Enabling transparency in the meat supply chain

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From the editor ...

Everybody is talking 'traceability'. Some consumers want to be able to see an image of the paddock where the beef was raised when they buy their steak in the supermarket and food processors want to be able to identify the source of all of the meats in their sausage rolls. The 'ISO 9000:2000 Quality Management Systems. Fundamentals and Vocabulary' says traceability is the ability to trace the history, application or location of that which is under consideration and when relating to products, traceability specifically entails "the origin of materials and parts, the processing history and the distribution and location of the product after delivery"; while the European Community Regulation 178/2002 'General principles and requirements of food law' defines traceability as "The ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution." Legal requirements are slightly different in many countries but the general gist is that in the event of a recall every item should be locatable. You may think this is a huge ask but modern technology including sensors, coding, communication systems and the Internet of Things is making traceability from paddock to plate an achievable reality.

Janette Woodhouse

Editor – *What's New in Food Technology and Manufacturing*

The IoT and the red meat supply chain

Countries, companies and consumers are demanding accurate information and precise identification of the products they purchase and many countries are implementing legal requirements for traceability. Internal and external visibility from the animal in the field, through the processor and distributor to the meat pie in the supermarket, is now becoming expected.

The path from the field to the fork is often long and tortuous but technologies, techniques and standards now exist to enable robust whole-chain traceability in the red meat industry.

The biggest enabler of this extensive traceability is the Internet of Things (IoT). Research firm Gartner estimates that the IoT will consist of 26 billion sensors, instruments and connected devices by 2020 (and this staggering number does not include smartphones, PCs and tablets). In another measure, International Data Corp estimates the annual revenue from IoT solutions will be around US$7.1 trillion in 2020.

Ultimately, nearly every business will be supported by machine intelligence transmitted through the IoT. However, for this to actually work the businesses will have to rely on accurate, fresh, timely operational data. And where will this data come from? It will be up to the foot soldiers of the IoT, the sensors embedded into the operations, to collect and communicate the data. Interoperability will be essential so that the data from one part of a supply chain in one company can be comprehensible to the rest of the users of the data.

GS1 New Zealand General Manager, Sector Development Gary Hartley has long recognised the potential in the IoT to transform the livestock industry and has conducted several trials that have demonstrated the IoT's viability for this task.

In 2012, Hartley and a network of deer farmers and processors, a shipping company and a distributor successfully demonstrated how a cut of venison sold in a Hamburg butcher shop could be traced back to a particular deer on a New Zealand farm. Radiofrequency identification (RFID) technology and the IoT were used for the tracking.

It wasn't all plain sailing as all of the players had to agree on a consistent, standards-based methodology for classification of the meat cuts. This was achieved using a network of parent/child RFID codes.

Hartley completed another demonstration of global traceability in the meat industry in 2014 when GS1 and ANZCO Foods trialled the use of RFID technology on a shipment of Halal-certified meat products to Kuala Lumpur.

In response to Muslim consumers becoming concerned about the authenticity of Halal claims on meats, the Malaysian Government has established an economy-wide repository on Halal products. The Halal Industry Development Corporation (HDC) has used industry-standard GS1 data formats and technology for the synchronisation of data between trading partners. This 'data pool' will enable supply chain transparency and traceability and the systematic authentication of both local and imported Halal products. (Food producers, processors and distributors will need to be registered with the HDC and to submit their product data).

In the ANZCO/GS1 trial, RFID technology was used on a shipment of Halal meat products to Kuala Lumpur. The products were certified at processing and then tracked and traced using EPC/RFID tags, readers and databases between processing in NZ at ANZCO's Kokiri plant and delivery to the Kuala Lumpur cold store.

The use of EPCglobal/GS1 Standards facilitated the interoperability and communication between the participating bodies.

EPCglobal Network

A GS1 initiative, the EPCglobal Network is a suite of internet services for sharing product data around the world. The open standards-based system will make organisations more effective through real and timely visibility of information about items in the supply chain.

