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Dual Function Cabinet Meets Multiple Customer Needs

SPECIFICATIONS REQUIRING PRESSURE and suction blast capabilities within the same cabinet system are rare, to say the least, for simple reasons. Pressure systems work faster than suction systems, consume less energy, operate over a wider pressure range, provide more control at both high and low pressures, and tackle jobs suction systems can't handle. So once the higher initial cost for a pressure system has been paid, switching to suction normally represents a step backward — *unless the system is destined for R&D as well as future production*. (See "Roles of Suction and Pressure" on page 10.)

Such was the case with a company involved in the development of various products, some used in air-blast equipment and others requiring shot peening and/or blast finishing. The firm wanted to use pressure and suction blasting for research and development in addition to production of prototype and finished products. Consequently, the company's specification required equipment that provided room to explore, produce and accept modifications at the same time.

"Typically this flexibility would require two to four pieces of equipment," reported one of the firm's lead engineers. "Empire met our needs with one system."

Concerning modifications, the firm wanted to minimize hardware by enabling the system's pressure vessel, normally a component in the pressure chain only, to operate as a storage hopper for media supplied to the suction system as well. In addition, the customer wanted a MagnaValve® beneath the pressure vessel/media hopper. (See Figure 1.) "Empire is one of the few cabinet makers that extends the legs on the media hopper so that we will have plenty of access to the valve," said the engineer. "We're currently running ferrous shot but if we switch to non-ferrous media, we can easily change the valve," he added. Given the modular design of our Pro-Finish® cabinets and our ability to adapt standard equipment, giving the customer this level of versatility presented no problem.

In fact, we operate an entire division devoted to modifying our extensive line of cabinets — over 100 standard configurations are available in our Pro-Finish® line alone — to meet specialized finishing needs with a minimum of custom engineering and its associated high cost. Drawing on our expertise in automated air blasting, in-house fabricating skills, and an array of standard factory options, we have developed hundreds of cost-effective equipment solutions ranging from straightforward, such as connecting two blast cabinets with an expander to contain long work pieces, to sophisticated, such as partial automation involving programmable controls.

Figure 1. Extended legs supporting the system's 3.5 cubic foot pressure vessel provided sufficient clearance for mounting of a MagnaValve® media flow valve.

In the case of the firm needing a single blast system for production plus R&D, the availability of items as standard factory options as opposed to custom equipment played an important role in their buying decision. For example, the 480 volt, 60 hertz, three-phase electrical package required by the customer is just one of five optional electrical packages offered with our Pro-Finish® cabinets. Likewise, the inside rubber curtains specified are a standard factory option, available in white or black, sized to fit the cabinet ordered, and include rubber coated mounting knobs. (See Figure 2.) Sound attenuators ordered for the system's fan motor outlet and blast cabinet inlet are, again, standard factory options.

For production purposes, the customer wanted to add equipment designed to reduce labor requirements and enhance quality. From our list of standard

Figure 2. Rubber curtains extend cabinet life by protecting interior walls from blast media.

factory options, the firm selected a fixed nozzle holder for the pressure-blast nozzle, a fixed gun holder for the suction-blast gun, a 24" diameter stationary turntable with a perforated top and variable speed control from 3 to 12 revolutions per minute, and an electric timer to control blast cycle duration.

The system's control package (See Figure 3), mounted on the left front of the blast cabinet next to the viewing window, includes on and off buttons for lights and blast, start and stop buttons for timed blast cycles, selector switches for automatic or manual blasting in either the pressure or suction mode, and controls for turntable rotation speed and blast cycle duration as well as MagnaValve media flow controls and a flow monitor installed by the customer. "Our production and R&D work require precise control of the media flow rate and repeatability of the process." said the engineer. "The MagnaValve and the system's control package give us both." All controls are electric to simplify data logging.

Figure 3. A selector dial for "PRESS" or "SUCT" on the system's control panel permits the operator to select pressure or suction blasting.

The automatic blast feature, which teams part movement via the powered turntable with timed blast cycles, not only eliminates the complication of operator involvement when evaluating results related to the adjustment of various blast parameters, it also contributes to repeatable production.

Because the system uses a wide range of relatively fine media consisting of beads and grit, our cyclonic reclaimer equipped with a magnetic separator and tuning band has the flexibility to recycle them all. Before flowing ferrous media, such as steel shot and grit, the magnetic separator is easily removed. When flowing non-ferrous media such as glass and ceramic bead, plastics and aluminum oxide, the separator plays an important role in extracting ferrous debris carried over from blasted surfaces. By adjusting the tuning band on the reclaimer, the amount of air introduced into the system can be controlled to assure precise separation of functional media from dust and other unwanted debris. (See Figure 4.)

As another goal, the customer wanted to maximize the length of production cycles by increasing the volume of the system's pressure vessel and decreasing maintenance on the dust collector. In response, we substituted an optional three-and one-half cubic foot pressure vessel — with optional sight glasses for easy level checks—for our standard one cubic foot vessel, and supplied our 600 CFM cartridge dust collector rather than a bag-type collector with equal capacity.

