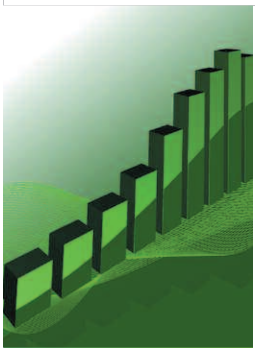

Greener Blasting Pays Dividends

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A leading manufacturer of metal products wanted to improve the efficiency of its air-blasting operations in an effort to shrink its environmental footprint and save some green in the process.

Before Empire became involved, six pressure-powered blast cabinets were being operated manually for three shifts, seven days a week to produce a final finish on the company's products. Empire's evaluation quickly uncovered two major opportunities to save energy and money. For starters, none of the cabinets included media-reclamation equipment even though steel shot, a highly durable blast medium, was being used to finish the company's products. Instead, the shot, along with dust and debris, was falling into each cabinet's bottom cone where it would accumulate before being released — again, accompanied by dust and debris — into a pressure vessel positioned beneath each cabinet (Figure 1). As a consequence, the media mix continued to degrade during each blast cycle as more dust and fines built up, resulting in reduced finishing rates with no corresponding reduction in compressed-air consumption. As an alternative, the cabinet operators could recharge the systems with virgin shot during refills in an effort to conserve energy by maximizing throughput, but doing so would have driven up costs for buying and disposing of media. Neither tack was attractive: pushing the media mix past its prime not only wasted time and energy but also compromised finishing quality; discarding tons of perfectly good shot made no sense either.

Problems with Pressure

Adding media reclamation to the capabilities of the current blast system or its replacement presented one obvious step toward the goal of leaner and greener finishing (Figure 2).

A second problem, endemic to all six cabinets, proved to be thornier. As a preface to why, it's important to remember that pressure-blast systems outperform suction systems according to almost any yardstick with one notable exception: continuous operation. Manual pressure cabinets typically spend as much as ten percent of their operating time off line

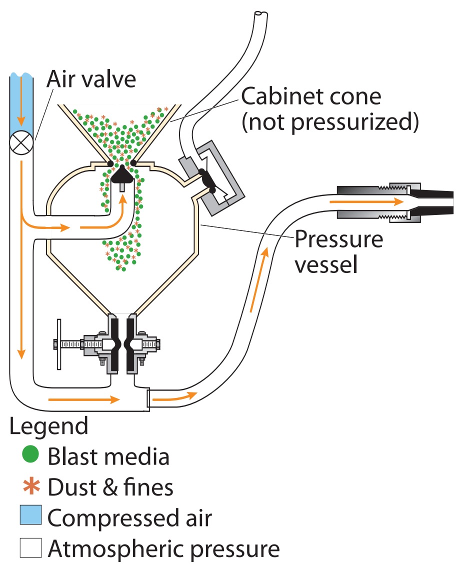

Figure 1 *If shot or abrasives are reused without being cleaned, broken media and work-surface debris degrade the mix progressively with each cycle, which wastes time and energy by slowing work and compromising quality. This drawing also shows why manual pressure-blast systems take time-outs. Because the media-supply vessel operates under pressure during blasting, it must be depressurized during refills. (Arrows show direction of air flow when system is active.)*

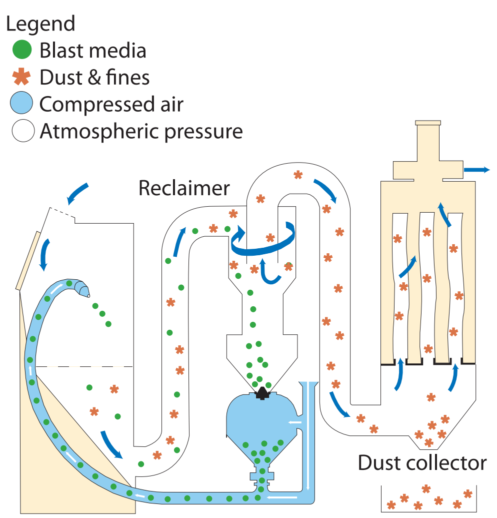

Figure 2 *Cyclonic reclaimers clean media by managing air flow. As air enters from the cabinet, it spirals in a downward vortex, throwing larger particles against the reclaimer's outer wall. Air pulled through the reclaimer's ports by the dust collector forms an upward counter vortex through a center tube that carries out dust and debris while good shot or abrasives drop into a storage hopper for reuse.*

while the pressure vessel within the system is being refilled with shot or abrasives (Figure 1). This drawback can be minimized to a degree by equipping the system with one of the larger, optional pressure vessels offered by most manufacturers of air-blast cabinets or completely eliminated by installing a continuous pressure system, which will be described shortly.