The global standard combines low-cost RFID technology, existing communications network infrastructure and the Electronic Product Code (EPC) (a number for uniquely identifying an item)

to create cost-efficient, real-time, accurate information about the location of items, the history of items and the number of items in the supply chain.

In contrast to a barcode, which only contains the identity of the product and its manufacturer, the EPC enables the inclusion of serial numbers that identify the item right down to the 'instance' level; for example, a case of rump steak can be identified separate from all other cases of the same product.

EPC numbers are not only used to identify items, they can be used to identify locations as well. In a meat processing plant, an EPC number can be used to uniquely identify specific locations on the site (say a boning room or an export dock door).

For tags and readers to be EPC compliant, the equipment needs to comply with a number of EPC-related protocols and standards. A key hardware standard requirement for all EPC tags and readers is interoperability.

The EPCglobal Network encompasses both the EPC identification numbering schemes and a special network component named the EPC IS, or Electronic Product Code Information Service. The EPC IS is the database component of the EPCglobal Network, which stores individual item data and event reads. It enables network users to exchange EPC-related data and thereby manage the movement, storage and presentation of the dynamic information required for traceability. EPC IS can be used in any industry, anywhere in the world. It can be used to link entities, objects, places and occurrences of all kinds in a dynamic manner; ie, the IoT.

No system is better than its components

RFID and barcodes, along with supply chain collaboration, can provide timely, actionable data related to the movement of the product through the supply chain and traceability for regulatory compliance.

Data collection by barcode and RFID is particularly accurate — often greater than 99%.

However, the system is dependent on accurate product identification. If the printers, label materials, scanners and sensors are not adequate for the task and suitable for use through the rigours and extremes of the movement of the product, the data gathered will be compromised or invalidated — and ultimately, useless.

The red meat industry is harsh — equipment such as sensors and scanners and consumables like labels must be robust enough to withstand cold-room, freezer and washdown conditions. Time taken to ensure this equipment is fit for these extremes will be well spent, and the benefits will be calculable.

By utilising the information, gathered at different RFID read points in the supply chain, companies will be able to track and trace goods and product information. They will even be able to record conditions such as temperatures etc as product passes along the supply chain. In the event of a recall, the affected products will be identifiable and locatable.

Economic benefits will follow as companies use the real-time, accurate information to manage their supply chains more effectively, respond quickly to market needs and meet safety and regulatory requirements from international export markets.

Technology protects against

‘counterfeit’ Australian meat in export markets

Jon Condon, Beef Central

It’s often been said that you can get a carton lid or vacuum-packaging bag printed with the logo of any Australian meat processor you choose in your Beijing or Shanghai cold storage facility within a few hours.

Such is the level of substitution occurring in China that a number of Australia’s best known premium Wagyu beef supply chains refuse to sell any product whatsoever into the Chinese market.

Hard-won supply chain reputations can be destroyed in minutes if a poor quality substituted product is picked up by an unsuspecting customer, who has paid good money for the real thing.

The problem of substitution in international markets has been around for decades, but recent price hikes for beef across the board have only raised the degree of temptation among unscrupulous operators to replace a cheaper piece of protein (not necessarily always bovine) for high-quality, safe, consistent Australian beef.

It’s been estimated that substitution and counterfeiting in foodstuffs and other consumables is a $1.7 trillion industry across the world each year, and beef is a growing part of it.

But technology is starting to zero in on the problem, with some novel and creative solutions.

Chinese-based technology company YPB (the acronym stands for words meaning ‘excellent brand protection’ in Mandarin) is a good example.

Chief executive officer John Houston, who has had a long business career across Asia, mostly in telecommunications, addressed a beef industry supply chain audience recently about the substitution challenge, and the solutions his company is developing.

“We sit in a very comfortable consumer market in Australia: you go to the supermarket and pick up a piece of beef on the shelf, but you don’t for a moment suspect that it is something that it is not,” he said.

