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RFID and Barcode Tracking Mandates

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Introduction

Up to about October 2003, the field of material tracking has been one of steady but unspectacular improvement over a period of twenty years or more. All of a sudden we are seeing dramatic changes in technology and especially in mandates by customers and the US Government. Some of the areas in which we are seeing major changes are:

- Barcode Labeling. The American product labeling standards organization (UCC) got together with the European product labeling standards organization (EAN) to produce a new set of UCC/EAN standards for barcode labeling of products. This includes the adoption of "License Plate" tracking as the standard methodology for tracking containers.

- Identification. RFID (Radio Frequency Identification) and EPC (Electronic Product Code) technology is now becoming low enough cost to be put into practical use. Up to mid–2003 application of this technology was hampered by lack of standards. ISO has released and continues to release standards that will enable the widespread adoption of this technology with interoperability between tags and tag readers.

- Advanced Shipment Notices. With the widespread use of the Internet, customers are requiring that their vendors place a unique tracking barcode on each pallet or other container and then send Advanced Shipment Notices (ASNs) using EDI or XML technology to them when the container is shipped. The ASN contains a description of the contents of the container along with the UCC/EAN barcode or RFID tag license plate to identify the container.

- Traceability. With fears of increased terrorism in the USA, the FDA has been given sweeping powers under the Bio–Terrorism Protection Act to require every organization in the food chain to be able to trace the source and destination of all materials they handle within four hours. This includes providers of packaging materials and anything else that touches the food or the human body and covers 25% of all goods sold at retail in the USA. We are also seeing QC (Quality Control) traceability requirements being placed on many vendors by their customers.

Sources of Mandates

While new technology is great, it is never adopted without major driving forces. In the case of tracking and identification technology, it is being driven largely by mandates from a number of organizations:

- Barcode Labeling. Being driven by large retail organizations, such as WalMart, large distributors, such as Sysco, automobile manufacturers, such as Chrysler and GM, and the

DOD (Department of Defense). These organizations are all requiring their vendors to apply barcode labels so as to make the receipt and processing of vendor materials as quick and mistake free as possible. They want to avoid the mistakes and labor–time required for manual data entry of data at time of receiving and replace this with a single scan of a barcode tracking label. These same requirements are now being adopted by smaller organizations for their suppliers down the supply chain as they all see ways to improve their efficiency and cut their costs.

- Identity. The big drivers for adoption of RFID tags are WalMart and the DOD. Both have mandated the use of RFID tags for pallets in January 2005. Initially these will be used in place of barcode tracking tags in receiving but these organizations plan to extended the use of RFID tags for tracking materials throughout their internal supply chains. The goal here is to further simplify material tracking by automatically reading the RFID tags at receipt rather than scanning barcodes. Many other large organizations are watching these initial trials and will move quickly to adopt the technology if successful.

- Traceability. The big player in the USA is the FDA (Food and Drug Administration) which now controls tracking and traceability of anything that relates to products that touch the human body in such a way as that could cause harm. They have traditionally controlled the manufacture of pharmaceuticals with their Good Manufacturing Practices requirements issued under the Federal CFR (Code of Federal Regulations) Part 21. Their role is now being expanded dramatically and will impact many other manufactures and distributors. Of particular note is the CFR 21 Part 11 requirement that lays down the requirements for electronic tracking systems used in FDA regulated applications.

  The European Union (EU) is starting to become a big player with traceability requirements on genetically modified foodstuffs. This is what is called a credence mandate in that we cannot easily tell genetically modified food from non–modified food but have to place credence in its labeling based on being able to trace the food back to its seed origins. Credence tracking is also becoming important in the USA for applications such as organic foods, Made–in–America and Union–Made labels.

  The Department of Homeland Security is requiring ever tighter regulations on the traceability of materials from cargo shipping containers and individual parcels. To combat terrorism it is essential to be able to rapidly trace back materials to their source and to monitor the flow of materials so as to prevent terrorist attacks.

  The DOD, the aerospace and automotive companies have always been big on component traceability so as to ensure the quality of the materials used in mission critical applications. These requirements are being tightened as the sources and deployment of materiel are becoming global.

  A major concern of many organizations is the introduction of counterfeit materials in the supply chain. It used to be that careful visual inspection would reveal which materials were counterfeit and which were not but, with modern technology, the fakes are indistinguishable from the real products except with sophisticated testing techniques. These counterfeit products range from pharmaceutical drugs to aircraft and automotive parts to hair salon products, watches, and handbags. The only way to guard against this

problem is to ensure that complete traceability back to the source is maintained throughout the supply chain.

Forces Driving Mandates

- Globalization. When you made a product in New Jersey and sold it in New York, it was easy to keep track of materials. Also there was no competition from China or Mexico so it was OK to be inefficient in your supply chain tracking as long as everyone else was in your limited geographic region. Now we are competing against the rest of the world while striving to maintain a high standard of living and high wages, so we have to use every technological advantage we can to squeeze costs out of the supply chain.

- Security and counterfeit protection. Terrorists and criminal organizations now have a global reach and it is critical to deploy technology that will give us early warnings of problems and enable us to react quickly and effectively when problems arise.

- Availability of cost effective technology. RFID tags and technology are now coming down in price to the point where this technology can be effectively deployed to track shipping containers, pallets, and other large containers. Soon EPC (Electronic Product Code) tags will replace or supplement UPC tags on all (or at least all expensive) retail goods. The availability of the Internet is now making ASN notification cost effective for many smaller organizations. Also barcode technology has become so inexpensive that it can be economically deployed almost everywhere.

- Lawyers and the cost of litigation. Hospitals kill people by administering wrong drugs to patients. Airlines kill people by using wrong parts on their planes. People get killed due to manufacturing defects in cars that are not spotted quickly enough. Defective products injure people. All these, and the attendant cost of litigation, is making it imperative to employ tracking technology to avoid mistakes. Nurses can scan a barcode on a pill case and a barcode on the patient's wrist band and have their mobile computer verify the drug and the dose is correct. Manufacturers can immediately track back the source of each problem and issue a speedy and limited recall that may prevent litigation. Contrast this with the Ford Explorer – Firestone tire fiasco which resulted in over 100 people being killed in rollover accidents and a cost to the manufacturers over $4 Billion.

- Availability of the Internet and global communications. This enables computers as well as people to exchange information on a world–wide basis. It enables products to be tracked from their source to their ultimate user.

- Availability of Global Standards:
    - UCC/EAN for barcode standards
    - ISO for RFID and EPC tags
    - FCC and ECC for wireless communications frequencies and standards.

  These are enabling materials to be tracked globally across national borders and make the adoption of these tracking technologies economical for the large multi–national organizations that drive the supply chain.

Conclusion

In the near future, we will be seeing many more tracking, labeling, and identification mandates being required of manufacturers, food processors, and distributors by Government agencies and by large retail, distribution, and manufacturing organizations. Many suppliers to these large organizations still currently make extensive use of pencil and paper data recording and manual data entry to track and label their products. These suppliers will need to adopt these rapidly emerging technologies or they will lose their major customers.

Author

This paper was written by Dr. Peter Green, who is a leading expert in real–time material tracking and control. He holds a BSEE and a Ph.D. in computer science and wireless tracking, both from Leeds University in England. He has over 35 years experience leading teams in the implementation of systems for industrial, commercial, and government applications. He was formerly on the research staff at MIT and was a Professor at WPI. He is currently the President and Chief Systems Architect of BellHawk Systems Corporation where he has led the development of its line of barcode and RFID tracking software as well as its innovative wireless mobile computer technology.

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