The cartridge collector handles cycle times of almost any length because the air-blast system can continue working while dust is removed from filtration surfaces. A minihelic gauge tells the operator when to initiate reverse jet pulsing, a standard feature that purges dust with the push of a button. (Optional photohelic upgrades move dust from filtration surfaces to a collection drum automatically.) And when cartridge filters wear out, they are easy to replace.

A recap of the customer's specification for a single cabinet system with pressure and suction blast, easy access to the media valve, manual and automated operation, media flow rate control and repeatability, broad media reclamation capability, and extended processing cycles boils down to a central requirement: flexibility. Happily, our Cabinet Division was limber enough to deliver.

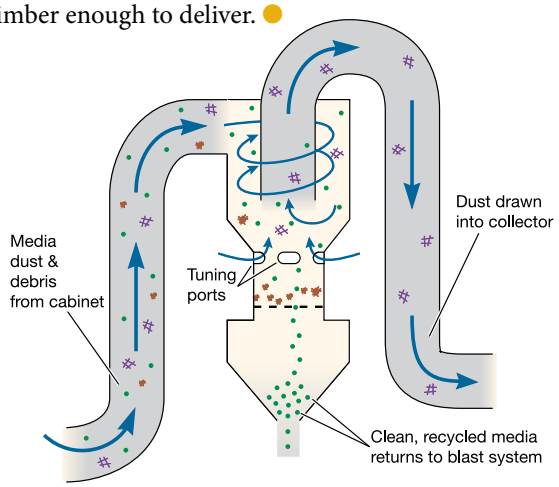

Figure 4. Reclaimer Operating Principles

The cyclonic reclaimer diagrammed above includes a movable band (not shown) that can be positioned over the tuning ports to recycle a wide range of abrasives.

As spent media, dust and debris are pulled by air flow to the reclaimer inlet, incoming air and media spiral in a downward vortex, throwing larger particles against the outer reclaimer wall. An air stream coming through the tuning ports forms an upward counter vortex through the center tube, which carries out dust while heavier particles drop into the storage hopper below for reuse. A screen catches any oversized debris.

Dust and undersized debris are drawn from the reclaimer into the bottom of the dust collector. Sudden expansion forces heavier dust particles to the bottom. Remaining fine dust is pulled to the surface of the dust filters.

Role of Suction and Pressure

In air-blasting equipment, one of two basic approaches — commonly referred to as suction and pressure (See Figure 1) — "pull" or "push" abrasives (known as media) to desired working speeds. Suction systems rely on compressed air from a supply line to create a venturi effect within a blast gun that draws abrasives through a feed line from a storage hopper operating at atmospheric pressure. When triggered, the blast gun releases compressed air and media to the work surface. The advantages of suction systems include lower capital costs and simplified piping, particularly in applications requiring continuous operation and/or multiple blast outlets. (See Figure 2, 3 and 4.)

In the case of pressure systems, the media-storage vessel operates at the same higher-than-atmospheric pressure as the air supply line (normally between 10 and 120 psi above atmosphere). When actuated, the system releases abrasives from the storage vessel into a blast hose where the difference between system pressure and atmospheric pressure (sometimes more than 100 psi) drives the abrasive particles during their entire trip to a tapered blast nozzle that adds more speed. This continuous "push" pays significant dividends in terms of energy use. On some jobs, pressure systems reduce compressed-air consumption by 75 percent. Moreover, pressure systems control abrasive flow with greater precision at both low and high operating pressures. As a result, they can deploy a broader range of media than suction systems and perform a much wider variety of tasks.

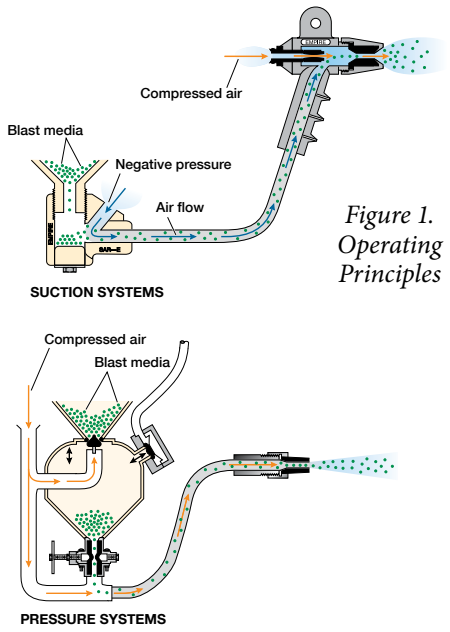

Figure 1. Operating Principles

Figure 2. Besides simplifying piping to multiple blast outlets, suction systems make possible innovations like the rotary blast head. Equipped with six blast guns, the head shown spins to provide even coverage on broad work surfaces.

Figure 3. Supplying six blast guns is relatively straight forward as demonstrated by the single air manifold and media hopper, each with six hose outlets.

Figure 4. As shown by a pressure setup with just two outlets, supplying pressure nozzles requires more hardware.