6). Empire provides a quick 360° spin of its laboratory and demonstration facility at www.empire-airblast.com. ●

(Fig. 6) Teach pendant provides a fast, flexible means for programming robotic blast machines. Visitors to Empire's test laboratory and demonstration room are encouraged to give it a try.