

Perspective



Machine-to-Machine: A Fresh Approach to Profits from Perishables

Meera K & Harish Rajan

Abstract

High value temperature-sensitive perishable products hold the promise of healthy profits for marketers. The catch is in getting them to the consumer – intact. The key to success in this business lies in ensuring the integrity of the cold chain within an efficient supply chain.

This Infosys paper offers insights on the challenges involved and an effective approach to automating processes with machine-to-machine communication to eliminate cold chain breaks.

Overview

Growing consumption and demand are driving producers and marketers of temperature sensitive products to ensure that such highly perishable products reach their target consumers in good shape. The demand for new temperature sensitive vaccines, healthcare, flowers and food products has resulted in increasing volumes of such products being transported across the world. Other products requiring specialized transportation facilities include high-tech micro-chips that are shock, humidity and temperature sensitive. These products require seamless cold chains to ensure that they reach consumers unblemished.

Whatever the perishable product – healthcare, food or high-tech – while the characteristic ‘temperature sensitive’ applies to product safety and quality, it impacts logistics and cost.

Perishables are high profile and, potentially, high-profit products. To ensure high margins from these products, it is critical to execute the supply chain flawlessly. The perishable cargo market is growing at 7.1% annually – faster than any other sector currently in global airfreight – and is expected to assume increased significance to airlines, airports and logistics companies over the next 5 years.

According to some industry statistics, losses of up to 33% of perishable freight are common. These losses mainly occur during storage and transportation. In dollar terms wastage can be as high as USD 35 billion annually.

Behind the scenes, challenges include new food security measures, higher fuel costs, increased port congestion, and intensifying retail competition.

To maximize profits and minimize losses due to supply chain gaps, marketers must ensure the integrity of the cold chain at each hand-off until the product reaches the consumer.

Cold Chain Logistics

A cold chain is the vital link providing temperature control in the entire supply chain of production, storage and distribution of perishable products. It ensures that these products retain their characteristics and associated value.

Evolving Scenarios

Given the premium placed on location, flexibility, and unique storage and handling requirements, perishables companies are inevitably driven to outsourcing logistics services. It is therefore imperative that new generation logistics enterprises adopt processes and technologies to cater to this fast growing market.

Refrigerated and temperature-controlled logistics providers are extending their value proposition to meet the varying demands of manufacturers and distributors of perishables. With services ranging from freeze blasting and variable temperature storage, to LTL consolidation, and integrated rail movement, outsourced logistics providers offer solutions for a range of cold chain requirements.

Third-party logistics providers are offering scalable solutions leveraging their proprietary technology, assets, and expertise to help manage the complexities of refrigerated warehousing and distribution.

Challenges

There are considerable challenges involved in achieving and sustaining the integrity of the cold chain. The complex distribution scenario involves refrigerated trailers, trains and cargo carriers with multiple hand-off points. Mishandling is commonplace while transporting fresh produce from the farm to the warehouse and thereon to the distribution center to be forwarded to retail outlets.

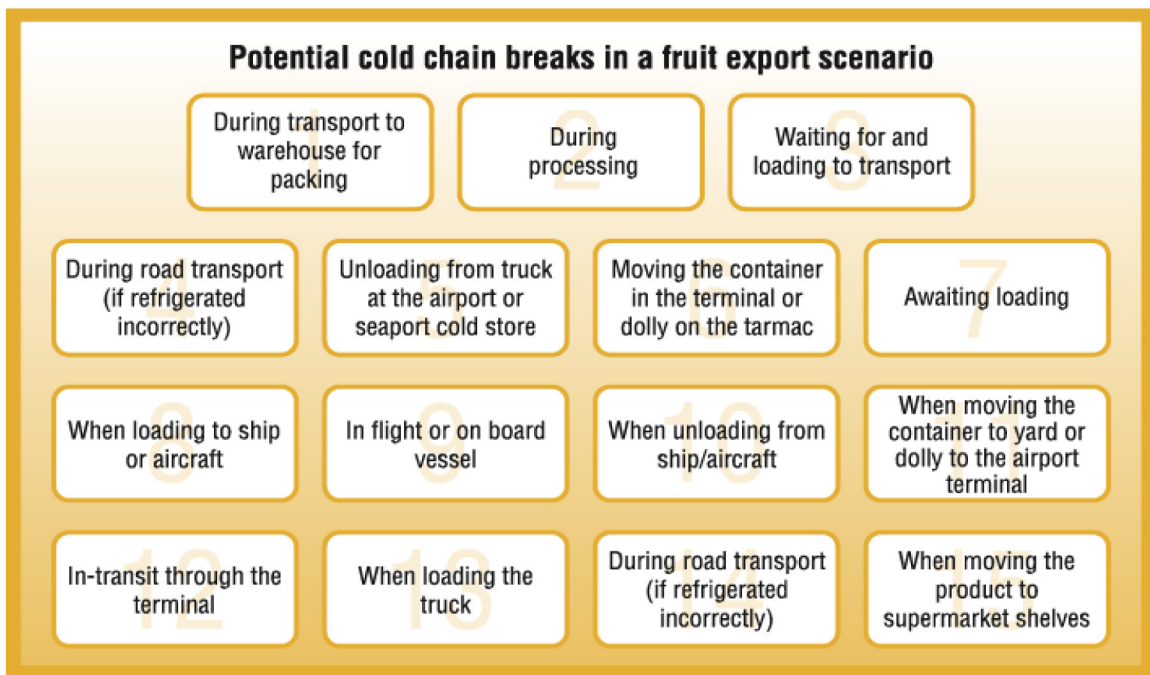
Perishables are susceptible to temperature abuse at every point in transit whether it is an open air loading dock at a distribution center or retail store, a higher-than-acceptable control temperature setting at Customs, or simply placement in the wrong section of a multi-refrigerated trailer.

