



## **Dow Corning, Lowry Computer and Avery Dennison Builds RFID Solution for Challenging WIP Application**

*Working with two materials that have caused issues for other RFID systems—metal and liquid—Dow Corning developed a high-accuracy RFID system to monitor work-in-process at its chemical processing plant.*

Dow Corning faced a major challenge in implementing a work-in-process RFID application. The high-priority project focused on tagging 55-gallon metal drums filled with liquids—two materials that have caused major operating issues for many RFID systems.

Undaunted by the challenge, Dow Corning began working closely with two of its suppliers: Lowry Computer Products, an RFID label converter and systems integrator, and Avery Dennison RFID, a leading manufacturer of RFID tag inlays. Together, the team developed a winning solution that also included RFID readers from Motorola and RFID network infrastructure from Reva Systems. The system not only worked effectively in close proximity with the liquid-filled metal drums, but also achieved a 100 percent read rate. This successful application has enhanced Dow Corning's reputation as an innovator in exploring and testing RFID technology for internal, closed-loop manufacturing applications.

### **Exploiting the Benefits**

Dow Corning Corp., Midland, Mich., a global leader in silicon-based technology, has an internal group that explores new alternatives in automatic identification. "RFID has been on our group's radar screen for the last six years," said Dave Zuwala, assistant analyst, manufacturing systems team and RFID consultant for Dow Corning Corp., Midland, Mich. To improve its internal materials handling processes, Dow Corning wanted to exploit the benefits of RFID, including:

- **Rapid Reading:** "Each of our bar-coded labels typically has a material number, batch number, quantity and other details," said Zuwala. "Being able to instead use an RFID system to read all of those labels quickly and at one time is a major advantage."
- **Permissible paths for materials flow.** If materials go outside prescribed paths in the plant, an RFID system can issue alerts. "Say you don't want a particular drum of material going out a certain door or area—instead you want to keep it flowing between two

separate processes. RFID is very good for providing visibility into that function,” said Zuwala.

- **Container visibility.** RFID can provide high visibility into key processing factors, such as the accumulated refrigeration time for a container, allowing users to determine which containers are out of spec.
- **Transparency:** “Using traditional ID technology, an operator has to scan a piece of paper that tells them which order they are working with, then go to the drum and scan each of the different indicators on a drum,” said Zuwala. “Today, that RFID tag is linked to back-end data. Once the operator scans the tag, he knows everything about what’s in that drum, because it is a unique identifier and it relates back to the database. That’s one of the greatest things about RFID.”

To see which of its internal processes could be improved through these benefits, Dow Corning set up a cross-functional RFID team that focused on the operating challenges faced by different business units within the company. “We went to our internal customers to find out how they could use RFID to add value or eliminate logistical problems,” said Zuwala.

To identify potential applications, the RFID team uses Dow Corning’s Six Sigma continuous improvement process. The process starts with major questions, such as: Can RFID be used in this process? Will it work effectively? Will it improve on the current system? “In some cases, we found we were already doing a good job and that RFID would not measurably improve the process; in others we found that RFID would deliver better results than the current system,” said Zuwala. Another important question is whether or not the project can be accomplished with a standard RFID product. A more expensive custom product might push the project cost/benefit ratio out of reach, while a standard, lower-cost product could be easier to cost justify.

After developing a list of potential projects, the Dow Corning team worked with EPC Global to understand how other companies prioritize RFID projects. “Then we took that list to our group of expert consultants and RFID business partners,” said Zuwala. Dow Corning concluded that 10 work-in-process (WIP) RFID applications—including the drum tagging system—offered advantages over incumbent technologies, such as bar coding, which the company has used for years in various identification systems. Dow Corning began to create RFID implementation roadmaps for these new applications.

One of the key issues for Dow Corning was that its work-in-process was not as visible as it should be in the company’s Enterprise Resource Planning system. The company determined that RFID would be a good way to create checkpoints within a WIP system by monitoring key information.

## **Tracking Containers**

One of Dow Corning’s most successful WIP RFID applications was the drum tagging project in its chemical processing area. The 55-gallon drums hold various silicone-based liquid products. “When we were testing it, we were surprised that this application actually worked, because there

weren't a lot of business cases involving RFID tagging of metal drums containing liquids," said Zuwala. "I went through the Chemical Industry Data Exchange (CIDX) and there weren't many scenarios for this application. But there's no better testing than the real world, which is exactly what we did."

To research this application, Dow Corning sent samples of the drums and materials to Lowry Computer Products Inc., Brighton, Mich., for testing. This was a key part of the process. "If you issue a general request for information, a vendor might return a thousand RFID tags—even if they have never even heard of your scenario," said Zuwala. "We don't have the time or the knowledge to whittle that down to a handful of tags that would be right for us. Lowry gets us to that level by recommending RFID products that fit our applications and our budgets." Lowry provides automatic identification and data capture solutions to supply chain markets as well as installation and maintenance services throughout the United States.

