AUTOMATION ON A BUDGET

More companies discover pneumatics

Manufacturers are finding that automation need not necessarily involve a lot of complicated I/O or computers. "Adding an air cylinder to a simple $25 arbor press can make pressing, clamping, and holding into hands-free operations," says Jim Ruthemeyer, a manufacturing engineering manager at **OPW Div., Dover Corp.**, in Cincinnati.

Ruthemeyer's company typifies a growing trend among U.S. manufacturers squeezed to do more with less. OPW has automated many of its processes without breaking the bank. Often the means of choice has involved putting pneumatics and controls on equipment that was once operated by hand.

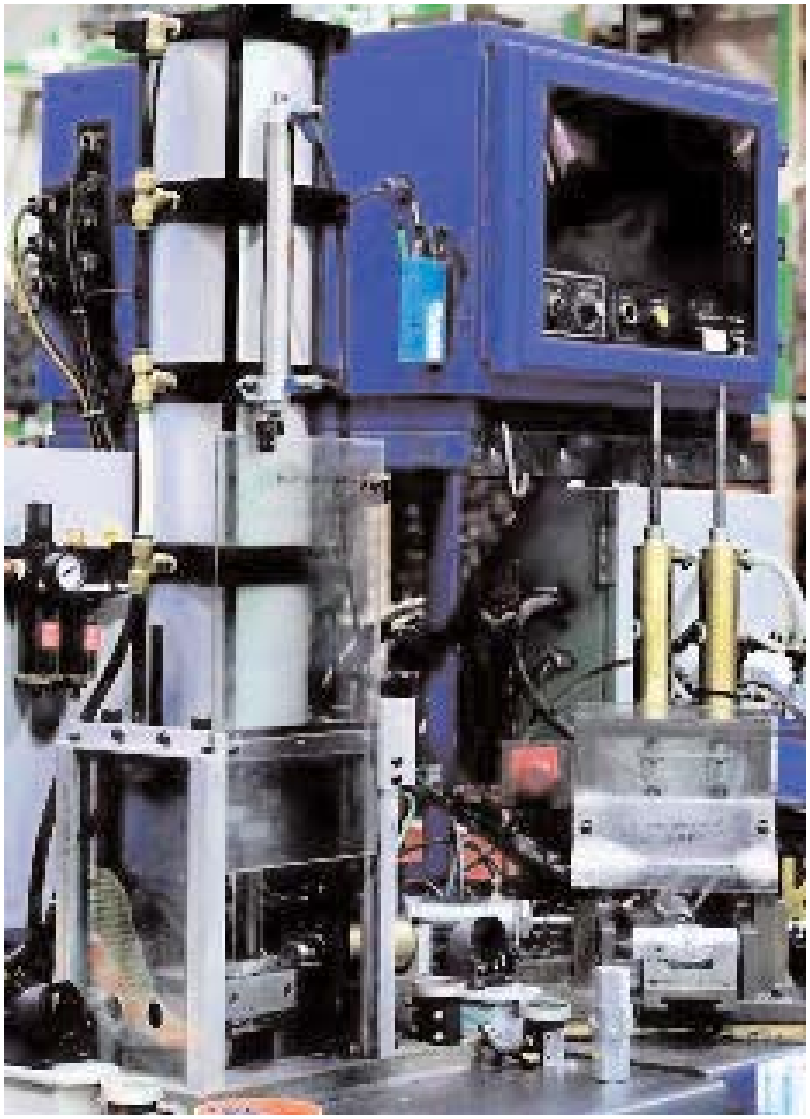
Pneumatics suppliers are encouraging the trend by kibitzing on installations and giving out ideas about how to implement automated processes. OPW, for example, says its pneumatics vendor takes the time to provide personnel with a hands-on education in pneumatics. Most of the firm's pneumatics come from **Clippard Instrument Laboratory Inc.**, also in Cincinnati. OPW staffers have gotten training at the Clippard facility. And touring the Clippard plant, they say, has generated several ideas. "Clippard is good at using their products in their own plant to do everything from opening window blinds to air-clamping on machining centers," says Ruthemeyer. "Seeing such a wide variety of applications opens your mind to the possibility of using pneumatics everywhere there is motion."

