CleanTech™
For Cleaning Process Improvement

Drying Efficiency

Rotary Air Knife System Streamlines Quality Control Process

By Matt Migliore

In 1945, when Samuel Hunter Leggitt formed the S. H. Leggitt Company with the aim of penetrating the market for natural gas filters and regulators, it is highly unlikely that he imagined drying would one day become a critical process for his business. But, nearly 60 years later, such was the case, as S.H. Leggitt Company found itself spending far more time and effort drying regulators coming off the assembly line than it could possible justify from an economic perspective.

The Drying Bottleneck

Marshall Gas Controls is the LP gas regulator manufacturing division of S.H. Leggitt Company. As part of its manufacturing process it performs a porosity test whereby the body of each regulator is dunked in a pressure tank full of water at 400 PSI. The regulator orifices are closed up prior to dunking, and the test operators check for leaks by looking for bubbles when the regulators are submerged in the water.

After the regulators are run through this process, they must be thoroughly dried, because any moisture left in the orifices after the regulators are assembled could lead to false gas flow rate readings. Further, the drying mechanism has to be sufficiently gentle to remove the moisture without damaging the regulators, as any surface abrasion on the gasket areas of the castings could produce failures during the pressure check.

The critical nature of the drying process in this setting forced Marshall Gas to dedicate more manpower to the project than it would typically provide for a peripheral function of this sort. According to Thad LaRoux, automation coordinator for Marshall Gas, he sometimes assigned as many as four men using handheld air guns to drying duty. Still, no

Air-knife dryers can provide 14-times the energy savings as a compressed air system.

Energy Savings
Blower Knives vs. Compressed Air

Although ideally suited for many factory uses, compressed air can be among the most inefficient delivery processes for blow-off nozzles and air knives, according to Sonic Air. A 100-plus PSI compressor, for example, delivers air to the typical blow-off nozzle/knife with 50–90 PSI of pressure loss through the 1/2″ to one-inch lines. Since virtually no surface liquid blow-off application requires nozzle pressure greater than five PSI, regardless of whether compressed air or blower/air knife, using energy to generate 100-plus PSI only to bleed it back down to five PSI is an inefficient method. In fact, a typical high-volume production line using 40 horsepower worth of compressed air for water blow-off can, for example, be replaced by a 10 horsepower blower/air-knife system. This 30 horsepower of energy/cost savings does not include the cost to run the refrigerated air dryers, oil separators, and maintenance of the entire compressed-air system.

matter how much manpower he put on drying duty, the process was creating a bottleneck in the assembly line.

Regarding cost, the manpower Marshall Gas was being forced to dedicate to drying was taking away from the added production that could be achieved if those operators were assigned to other portions of the assembly line. In addition, the power consumption associated with the air guns was significant, as they were pumping 100 PSI into the air for two shifts a day.

Recognizing the inefficiency of its drying process, Marshall Gas ultimately decided to pursue an alternative solution. The search for a new drying system was given priority status from the executives at the company. "My boss said, 'This [drying system] has to work,'" LaRoux recalls. "He said, 'There is no way this can come in and be remotely questionable.'"

Finding a New Solution

Once the decision-makers gave the green light to implement a new drying system, Marshall Gas narrowed its search to two final candidates, an infrared oven-based drying solution and a nozzle and air-knife blower system. "Initially, I was really leaning toward the infrared oven," says LaRoux, who didn't believe the blower system would be able to reach the more cumbersome orifices on the castings, some of which measure mere fractions of an inch in diameter. Also, he says, "The orifices are kind of positioned badly as far as getting a direct stream of air into them."

But before he made his final decision, LaRoux sent some castings to each manufacturer. He asked them to try to dry the parts after running them through a water test similar to the one Marshall Gas was performing. He says, much to his surprise, Sonic Air Systems (*www.sonicairsystems.com*), the manufacturer of the air-knife blower system under consideration, called him up shortly thereafter and confirmed that they were able to dry the parts.

When LaRoux went to visit Sonic Air to witness the dryer firsthand, he says the demonstration simulated a worst-case scenario by dumping water on the parts as they went into the dryer. And even under these abnormal circumstances, he says the parts came out the other end completely dry.

Based on the test results, LaRoux recommended to his boss that Marshall Gas purchase the Sonic Air air-knife blower system. He says the decision wasn't an easy one, because the infrared oven was capable of drying the parts as well, but Sonic Air quoted the system about $10,000 cheaper than the infrared oven manufacturer. Ultimately, Marshall Gas decided on the Sonic Air rotary air-knife system.

