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Sensing a Problem

Advancements in leak detection technology are allowing Whirlpool Corporation to meet efficiency goals and produce more reliable refrigerators in plants around the world.

While mistakes on the production line are never good, quality control is one area in which error is totally unacceptable. Checkpoints guarantee reliability and, more importantly, customer satisfaction.

Knowing this all too well, Whirlpool Corporation worked quickly to attack a leak detection problem it was having at its refrigerator plant in Joinville, Brazil. Nelson Possamai, the plant manager of the facility at the time, noticed that there were several issues surrounding the leak detection technology the plant was using. "When we were working on the redesign of the Joinville plant, we ran into three problems," he confirms. "The first consisted of the interference of the foaming agent on the leak detection system. The second was we needed to increase the production speed of the assembly lines. Thirdly, we wanted to increase the reliability of our workforce."

Addressing all of these problems meant new equipment, and Possamai was able to quickly select a leak detection supplier. "We decided to work with Inficon GmbH due to the renowned reliability of their products, and the fact that they proactively pushed for cooperation," he says.

Whirlpool Corporation in Joinville, Brazil, recently purchased new leak detection equipment for the production of one-door refrigerator models, top-mount models and horizontal and upright freezers.

The two companies worked together closely for about a year, fine-tuning a piece of equipment that tackled each and every issue. The end result was the Ecotec E3000—a brand new product catered specifically to Whirlpool's needs.

Sandra Seitz, product manager for leak detectors at Inficon (Zurich, Switzerland), says the product was actually part of a new sales strategy. "A little over 2 years ago, we had a dramatic change in our sales strategy from a product selling strategy to a global key account management strategy," she explains. "This means that you look at your major customers and instead of just proposing a product to them, you start working closely with them to make sure you either are offering the right product or you modify the product so that it absolutely fits the needs of your key account customers."

False Alarms

According to Possamai, the greatest problem Whirlpool was having was the interference between the blowing agent and the refrigerant gas during testing. "This caused mass confusion in the production lines, as workers could not differentiate between real leaks and the consistent false alarms from the leak detection units due to this interference," he says. "Our main goal was to eliminate this problem to guarantee high-quality products for our customers."

The leak detector used at the time was successful in picking up R-600a refrigerant leaks, but it was also sensing the outgassing cyclopentane 70 foaming agent. "That blowing agent chemically is very similar to the refrigerant they were using," Seitz of Inficon explains. "So the leak detector was picking up that blowing

To cater to Whirlpool's needs, Inficon developed the Ecotec E3000 with two major improvements—heightened sensitivity and faster flow. "Technology was of utmost importance in meeting our goal, as the technological improvements of the new products addressed our demands successfully," says Nelson Possamai of Whirlpool. "The new Inficon detectors were most helpful in eliminating false alarms in the leak detection system, in improving the speed of assembly lines and in decreasing the instability of labor."

agent. It was showing that as a virtual leak."

Whirlpool wanted to address the problem without changing its current production methodology or materials. Using their new sales strategy, Inficon was happy to oblige. In fact, after speaking with other customers, the supplier found that these types of false alarms were a common problem among refrigerator manufacturers. The answer was a more advanced sensor.

Using new digital signal processing in the software, the improved sensor can measure different signals and evaluate them against each other to differentiate the refrigerant signal from the foam signal. "This is only possible because the sensor is working in real-time," Seitz says. "You cannot sniff the refrigerator and then wait until the unit has calculated the results. So the real achievement here is that the leak detector does all of these calculations and evaluations with essentially no lag time (about 10 milliseconds), and then shows the operator only real leaks from the refrigerant and not the foaming agent."

Raising Reliability

In addition to eliminating false alarms, the sensor also addressed some of the challenges Whirlpool was having in detecting actual refrigerant leaks. "Inficon was able to produce a leak detection product line with a new vacuum design with higher flow though the sniffer line in correspondence with faster sensors," Possamai explains. "This allowed us to identify leaks more efficiently and with greater reliability."

In addition, because the new detector sucks in air from a greater volume, it allows operators to detect leaks from greater distances. With the old system, if the operator was not close enough to the leak, then the system did not pick up the leak. "The increased flow makes the process less prone to error, or as we say, more tolerant to operator variation," Seitz explains.

Making all of this happen in one system required some serious design work. Seitz says that when you increase the flow, the device is not only sucking in more gas from the leak, it is also sucking in gas from the surroundings, which can decrease sensitivity. "So you can only do this if at the same time you improve the absolute sensitivity of the sensor," she explains.

Other improvements included a redesign of the display, which now resembles an ATM machine display with eight buttons on the side. "There are a lot of messages that you can send to the operator, and he just pushes a button and is able to get the information he needs," Seitz says.

The sniffer also has its own display, a feature not offered on previous models. Because the operator has to closely watch the probe to ensure the right joint is being sniffed, Seitz says it only makes sense that a display would be located directly in the operator's view. "Customers say they really like this feature because the operator can concentrate on the sniffing process and not even bother (worry) about the main unit in the background," she says.

The main unit's menu structure has also been reworked, and the leak detection software is now available in eight different languages, including Chinese and Japanese.

A Global Solution

One of the more unique aspects of the project is that it was truly global—from start to finish. Inficon's German business unit developed the leak detector, while its facility in East Syracuse, New York, U.S., designed the new sensor. Communication between these two locations and the Whirlpool plant in Brazil created several challenges, including differences in time, culture and language.

This made careful planning a key element of the project, according to Seitz. "There is only a certain slot during the day where you can actually talk to people," she says. "You can't send somebody down there for a 2-hour visit because it's a 14-hour flight."

Organization was also important when shipping trial products to and from Brazil. The region has an import tax of 40 percent, an export tax of 40 percent and no temporary import options. "So if you ship something into Brazil, you're almost better off scrapping it in Brazil rather than send it back," Seitz says.

Communication strategies included weekly conference calls between the two Inficon business units. The supplier also utilized a distribution partner in Brazil that it trained on several occasions.

"Our key account manager from Inficon traveled to Brazil many times," Seitz adds. "At least two times, we also had a technical person from Cologne travel to Brazil to assist on-site."

To further enhance communication between the companies, Inficon built a new service facility closer to Whirlpool's Joinville facility. "When we started doing this project, we stumbled across another problem in Brazil, which was that the plant in Brazil was quite a distance from our technical center in São Paulo," Seitz says. "So we actually opened a new service center near Whirlpool so that we can react fast. When the problem occurs, somebody can go there and analyze the situation."

Once the leak detection system was finalized, Inficon continued working with Possamai on the design of the assembly line layouts to increase speed and improve ergonomic issues.

In the end, Whirlpool was so pleased with the success of the Brazil project, it decided to install the leak detectors in its refrigeration plants in Brazil, Mexico, Italy, Poland, and South Africa. "Inside Whirlpool Corporation, we exchange ideas about best practices," Possamai tells APPLIANCE. "When a certain process is successful in any given plant, we exchange information to implement the process in other plants. It is due to this reason that we have Inficon products in all of our air-conditioning and refrigeration plants worldwide."