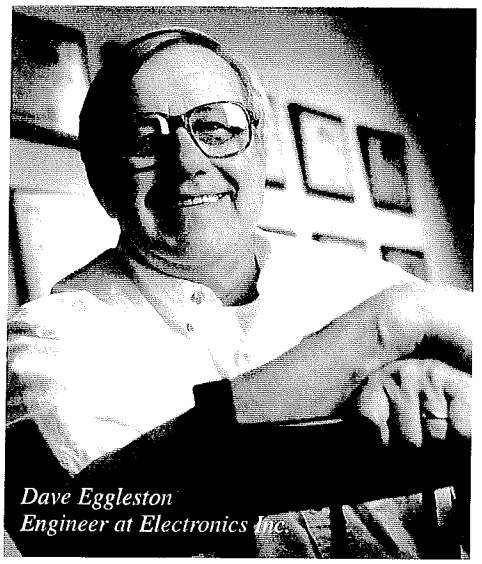
Air Valve Testing

by Dave Eggleston



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I have been asked, "What's the reason for the success of the MagnaValve?" There is no question that this magnetic valve, with no moving parts, has captured the attention of the shot flow market for the last 20 years. Some people still marvel that the valve works at all; that it actually functions as a "Normally Closed Valve" and stops the flow and weight of steel shot when it's not energized.

As stated in my past articles, the economic and process control benefits of MagnaValves are substantial. A problem-solver must be both efficient and effective and MagnaValves certainly have these characteristics.

Early requests from the aerospace industry for media control compatible with computers were met in 1979 with the introduction of our magnetic valves for a project at Boeing Commercial Airplane Company in Seattle, Washington. These early valves were designed to work only on wheel-type peening machines. Valves for the air blast market were soon developed and an entirely new product line evolved at Electronics Inc.

To prove that our valves are suitable for each application, each valve must be flow tested in such a way that it closely simulates the customer's application environment (every valve is tested before delivery). The following is a brief history on how we've achieved this goal with our special test stands for air-type MagnaValves.

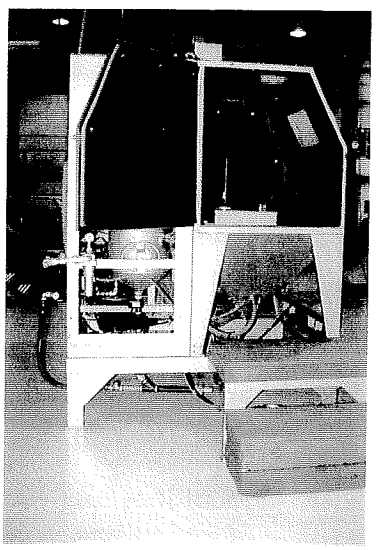
Our original test stand consisted of a simple media storage hopper suspended over a catch basin placed upon a weigh scale. Media was dispensed for one minute at various flow rates and the data was converted to a graph displaying the valve's characteristics. Early generation MagnaValves could achieve ±5% accuracy without too much difficulty but some shot types and sizes, such as stainless steel shot, would occasionally present challenges. We discovered that the valve would work with this less-magnetic media but special actions had to be taken.

As production rates increased for MagnaValves, we built a second test stand that was similar to the first. This not only doubled our production test rate capacity, it also gave us an opportunity to experiment with a wider range of media and modifications for accuracy improvement. One of the modifications was the introduction of the 400 series MagnaValves that included linearity compensation. This provided the capability of achieving ±1% accuracy by adjusting the response in 10% increments. This allowed us to easily meet the most stringent aerospace specification (AMS 2432B) which required ±10% shot flow rate accuracy.

Because MagnaValves are being brought into diverse markets and applications that use relatively new media, such as fine media or Micro media (50-300 micron), Electronics Inc. has continued to expand its testing capabilities. To give you an idea of the flow challenges of fine media: Imagine how easily you can pour a cup of sugar compared to a cup of flour. The flour sticks together and pours inconsistently while the sugar has an even, consistent pattern. This is similar to how fine or micro media flows compared to larger standard media. The problem becomes even more complicated when applications require multiple media sizes to flow together.

In order to develop MagnaValves to flow these different media, we needed flexibility in test equipment as well as practical machine simulation. We also recognized that we were constantly changing media types and sizes in our existing test stands—these factors led us to our next stage of testing capability. We designed and built a third test stand with ten test stations, each with a dedicated type/size of shot that gives us much quicker production testing, and, more importantly, constant product improvements. The newest test stand also includes a special test for air pressure stand-off capability. We have found that some machines exhibit a high differential pressure above and below the MagnaValve. Since the MagnaValve has only a magnetic field to regulate the shot flow, there is a limit to the differential pressure stand-off before the media is sucked into the mixing chamber. We can now document our valve's pressure capability so that we can meet the requirements of various customer machine designs.

These machines have greatly increased our production and development capabilities for air valves, but we wanted more. We recently purchased a pressure-type blast cabinet with a single air nozzle. We raised the machine 18 inches off the floor so we can easily change valves and plumbing. A new test panel can accept our FC-24, a programmable-controller, and any other control scheme our customers dream up. We then added a turntable and customer nozzle holder to better simulate actual field production situations. This capability will also be helpful when we train customers because we can duplicate their shot peening processes on production equipment.



Today we can put MagnaValves onto a fully functional machine and duplicate almost any customer situation. (This also provides us with added capability when we train FAA inspectors—they can run the machine and peen Almen strips to learn how to get intensity and coverage.) But we are never done and more testing products are in development. See you in the summer issue of *The Shot Peener* where I'll be writing about the latest and greatest in wheel valve testing.