“But it’s not like that in all other countries. In China, it’s not uncommon to go into a restaurant or supermarket and be presented

with something that is meant to be a branded product, but it will be a copy."

"Counterfeiting is an absolutely enormous industry in China, and it goes well beyond a fake handbag or watch. People are dying after eating substituted foodstuffs. Brand values are being decimated. It's a much bigger issue than anyone in this room realises," Houston said.

"While the Chinese Government is keen to do something about it, it's such a big issue that we need to address it and embrace it from this side, also, before our products get to China, because there's a very, very large 'swap' occurring of cheaper meat cuts for premium cuts in the Chinese market.

"Why is it done? There's a lot of money to be made, if they don't get caught. Not only can we lose the value of our brands, but it also represents criminal activity," he said.

McDonald's China last year recalled 4300 cartons of patties that had forged expiry dates on them. In 2008 the baby formula industry was rocked by the infamous melamine scandal, killing six and sickening 300,000 infants. Perpetrators were put to death, but it did not stop the problem of substitution.

Invisible tracers

YPB's solution has been to develop a system based on impregnating consumer products under threat of substitution with invisible tracers, which can be picked up using a specialised scanner.

"One of the attractions of the technology is that it is 'invisible' to those in the supply chain," Houston said.

"If the counterfeiter can see it, it can be copied. Barcodes used in track-and-trace systems are among the first things counterfeited. A brand owner might put a hologram on their product, thinking that it is a perfectly good way to protect their brand integrity and give buyers the confidence that the product is real. The problem is, there are now 94,000 hologram manufacturers in China."

YPB's anti-counterfeit technology produces a powerful, covert, forensic trace signature which, together with a specialised, hand-held scanner and iPhone app, allows brand owners and others to easily detect and report fakes or counterfeits.

The tracers, based on inorganic, non-radio-active, rare-earth-based trace minerals, can be impregnated — in minute quantities — in fibres, plastics, paper, resins, paint, packaging or other materials.

The active ingredient is also safe, having been certified by US, EU and Chinese food and drug administrations as safe for contact with food items. This allows the tracer to be embedded directly onto food items themselves. Already there are imported high-quality chocolates in China carrying the characteristic tracer signature.

"It becomes such a part of the product it is invisible, and cannot be copied, compromised or distorted — even by burning," Houston said.

The technology was the brainchild of a Chinese professor regarded as a world expert in the field of fluorescence. Each source of fluorescence has a different characteristic excitation and decay pattern.

The particle size of the material used in YPB's diagnostic product is the same size as a particle of airborne pollution, meaning it cannot be seen or destroyed.

"It would be relatively simple for us to provide a product for the Australian red meat industry to mark product with a tracer, in much the same way as a roller food-dye stamp is currently used on red meat items," Houston said.

Part of a broader solution

While he doubted his company's product would ever be a 'silver bullet' for all substitution problems involving Australian beef, it could be part of a solution, he said.

"From the time the product leaves these shores to when it reaches its final food service or retail destination in China, the industry needs to think about ways to protect the product as it passes through the transport and distribution cycle."

He said that in addition to protecting proprietary commercial beef brands from substitution, it was equally important to protect the 'brand Australia' reputation for clean, green and wholesome products, which could equally be damaged by counterfeiting.

"By using information, knowledge and technology, we think it's possible to protect both the value of the Australian beef brand and individual company brands," he said.

The sixty-four-dollar question, of course, is: Are counterfeiters already working on reproducing the unique tracers used in YPB's technology?

"We don't believe it can be copied," Houston said.

A range of about 10 uniquely identifiable traceable 'signatures' is being developed, meaning combinations can be used to create a 'batch' which can be very clearly identified with a specific company, or time period.

YPB has also developed a complementary iPhone app, for use alongside its tracer/scanner technology, which allows consumers to distinguish and report real products from fakes at point of sale.

