

## **Information for Managing the Cold Chain Necessary v. Sufficient?**

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### **Synopsis**

The cold chain is a specific, high value portion of many business' supply chains. Traditional supply chain management systems produce information regarding "transactions" (orders, shipments, payments) and "location" (warehousing, traffic, inventory). Perishable goods require information regarding their "condition" as they change in value while in the supply chain. It is possible to improve the quality, timeliness and granularity of traditional supply chain information with sophisticated data gathering applications, such as RFID. However, product losses due to improper management of product condition can easily overshadow gains expected from that incremental investment.

While transaction and location information are necessary to proper management of the cold chain, they are not sufficient. Condition information must be part of the equation.

### **Background**

Defined at a high level, the supply chain encompasses all value-added activities involved in delivering a product to an end customer: manufacturing, logistics and transaction management. Using this definition, the supply chain must be considered to be among the most critical set of processes in any enterprise, even as they become more complex and global in nature. That complexity is evident in both the in-bound and out-bound segments of the supply chain.

Today, the markets for raw materials are worldwide, requiring even the smallest businesses to operate in-bound supply chains of increasing length. With improvements in communication technologies, out-bound supply chains are also becoming longer also facilitated by new kinds of logistics suppliers that make it possible to service remote locations as easily as if they were right around the corner.

Information technology has developed rapidly in order to enable these extended supply chains. There is a large amount of data required to keep these processes on track, and it has to be delivered quickly from various geographically distributed locations. Complex systems are built from enterprise-wide resource planning/execution, integrated warehouse management/traffic, customer relationship management and data/telecommunications systems. Data from these systems is considered the enterprise's lifeblood, allowing customers to be properly with the correct product while generating and sharing proper transaction records. It is important to consider the nature of this data.

Supply chain management systems traditionally developed two kinds of information: transaction and location. Transaction information conveys all of the financial details of the exchange of goods for currency. Order management/CRM, purchasing, shipping, point-of-sale systems, etc., provides information to the enterprise financial systems showing how much material was bought, sold, shipped and then how much money was paid and received. Location information is more specific to where the actual goods themselves are; in-transit (traffic), warehouse, inventory systems generate this kind of information. This data may not be sufficient, depending upon the nature of the goods being supplied.

### **The Cold Chain—A Special Case**

A wide variety of food, pharmaceutical, and chemical products are degraded by improper exposure to temperature, humidity, light or particular contaminants. “Cold chain” is the term applied to a supply chain established for products that must be handled under controlled temperature conditions.

Exposure of these temperature-sensitive, or “perishable” goods, increases the potential for them to diminish in value. However, different categories of perishable goods can degrade at different rates. The value of food products can decrease incrementally. Consider a truckload of fresh produce that is subjected to high temperatures while in-transit. Product that was once fresh and valuable is less valuable at the point of delivery. This loss of value can be measured as a reduction in available selling price/grade, weight and/or shelf life. There is also a much greater risk of microbiological contamination. Foods stored above 41°F provide a rich growth environment for both spoilage organisms and pathogens, resulting in greater risk of both economic loss and an outbreak of food borne illness.

Compare this incremental loss of value to the risk posed to a pharmaceutical product. Many drug products require storage at 2°C to 8°C; a good example is a vaccine. As part of the qualification of that drug product before it is allowed to be sold, the manufacturer studies the impact of storage conditions on the product’s shelf life. If the product is exposed to temperatures outside the acceptable range determined in this “stability testing”, the product is considered to be neither safe nor effective. In this case, the product must be withdrawn from sale; it is worth nothing. Clearly, this results in serious economic loss to the members of the cold chain. A container-load of biologically derived drug products can be valued at more than \$10MM.

However, there are other issues to consider. When drug products are in limited supply, not having that medicine available because it was mishandled, results in serious social cost. Further, in a 2001 case documented in Massachusetts, vaccines were rendered ineffective, as they had been inadvertently frozen while in storage. This resulted in increased health risk for portion of the Commonwealth’s children and a product loss valued at \$200,000.

### **Managing the Cold Chain—Additional Required Information**

The cold chain includes all stages of perishable product movement or value-add, whether the goods are in-transit, in process, in-storage or on-display. For enterprises that manage temperature sensitive goods, the investment in equipment and labor is considerable. An inventory of the specific assets and standard operating procedures all dedicated to the management of temperature may include refrigerated trucks, containers, cargo holds, warehousing, packaging, display cases, personnel, and training. These are specific assets and labor costs deployed to manage specific products. By definition, they require specific information in order for the associated processes to be managed properly.

Where traditional supply chain systems provide transaction and location information, the cold chain requires additional information about the “condition” of the product. Doing business in perishable goods requires similar systems that allow goods to be bought, sold, produced, shipped and stored. However, it is critical that their condition also be tracked, so that the changes in value can be monitored, controlled minimized and improved.

Knowing that a drug product is safe for sale, or that a container of imported salmon must be sold quickly, is critical to the members of the supply chain. This knowledge provides a higher level of control, a critical aspect to managing processes that are increasingly complex. The additional control afforded by better information allows supply chain members to know that incoming material is an out-of-spec product and must be replaced, or re-routed to a closer location and promoted for quick sale because of its reduced shelf life. It should be noted that this concept of control is not just a logical business concern. For officials charged with the safety of our supply of both food and pharmaceuticals, such as the Food and Drug Administration, documented levels of process control are a matter of regulation.

**Summary**

The supply chains required by current business practices are longer and more complex than ever before. Technology advances in the business and communications systems have made the controls available to manage that complexity, generating more data, faster and at greater levels of granularity. Those data fit the categories of “location” or “transaction”, and the application of RFID technology promises significant improvement in data production.

However, it is necessary to consider the nature of the goods moving through the supply chain. For perishable goods that require the creation of a “cold chain”, it is vital that “condition” information be generated and tracked by the management system. Because perishable goods can change in quality and value, knowing their condition is critical to optimizing the performance of the supply chain. Without condition information, the benefit of additional system investment, such as in RFID, will not be fully realized.

**About Sensitech**

Sensitech is the leading independent provider of cold-chain information and analysis that enable global leaders in food and pharmaceuticals to protect the integrity, freshness and efficacy of their temperature-sensitive products. In the past decade, Sensitech has protected more than \$200 billion of its customers’ assets around the globe. The company is based in Beverly, Massachusetts, and has offices in Redmond, Washington, and Fresno, California, with service and distribution offices around the world. For additional information about Sensitech, call 978-927-7033 or visit [www.sensitech.com](http://www.sensitech.com).