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EPCglobal Transportation and Logistics Pilot Takes Visibility to a Global Level

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The program's second phase, the organization says, illustrates how EPC-based technology can be utilized to track goods as they are transported by air, sea, road and rail, from China to the United States.

By Claire Swedberg

July 16, 2008—GS1 subsidiary EPCglobal recently announced the completion of phase two of its Transportation and Logistics Services (TLS) Pilot Program. This program tests RFID technology, including Electronic Product Code Information Services (EPCIS) software, to track shipments between the point of manufacture in China and receiving warehouses within the United States. The pilot's second phase followed two shipments from a Chinese manufacturer through ports in Shanghai and Long Beach, Calif., and on to at a warehouse in Janesville, Wisc.

"The TLS pilot demonstrated that GS1 EPCglobal standards can facilitate the utilization of RFID technology in a collaborative supply chain," says Tom Escott, president of Schneider National, which supplied trucks and project management for the project. "The success of the pilot, despite the challenges of multiple supply chain stakeholders with disparate business conditions and technology platforms, helped define the 'art of the possible' from a transportation and logistics business value perspective."

The successful completion of the pilot's second phase, Escott says, triggered plans to launch the Transportation and Logistics Phase 3 Pilot Program. This third phase will involve the active participation of additional organizations and corporations in the transport and logistics industry, as well as a greater number of parts and finished products, and more regions.

The first phase of the program monitored shipments between Shenzhen and Hong Kong (see 'Largest Global Pilot Yet' in the Works for EPCglobal). During phase two—which began on Dec. 1, 2007, and concluded five weeks later, in January of this year—two shipments of tires were sent one week apart from an unnamed manufacturer in Shanghai.

For both shipments, the pallets, shipping containers and tractor trailers were tagged, using a combination of passive and active RFID tags. Pilot participants applied EPC Gen 2 UHF passive tags to the pallets. To identify the containers and trailers, those participating employed what GS1 refers to as conveyance asset tags (CATs), also complying with the EPC Gen 2 UHF standard, as well as one 2.4 GHz and one 433 MHz active tag, serving as extended conveyance asset tags (XCATs).

As the containers and trailers moved from Shanghai to Janesville, data generated from RFID reads was stored in EPCIS-based applications in China and the United States. In-transit visibility and chain-of-custody information could be accessed by the tire manufacturer, logistics providers and consignee, using a password to log on to a Web-based accessing application. The application transmitted e-mail alerts to authorized recipients when the shipment's status changed—for instance, when the cargo arrived at a location such as the sending or receiving port.

RFID tracking commenced in China, where the tires were manufactured, packaged and loaded onto pallets. At that point, the manufacturer printed and encoded the Gen 2 tags with a unique EPC ID number, applied them to pallets and read the ID numbers using Sense Technology handheld interrogators. Once the pallets were loaded into a cargo container, 2.4 GHz and 433 MHz active and EPC Gen 2 UHF passive RFID tags from a variety of vendors—which would be compared and contrasted for performance in the pilot—were attached to the container and read. The container was then closed, and a mechanical seal was applied, the ID number of which was input and then associated with the passive and active tags.

The container was then transported for shipment, passing several fixed interrogators that read all six container tags at a gate on its way to the ocean shipping terminal. When the container arrived at the Shanghai port terminal, another set of three fixed RFID readers captured that arrival as the container passed through the terminal facility gate and was then moved into a marshalling yard (container storage area). The tags were not read at the point of loading the vessel, however, because the research group was unable to secure permission to do so from Shanghai port terminal operators.

When the materials arrived at the Long Beach ocean terminal, the container's tags were read once more by one fixed reader as they were unloaded from the vessel, using another set of fixed interrogators. Three readers then captured the container's arrival at the assigned bay at the port's cross-dock facility.

When the mechanical seal was broken prior to unloading, its ID number was manually entered as the tags were interrogated, and the seal was de-associated from the passive and active tags attached to the container. As the container doors were opened and the unloading process initiated, the pallets' passive tags were also de-associated from the passive and active container tags. The cargo was then unloaded and awaited pickup by a separate trailer as part of the cross-docking activity.