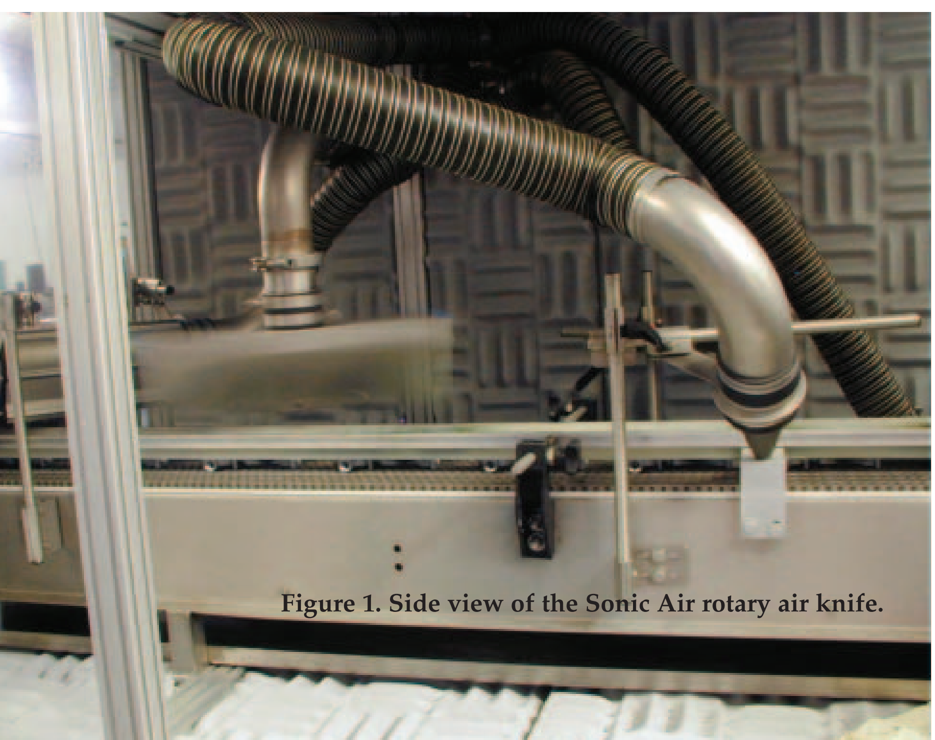

Figure 1. Side view of the Sonic Air rotary air knife.

Final Results

All told, the Sonic Air dryer has four air knives and two nozzles and provides 15 horsepower (Figure 2). Three of the knives are stationary and one is based on Sonic Air's patent-pending rotary technology, which enables it to move around to reach some of the more remote areas of the part. The nozzles have 3/8" orifices and are positioned at the end of the conveyor to provide added drying capability. The system as a whole only raises the part temperature by a few degrees, thus protecting the castings from heat damage.

LaRoux says the system has allowed him to reassign three operators from drying duty to other parts of the assembly line. "The thing has paid for itself with the labor alone," he says.

In addition, Marshall Gas has realized significant power savings since implementing the dryer.

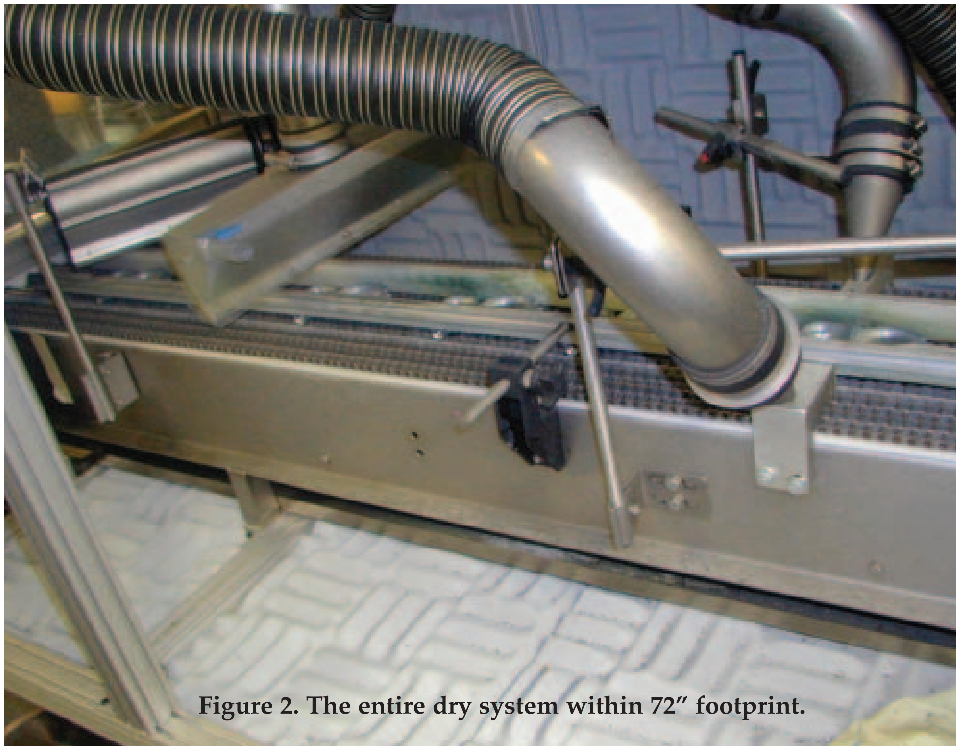
Figure 2. The entire dry system within 72" footprint.

Although LaRoux says he has yet to run tests to determine the exact amount of savings, he estimates the energy cost is much lower since moving away from a compressed air-based drying process. In fact, according to Sonic Air, its air-knife dryers can provide as much as 14-times the energy savings as a compressed air system.

Since the system was implemented over a year ago, LaRoux says Marshall Gas has been quite satisfied with the results. "Now we can test and dry parts faster than the operators can assemble them." Under the old drying process, the operators often had to wait for parts to move through the drying phase of the assembly line.

So far, LaRoux says Marshall Gas has only had one problem with the Sonic Air system, but it really had nothing to do with the dryer itself or Sonic Air. When the system was moved from Marshall Gas's San Marcos, Texas headquarters to its manufacturing site in Mexico, it was incorrectly reassembled. The motor was mounted backwards, and as a result was pulling air instead of blowing it. LaRoux says the problem was alleviated with relative ease, as one of Sonic Air's tech support people was able to walk Marshall Gas through a fix over the phone. ■

Reprinted by permission of the publisher from the June/July 2004 issue of *CleanTech*. For subscription information call 908-788-0343, ext. 132 or visit www.witterpublishing.com.

SONIC AIR SYSTEMS
Engineered Blowers & Air Knife Solutions

1050 Beacon St., Brea, CA 92821
Phone: 714-255-0124 • Fax: 714-255-8366
www.sonicairsystems.com