YPB estimates that embedding the tracer process adds less than a cent to the cost of a 7c tamper-proof soy sauce cap, for example.

This article was originally published on Beef Central. To view the original article, click here.

Farmers of the future will need to be more tech savvy. CSIRO

Technology is changing the face of

northern Australian cattle farming

*Dave Swain, Central Queensland University, The Conversation

As these new technologies take on more of the load in cattle farming we need to change the way we think about training people for the grazing industries of northern Australia. We need to start by teaching those in traditional agriculture industries how to make better use of new technologies as well as creating more opportunities for people in the IT and other high-tech sectors.

Will Wilson is a Central Queensland cattle producer and founder of a company that is developing an app called iHerd.

Will spoke about his app at a recent conference and agriculture innovation and he told how a growing group of cattle managers around the world were now downloading and using his app.

His presentation was at the Belmont Research and Education Centre, located a half hour drive north of Rockhampton in Central Queensland. Will certainly looked at home on the cattle property with his big boots and big belt.

Knowing that Will was an out and out cattleman I wasn't sure how he was going to go giving a talk on technology. The Belmont set-up had provided some technical challenges for the previous speakers – an old laptop can be temperamental at the best of times.

But Will stood up, pulled his smart-phone from his pocket and without any fuss linked into the projector via Bluetooth. He then proceeded to seamlessly run through his talk using interactive slides that he had prepared on his smart-phone.

He told how the app allows a producer to track and monitor mobs of cattle as they move around the farm, effectively enabling farmers to track management interventions such as animal health issues.

Will represents a growing number of northern cattle producers that are engaging in the development and use of digital technologies to enable precision livestock management in extensive and complex cattle productions systems.

Typically northern cattle production systems are low input and mustering cattle is expensive. So producers aim to minimise the number of times cattle have to be brought through a set of yards.

On properties that have well managed watering points it is possible to set up cattle yards with one-way gates or spear traps at the watering trough. When cattle come to drink from the trough they can be held in the yards.

This system has been traditionally used to reduce mustering costs.

Walk-over-weighing automatically records cattle weights each time they go to water. CSIRO

Northern Australian beef production systems have traditionally been low input. CSIRO

The digital farm

The Cooperative Research Centre for Remote Economic Participation (CRC-REP) has been working on a project that links automated monitoring using electronic identification tags that are fitted to the cattle.

As cattle come to water they walk across a set of weigh scales, and using sophisticated walk-over-weighing algorithms their weight and electronic ID are recorded.

The work from the CRC-REP project is being developed and refined to incorporate a drafting system that not only allows automated monitoring of cattle but also automatic management, selecting animals which meet a predefined weight range.

Since the introduction of Brahman cattle in northern Australia, Central Queensland has provided a proofing ground for new and emerging beef cattle technologies.

Belmont Cattle Station is an AgForce owned cattle station that has a long history of supporting the latest beef cattle scientific research.

AgForce in Central Queensland has now established a partnership with my university to enable the property to be further developed to support emerging research and importantly to make direct links with education and training activities.

Our research work on precision livestock management has established a wireless sensor network to monitor and track the location and movement of cattle across the property.

Researchers are working to develop real-time data processing algorithms that can be used to determine reproductive status, health and the productivity of the cattle.

Technology that allows farmers to automatically monitor their livestock means they will be able to collect more information with less effort. Linking the information to automatic management systems will further reduce the time farmers spend working cattle.

Precision livestock management data systems will require farmers that can capture the benefits from large complex datasets. Managing technology that can manage cattle.

Agricultural training programs need to provide the next generation of farmers with skills to capitalise on the benefits of digitally enabled automated monitoring and management systems.

Maintaining and supporting IT hardware platforms that have a dedicated agricultural application is a big jump from simply working out a feed budget.

Ironically, the unique challenges of making electronics work in remote rugged locations may well mean that a broader range of industries will seek to recruit the next generation of agricultural graduates.