Part distributors often get involved in such efforts as well, sometimes doubling as integrators. This was the case with OPW's Clippard distributor, **Isaacs Fluid Power Equipment Co.**, in Mason, Ohio. "They provide the expertise to design perhaps 95% of our control circuits," says Ruthemeyer. "They are much more than just a parts warehouse."

One advantage pneumatics holds over electronic and electromechanical alternatives is that air logic is clean, safe, and uncomplicated. "Most of our circuits are fairly simple, so air logic is easier to keep organized compared with PLCs," says Ruthemeyer. There are no wires or sensitive components that need the protection of an enclosure. And it is more straightforward to troubleshoot air logic than electronics, he says.

OPW's pneumatic applications range from operating machine guards, clamping parts in machine-tool fixtures, and automating band-saws, to pressing, swaging, and crimping operations.

One typical case involves endurance testing of gasoline nozzles, cycling handles with pneumatic cylinders to repeatedly start and stop flow. Control valves regulate airflow and actuation rate, running the test as fast as possible while ensuring the nozzles latch properly.



The OPW Div. of Dover Corp. supplies more than 60% of domestic gasoline fuel-delivery systems, including nozzles, swivels, break-away fittings, and emergency-shutoff valves. The company has increasingly turned to pneumatics to speed production of precision, high-quality parts.

One version of the test operates at 30°F for 100,000 cycles, then to failure at ambient temperature. It takes several months as nozzle life typically exceeds 1 million cycles, so "it's important to have high-quality cylinders that outlast the test," says Ruthemeyer.

Another test station checks that bronze swivel adapters rotate freely. The parts must turn when subject to 30 lb-in. of torque. But manual torque wrenches inherently produce a lot of variation in the readings. Sophisticated electronic torquemeasurement systems, another option, were pricey and required time-consuming calibration.

Pneumatic actuators and air logic let OPW automate MIG welding processes. Part quality exceeds Six Sigma.

The company turned to an inexpensive pneumatic rotary actuator instead. Knowing the surface area on the actuator's vanes, and the gage air pressure, the system precisely controls the amount of torque applied to the swivel. The torque tester accepts parts that move and rejects those that don't, whether due to a defective part or a system failure. Thus, it can never accept a bad part. And because air is compressible, there is no risk of a too-tight part damaging the system.

OPW also uses pneumatics to automate a difficult aluminum-tube welding process. Relying on pneumatics for actuation and clamping, with the push of a button a custom-built welder clamps a tube and threaded adapter tightly and rotates the parts under a MIG welding torch. The completed assembly swings out of the way, readying the workstation for the next setup. "The work used to be handled by an outside supplier. Now it is done inhouse, fully automated, with better than Six-Sigma quality," notes Ruthemeyer. A growing reliance on pneumatics forced OPW to take a hard look at the plant's compressed-air capacity. The facility houses four **Ingersoll Rand** reciprocating compressors with a 2,000-gallon air-storage tank, and they faced the need to replace one of the costly compressors.

Conservation turned out to be a better option. One problem was that air pressure throughout the plant was largely unregulated, with various systems ranging from 70 to 100 psi. "First, we regulated the entire plant at 85 psi, so everything from blow-off guns to presses were now using less air, wasting less energy, and significantly cutting demand," he says.

An inexpensive pneumatic rotary actuator provides accurate torque testing of brass swivel adapters. The unit is more precise than a torque wrench and considerably less expensive than electronic torque testers.

Then they attacked leaks. An audit found that even when idle, leakage kept the plant's air consumption at 75% of capacity. The benchmark for a good, tight plant is 10% or less, indicates Ruthemeyer. Initial corrective measures involved merely listening for leaks and repairing the culprits. They repeated the same steps on quiet weekends, and eventually turned to handheld ultrasonic devices to track down the elusive ones.

Fewer leaks means the plant now operates on a single compressor, cutting electricity costs from $42,000 to $14,000 annually. Less required maintenance saves several thousand additional dollars per year.