External drivers such as regulatory and industry demands for quality improvements in cold chain logistics solutions are exerting greater pressure on logistics providers, particularly in the transport of temperature-sensitive pharmaceuticals.

In addition, internal quality assurance departments are placing ever more stringent strictures on logistics. Their concern goes beyond regulatory compliance to [reducing total operating costs and losses while preserving product quality](#).

The following factors can be critical to the success of a perishables supply chain:

- **Time lost in trans-shipment** translates at best to a shortened selling window; at worst to dead inventory or dissatisfied consumers. Exporting by sea is more economical, but **the transit times** involved make it imperative that the cold chain is managed seamlessly
- **Globalization** places additional pressures on businesses that source food products from myriad offshore locations. This translates to increased competition for products closer to demand domestic distribution networks, optimal transit time & just-in-time inventory management.
- **Temperature logging devices** used in the container to monitor air and/or produce temperature should be **strategically located throughout the load** to give a more accurate guide to the temperature
- **Integrating warehouse and transportation services** is important to ensure that the product remains in a "continuous movement" loop within the supply chain



Impact of cold chain failures

Apart from financial loss, cold chain failures can impact operations with possible cascading effects – especially on throughput and inventory management. Cold chain failures often lead to:

- **Impact on commercial advantage:** Commercial advantage is often lost in cases of poor logistics service reliability due to last minute changes to schedules, schedule slippage, service cancellation, missed trans-shipment connections, industrial disputes, and/or inaccurate arrival information
- **Impact on product throughput:** Failures in the cold chain caused by inadequate package at the point of shipment, damaged goods, lack of cold storage prior to shipment during transshipment, failure to maintain reefer temperature or place product in cold storage on arrival, failure to obtain prior Customs clearance, failure to use refrigerated transport after clearance and failure to maintain temperature control can impact the overall supply chain throughput.
- **Inventory control:** Inventory management can be compromised by inaccurate cargo details resulting from late or incorrect documentation, incorrect labeling, and ignorance of clearance requirements.

Improvements to Keep the Cold Chain Intact

Measures that can assist in maintaining cold chain and product integrity include having specialized vehicles to transport temperature sensitive products.

It is critical to ensure that refrigerated temperatures are set prior to loading and maintained during transport, besides deploying temperature (and humidity) recorders. Other devices such as probes measuring the internal temperature of products and remote recorders in shipping containers help achieve temperature control. Accurate measuring and recording are crucial throughout the chain.

On the shipping front, specialized scheduling procedures, defining specific pick-up and delivery times and better scheduling of deliveries are essential. These processes must be accompanied by better handling procedures and increased use of mechanically assisted devices to load and unload shipments to minimize product damage.

It is also important to closely monitor transfer points, such as chiller/ freezer to cold store, factory to distribution vehicle, retail cabinets to consumers' refrigerators as these are typical problem areas.

Most of these improvements can be implemented through automation and remote management leveraging machine-to-machine communication.

Infosys Approach

The Infosys approach to effective cold chain management is driven by critical tracking and monitoring intelligence captured remotely with the help of Machine-to-Machine or M2M technology. The M2M technology-enabled solution connects machines in the field with each other and with back-end enterprise systems to provide clear visibility and actionable field information to decision makers.

Knowledge of the location of the reefer (refrigerated trailer/railcar/ship), restricting reefer movements to a predetermined area (geo-fencing), monitoring the reefer status for temperature, humidity, shock, are vital intelligence inputs that can be utilized to solve logistics issues.

These inputs can be captured using M2M, which is an automation technology based on open standards and protocols. M2M technology based remote data capture and remote control of reefer equipment provides real time visibility into the location and status of a container and its perishable cargo.

The methodology involves building a system based on sensors in the cold storage or transportation container networked with backend systems using a combination of short range wireless and/or wire-line technologies (landlines, cellular, WiFi, satellite technology, etc.) to ensure that perishables are handled in line with the procedures.

Methodology Features

The Infosys approach provides for data capture by wireless motes that are tiny, self-contained devices containing sensors to communicate with each other and other devices. These low-cost devices can measure parameters like temperature, humidity, power levels, etc. Multiple motes embedded throughout the container verify temperature/humidity levels at various points.