As farmers acquire and apply new technical skills so these skills might end up being used by a wider range of industries. A broader uptake of agriculturally derived innovation might just lead to a more agriculturally minded nation.

**Dave Swain is Professor of Agriculture at Central Queensland University. This article was originally published on The Conversation. Read the original article.*

A link to the video for this article can also be viewed here

Identification solutions from SICK

optimise meat processing at Goedegebuur

Anyone ordering sirloin, rib-eye or tenderloin steak in a restaurant in Europe is most likely being served quality beef from Goedegebuur, a beef specialist in Rotterdam, Netherlands. More than 170 employees process over 2000 beef hindquarters there every day for catering trade, restaurant chains, meat industry and retail all over Europe. MPS Food Logistic Systems, one of the leading specialists in intralogistics solutions helped Goedegebuur to optimise the packaging line. Image-based code readers from SICK play an important role.

Edwin Valstar, IT Manager at Goedegebuur, said, "In developing the solution for the packaging line, we did not want to stop at automating existing processes. We also wanted to optimise our work and increase capacity. MPS Food Logistic Systems helped us to restructure our packaging line."

Restructuring the work process

"In the past, employees worked in a line, one after the other, weighing, labelling, sorting and packing the meat," reported Valstar. "Now the working areas are separate. Several employees weigh and label the vacuum-packed cuts of meat. With a simple push of a button, they indicate which cut of beef they are processing. The MPS sorting machine then uses this information to determine how the meat is sorted. The boxes are then packed by the employees stationed below at the sorter."

The 2D challenge

MPS Food Logistic Systems was able to count on many tried-and-tested partial solutions for the intralogistics system at Goedegebuur. Erik van den Beld, manager engineering at MPS, was faced with a number of challenges when it came to scanning the box labels: "The available space for applying an additional code on the box label was

really limited. There was also no way of ensuring fixed alignment of the label, because some labels are applied by hand. For this reason we chose a 2D code. To set up a reliable process that took into account the capabilities of the existing label printers, we had to find a suitable module size. This size, and the number of digits required for creating unique codes, led to a code format of 18 x 18 mm."

But there was still a further problem: the labels could only be affixed to the front side of the boxes. As van den Beld explained, "It would have been easy to scan box labels running parallel to the conveyor belt. But we had to come up with a solution that would allow labels to be scanned on the front or back sides of the boxes. For this reason, the 2D code scanner had to be set at a difficult angle. Reading performance is a critical aspect of scanners in logistics systems. Code readers constitute both the interface between our machines and transport components and the PLC, as well as between MPS warehouse management and the order processing system on the other. "TheLector®620 image-based code reader produced very good results under these circumstances."

Tracking every step of the way

SICK's image-based code readers play an important role in traceability. "Legislation charges us with classifying areas of responsibility. From the time the beef quarters reach us to the moment that they leave our premises, we must be able to track the meat," explained Valstar. "Thanks to SICK scanners, we can always tell where individual meat products are located."

In addition to the Lector®620, MPS also employs SICK sensors at other stages of the process. "In the chilled storage area, we employ DT50 mid-range distance sensors, to take depth measurements. The system uses these measurements to determine where there is available space for additional boxes or crates." The shelf crane there is one of the newest innovations from MPS. "Our crane has very low energy demands. It is fast and can be fitted with different load-bearing tools."

Erik van den Beld from MPS was similarly complementary about SICK: "SICK helped us test the codes and also provided support during the coordination of the codes and the scanners." Thanks to the high-quality, reliable and innovative approach of the sensor manufacturer, van den Beld said that his company would also be a regular customer of SICK in the future. "We are always referring to SICK products for special solutions."

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About SICK

SICK is one of the world's leading manufacturers of sensors, safety systems and automatic identification products for factory automation, logistics automation and process automation. As a technology and market leader, SICK provides sensors and application solutions that create the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

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