Prior to pickup from the Long Beach port, the new trailer had six more passive and active tags applied and commissioned. The cargo-loading event was then captured by two fixed interrogators and one handheld (for the CAT tags), and the passive pallet tags were associated with the new passive and active tags on the trailer. After loading, the trailer was closed, a new mechanical seal was installed, and the seal ID number was manually entered as the tags were read. Then, once the container tag was interrogated, the pallets were associated to that tag and the mechanical seal data was associated to the read. As the trailer exited the yard, readers captured the trailer's departure from the cross-dock facility.

Another set of interrogators located at the warehouse entrance gate read the trailer tags, thus capturing the trailer's arrival at the consignee's warehouse in Janesville, Wisc., where cellular communications were employed to transmit the data from readers to the middleware to the EPCIS software. When the mechanical seal was broken prior to unloading, the data from that seal was manually entered as the container tags were read, and the seal was again de-associated from the trailer's passive and active tags.

The cargo-unloading event for the CAT tag was captured with handheld readers—fixed interrogators for the XCAT tags—and the passive pallet tags were de-associated with the passive and active trailer tags. The cargo was then unloaded from the trailer, and the consignee accepted delivery of the cargo, after which point the data from all of the reads was transmitted to the EPCIS application via the middleware.

Shirley Arsenault, TLS facilitator at EPCglobal, cites several challenges in this pilot program. Because researchers tested several types of tags on the containers and trailers, six reads were received for each container and three readers were installed at each read point to capture the various passive and active reads. The pilot included four middleware providers—Oracle, NEC, Globe Ranger and Adtio—to upload the information to the EPCIS application. Those four companies had to capture data using XCAT and CAT tags.

"The suppliers of the EPCIS and accessing applications also had to make modifications to their software," Arsenault says, "to accommodate these changes and make decisions on how to display information." For instance, although there was only one container, there was read data for six container tags that needed to be displayed. "The XCAT tags performed very well," she claims, with 100 percent read rates. "There were greater challenges with the CAT tags, requiring fine-tuning of reader location and parameters."

The project also demonstrated that vehicle identification needed to be more precisely defined. In the ocean section of the pilot, for example, the ship was identified using a Global Location Number (GLN), traditionally utilized for fixed locations. In the pilot's air section, the truck trailer was identified with a Global Returnable Asset Identifier (GRAI).

"Further discussion, consensus and guidelines need to be developed for end users," Arsenault states. Overall, the pilot found that with the improved shipment visibility, basic logistics processes such as yard operations, receiving/shipping processes and alert notifications for exception management can benefit from the application of EPC and RFID technologies.

Some modifications had to be made for the program. For instance, GS1 had planned to install readers at the port terminals, and to transport some of the shipments via rail. Due to time constraints, however, the organization was unable to complete the negotiations to include this in the pilot. GS1 had also intended to incorporate customs requirements in the EPCIS data, but was unable to complete discussions with the appropriate organizations within the project deadlines.

Phase three of the pilot is now being planned, though GS1 has provided few details about this phase thus far. The trade lane will include Europe and Asia, and the pilot will span a greater period of time with additional shipments. "We are also inviting customs to participate in the pilot discussions," Arsenault says.

The second phase reinforced the need for standards adoption since it proved the efficiency of the technology, and now points to the need for a shared standard to make it possible for parties throughout the supply chain in various parts of the world to share data. What's more, Arsenault says, the pilot stressed the importance of EPCIS accessing applications, which will make it possible for parties to use EPCIS to access information regarding a shipment.

Phase-two participants also included Alien Technology, which provided CAT tags; Allumis, EPCIS accessing application; Confidex, CAT tags; DHL, logistics services; iControl Inc., tags and readers; Motorola, interrogators and tags; NTT, tags; NTT Comware, middleware; NYK Logistics, project management and aircraft; Savi Technology, tags and readers; and UPM Raflatac, tags.

Additional participants were Japan's Ministry of Economy, Trade and Industry (METI), which supplied funding for the air portion of the pilot; and GS1 member organizations from China, Hong Kong, Japan and United States. Funding for the Transportation and Logistics Phase 2 pilot was also provided by the participating organizations.