The liquid/metal challenge required a unique solution. "With ultra-high frequency tags, 902 to 928 MHz, the radio waves are absorbed by liquids and reflected by metal materials," said Jeff Tazelar, RFID product manager for Lowry. "This prevents reliable reads unless steps are taken to overcome the challenges."

Engineers at Lowry's state-of-the-art RFID testing facility tested a wide variety of inlays and selected Avery Dennison RFID's AD-900 inlay, a durable, impact-resistant PVC tag tuned for direct adhesion to metal surfaces. Measuring 7.49"×1.10"×0.21", it is designed with a PVC backplane to ensure the inlay is off the metal, allowing the radio waves to power up. This inlay delivers accurate read rates at long ranges in proximity to difficult materials such as metals and liquids, according to Tazelar.

Dow Corning then used the tags in an in-plant pilot application. "We put drums on pallets and turned them inward so that the tag was facing another drum, and they still worked," said Zuwala. "Our read rates are 100 percent. Being able to read tags on metal drums containing liquids was a huge moment for us, particularly since a lot of people told us it couldn't be done. And we didn't even have to use an expensive active tag to make it happen."

Other key factors contribute to the 100 percent read rates. "The antenna configuration and its positioning are vital to achieving 100 percent read rates, regardless of the tag orientation to the readers," said Tazelar. "Of course, the most important factor was finding the best RFID tags and readers to overcome the challenges posed by RF-unfriendly materials."

Lowry's engineering team tested various readers with the AD-900 inlay. Further tests with Dow Corning determined the efficacy of the readers and the optimum reader-to-antenna positioning. Dow Corning selected the Motorola XR 440 fixed reader for the 55-gallon metal drum transport application. No printer/encoder is required. Since the system uses metal mount tags, the same hardware used to read tags also encodes them at a commissioning station, where the existing bar code data is associated with each drum and pallet tag.

Lowry installed Reva Systems' Tag Acquisition Processor (TAP) appliances to control the process and allow users to manage their product data and RFID readers. The TAPs process all

the collected data for location accuracy then pass it to Dow Corning's SAP enterprise software application via a certified interface. Reva Systems is a developer of RFID network infrastructure products that Lowry has relied on to simplify RFID deployments while improving the overall systems performance at each facility

"All of our readers will report to a Reva reader management system," said Zuwala. "We don't want to get into situations where we're installing proprietary systems. It is important for us to have interoperable hardware and interoperable standards. The chemical industry is very big on standards."

### **How the Process Works**

Dow Corning's tracking process begins when 55-gallon drums are tagged in the manufacturing area and read by the fixed reader at a portal or dock door when exiting the area. RFID tags are enclosed in a protective plastic sleeve affixed to the drum—similar to a UPS packing slip. Drums are tagged individually, and the 4-drum pallet is also tagged. Each pallet is then transported to a repack area, where tags are read once again at entry by a Motorola MC 9090 handheld reader. In the repack area, the products are transferred into smaller containers to fulfill customer orders. The smaller drums and containers are also RFID tagged to document a "parent-child" association with the RFID-tagged 55-gallon drum. The RFID database creates a chain of custody or "ePedigree." The chemical industry is highly regulated, and the ePedigree makes it easier to track and trace products.

After the liquids are transferred, tags are removed from the 55-gallon drums and sent to a decommissioning station where they are disassociated from the previous data and prepared for reuse. Dow Corning has found this retrieval and reuse of RFID tags to be the most cost-effective approach to WIP tracking.

### **Other Applications**

Dow Corning is using a variety of RFID tags for other pilot applications as well. One project improves visibility on the movement of tanker-trailers between different fence lines within the manufacturing plant. This information is used to measure transport time and dwell time in moving materials in and out of Dow Corning facilities. "We can perform an RFID transaction at the gate as it leaves one site and another transaction when it arrives at the other gate," said Zuwala. "We should be able to learn a great deal from that—it's similar to tracking a shipping container going overseas." This application uses a passive Symbol 6"×6" tag affixed to each truck. Fixed readers record the entry and exit of each truck using Reva TAP appliances. Another pilot project tracks IT equipment within a plant, such as laptop and desktop computers. "The purpose is not so much to prevent theft as it is to determine the location of computers holding secure information," said Zuwala. "It's an experimental program." Dow Corning uses an EPC-compliant Avery Dennison AD-222 inlay and UHF Gen 2 tags for this internal asset-tracking application.

### **More Projects Coming**

Dow Corning plans to continue developing new RFID applications by using the same process that led to the drum tagging project. “It’s a four-step process” said Zuwala. “We create benchmarks in a proof-of-concept, evaluate the value proposition, develop a pilot application, and study how it impacts the existing business process and IT environment. That allows us to determine if it is a viable project—and we expect to have many more viable projects in the future.”

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