Motes communicate with each other using a short range wireless technology like Zigbee in a mesh network and are distributed across reefers and cold storage locations. Each location has one mote as the coordinator to collect information from its peers.

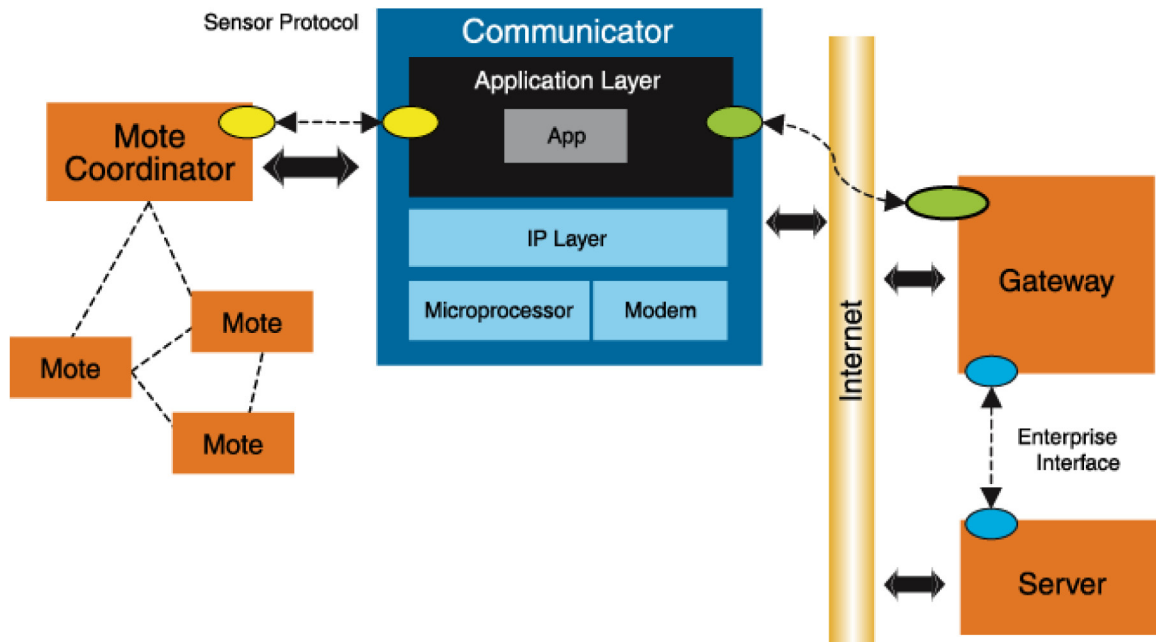
Communication with backend systems is performed by a long range communicator module that “plugs” into the coordinator mote (over a serial interface) and transfers the data to the backend monitoring systems.

Embedded intelligence in each mote (a tiny program) gathers the sensor data for transmission to its peer motes using a low bandwidth binary protocol. The coordinator mote uses the same protocol to transfer the data to the communicator. Motes do not store any information; they are programmed to only share the sensor information at any instant in time.

The communicator is an intelligent device comprising of a processor and a radio module and can communicate with backend systems over different types of networks like WiFi, cellular or satellite. Communicators can be designed according to the needs of a logistics provider. The communicator can directly talk to the gateway over the Internet using an xml-based application protocol. It has the intelligence to accept and store sensor data, periodically transmit information to the gateway, get control commands from the gateway, and send control/configuration information to the motes.

Enterprise interface is provided by a gateway which is a single point contact on the network that front-ends the enterprise systems. It provides interfaces to control remote terminals (communicators) and gather data through a standard interface like Soap, RPC, DCOM, etc.

Methodology Components



Benefits

- Cost effective:
 - Several low cost motes to sense data, but only one communicator in a location (ship or truck or warehouse)
- Real time access to sensor data
- Ability to monitor temperature in real time
- Reduced insurance claims and premiums due to proactive temperature management
- Proactively switch on the reefer with correct temperature settings
- Reduced risk of losses through monitoring of temperature variations
- Increased reefer fleet and asset efficiency from real time tracking of container/reefer movements and stops

Conclusion

Delivering perishable products to consumers involves considerable complexities and risks, particularly in the successful operation of cold chains. Accurate and timely information on the temperature, humidity and transit status of these goods is critical for producers, distributors as well as consumers.

The Infosys approach to achieving and sustaining cold chain integrity involves automating intelligence collection and transmission using Machine-to-Machine or M2M technology. This methodology provides the new generation logistics enterprise the capabilities to ensure successful and efficient cold chain operations enabling it to differentiate its offerings for the perishables market.

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About the Authors

Meera K was part of the Wireless and Multimedia group at Infosys. She was part of M2M Center of Excellence and has worked on defining M2M solutions for various segments including retail, transportation and automotive.

Harish Rajan is a Senior Associate, Transportation & Services Business Solution Consulting Group, Infosys, and can be reached at harish_rajan@infosys.com



For more information, contact askus@infosys.com

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