

Wireless technology to give real time cold chain security

The worldwide shipment of refrigerated food is big business. Over 60 million tonnes of refrigerated products are shipped around the globe each year, at an estimated value of US \$1 trillion. In Australia, domestic perishable shipments are valued at US \$22 billion (A\$28 billion)

Adam Carey reports on a new Australian initiative that's keeping an eye on every link in the chain.

As suppliers of perishables go to greater lengths to protect their interests by improving quality assurance at all stages of the cold chain, technology vendors are producing new and innovative solutions to help them get access to more data about their shipments, and get it fast.

An Australian company, Ceebron, has spent the past four years developing a temperature monitoring technology that uses low-cost disposable tags, an ad hoc wireless network and the internet to relay near real time data during transit from the pallet to the supplier.

While radio frequency identification (RFID) technology has been gaining traction in cold chain applications, Ceebron founder and chief executive Don Richardson says wireless networking is a more robust and immediate communications mode than RFID.

"Getting a signal from the back of a semi-trailer through 30 tonne of frozen meat is no mean communications challenge ... and we can do all that quite well with this technique, whilst previous trials with alternative technologies have not been able to yield these sorts of results," he says.

He says ad hoc wireless networking is also more adaptable to changes in conditions during transit, such as a shifting pallet load or wireless interference, than other track and trace technologies.

"If something moved or if a network was disturbed, the network is smart enough to find an alternative way to get the message through on time," he says.

The solution was developed in conjunction with telephony giant Motorola.



One of the Smart Trace tags

In January, Food Science Australia, a joint venture of CSIRO and the Victorian Government independently conducted four field trials to test the reliability and accuracy of the Smart-Trace system.

Perishable products including frozen and chilled lamb and beef, pre-cut salads, juice, garlic bread and vaccines, were transported by both road and rail along the east coast of Australia, and from Brisbane to Fremantle via Melbourne, in fully loaded trailers with Smart-Trace tags attached to pallets throughout.

The trial outcomes validated the concept and development work carried out over the past four years.

Two sea trials are scheduled for later this year, with a consignment of frozen beef to the US, and chilled beef to Japan.

Richardson says the most surprising revelation from the trials was the level of temperature variation that was recorded within a single, fully loaded refrigerated trailer.

By the end of a 130-hour road journey from Brisbane to Fremantle, including a run across the Nullarbor Plain in which the outside temperature peaked at 45°C, the tags had recorded temperature variation of as much as 7°C inside individual trailers.

These variations fall outside allowable levels in food safety regulations.

Food Science Australia also monitored the temperature using 200 sensors of their own placed throughout the load (see thermographic chart).

Although Food Science Australia vouched for the accuracy of the Smart-Trace tags after the trials, the temperature readings from the tags were found to have fallen half a degree Celsius outside FSA's readings.

According to Richardson, this glitch was remedied by changing the calibration formula of the volume signal emitting from the tag.

"We're trying to provide a level of responsiveness to our customers that protects their relationship with their powerful retailer friends and their logistics services partner," Richardson says.

Numerous factors during transit conspire to create variable temperatures within a single pallet load, including; ambient heat, thin insulation, damaged door seals, poorly maintained refrigeration units and trailers loaded above the regulation load line.

You add all those sorts of things together and they result in variability that has been not apparent to the consignors of product to date. We're providing (suppliers) a tool to see just what sort of variation does exist. Once you have a problem and you can measure it, then you can start doing what needs to be done to improve it."

Armed with this information, suppliers can make a decision with their retail partners about whether to cancel the consignment, or sell it with a shorter shelf life, depending on the level of temperature abuse that has occurred.

Industry association Meat and Livestock Australia (MLA) has provided approximately 50 per cent of the \$4 million funding for research and development of Smart-Trace over the past four years, in an effort to improve quality assurance in its industry.

According to MLA market estimates, in 2005 the domestic retail value of the red meat market was over \$8.1 billion, and the export market was worth over \$5.5 billion to Australia.

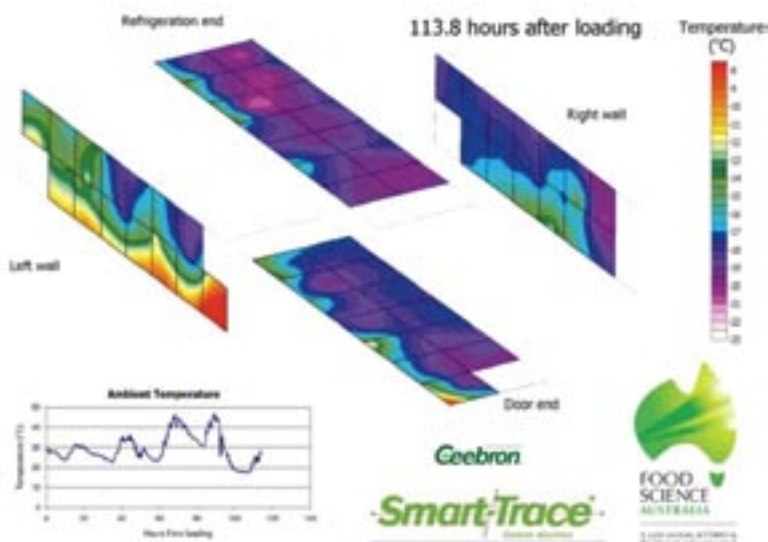
Australian red meat exports to Japan and Korea have hit record levels in the past two years, benefiting from concerns about mad cow disease in the US.

But MLA forecasts stiffer competition in the next few years as US beef exports recover and South American exporters fight for a bigger market share.

"Red meat represents a fairly sensitive product category both locally and internationally when it comes to food safety concerns, so being able to provide full traceability, and in near real time, is a competitive advantage for

companies in Australia trying to compete with the likes of Brazil or Argentina," says Richardson.

Full and timely traceability to ensure food safety is increasingly becoming a requirement for access to major international markets, following recent regulatory changes adopted by developed nations under the jurisdiction of the United Nations and the World Health Authority. ■



Temperature map of trailer load of frozen meat from Brisbane to Fremantle

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