In most cases, the time lost to system refills is a small price to pay for the greater productivity possible with pressure systems. Typically, a pressure cabinet will work three, four or even five times faster than one powered by suction. In this case, however, a minor limitation was causing a bigger problem. Apparently, the control schemes in all six cabinets had been specified with little regard for the specifics of the application. Instead of going into the refill mode only when more media was required — a process normally taking over a minute — these cabinets would go into the refill mode whenever an operator released the on/off foot-treadle control. In certain types of applications this sort of arrangement makes sense but not in one where processing times per part are short and production is continuous. Saddled with inappropriate controls, the cabinet operators adopted the only reasonable procedure for maintaining acceptable production rates. They loaded the cabinet enclosure with as many workpieces as one pressure-vessel's worth of shot could handle and kept the air line open until the media supply ran out. Unfortunately, this pedal-to-the-metal approach wasted a lot of media and compressed air while the operators switched from one piece to the next.

It's worth noting that even the most operator-friendly manual blast systems suffer from inherent inefficiencies. Consider the problem of over-blasting, for example. It represents the norm rather than the exception for a couple of reasons. In a cleaning or finishing operation, an under-blasted part will be rejected while an overworked part will normally go unnoticed. Furthermore, seeing a workpiece clearly amid the airborne dust and media within a blast cabinet is not always easy, so operators tend to err on the side of too much rather than not enough. When blast durations are 15 percent longer than necessary, then 15 percent of the labor, energy and media invested goes to waste.

Answers in Automation

As mentioned earlier, this manufacturer relied heavily on air blasting — six manual cabinets operating for three shifts per day, seven days a week — to repeat the same task, making the application ideal for an automated approach. Consequently, the manufacturer's objectives, constraints and sample parts were turned over to our automation division for a proposal. With the help of our laboratory staff, which evaluates and demonstrates equipment approaches in our state-of-the-art test facility, we developed two machines capable of handling the entire workload.

The blast enclosures each house 36-inch indexing turntables supporting six workstations equipped with fixtures to hold the workpieces. Six nozzles stroking vertically deliver shot in bursts precisely timed to provide the required coverage with a minimum of air consumption. Moreover, the machines exploit the advantage of pressure blasting — but without taking breaks for media refills. By relying on two pressure vessels linked through a programmable controller (Figure 3), the systems finish workpieces continuously. In addition, they include media-replenishing devices that automatically meter new shot into the systems to make up for degraded media extracted during reclamation. As a result, the media mix remains consistent and so do the finishes.

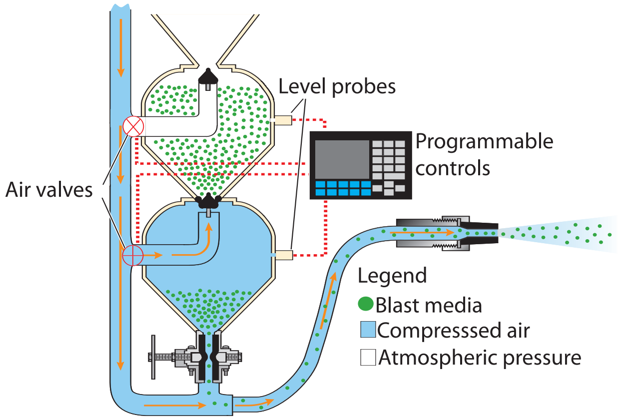

Figure 3 *Two-vessel system eliminates time outs for refills by coordinating pressurizations with media requirements. When the bottom vessel nears depletion, the top vessel pressurizes to supply more media via gravity feed.*

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By operating these two machines for 20 hours a day, five days a week, the company is able to perform an amount of work that previously required six machines and 144 man hours, seven days a week. At the same time, finishing results have improved, media costs have declined and compressed-air consumption has dropped by approximately 20 percent — green news all the way around!

10 Green Heresies

According to Wired magazine's web site, "Winning the war on global warming requires slaughtering some of environmentalism's sacred cows." The following are 10 "inconvenient truths" that will shake believers and non-believers alike. For the full story on each topic, go to http://www.wired.com/science/planetearth/magazine/16-06/ff_heresies_intro

Live in Cities: Urban Living Is Kinder to the Planet Than the Suburban Lifestyle

A/C Is OK: Air-Conditioning Actually Emits Less C02 Than Heating

Organics Are Not the Answer: Surprise! Conventional Agriculture Can Be Easier on the Planet

Farm the Forests: Old-Growth Forests Can Actually Contribute to Global Warming

China Is the Solution: The People's Republic Leads the Way in Alternative-Energy Hardware

Accept Genetic Engineering: Super efficient Frankencrops Could Put a Real Dent in Greenhouse Gas Emissions

Carbon Trading Doesn't Work: Carbon Credits Were a Great Idea, But the Benefits Are Illusory

Embrace Nuclear Power: Face It. Nukes Are the Most Climate-Friendly Industrial-Scale Form of Energy

Used Cars — Not Hybrids: Don't Buy That New Prius! Test-Drive a Used Car Instead

Prepare for the Worst: Climate Change Is Inevitable. Get Used to It