Alternatives to Barcoding for Logging Operations

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Background

Les Wootton is a Logistics Consultant for Sanderson Computers and is responsible for New Zealand-based projects. His roll is to identify ways of improving logistic operations through the use of new technologies. This involves taking projects from initial design concepts through to implementation as a total solution.

Les Wootton's background is a design engineer in the field of electronics specializing in radio frequency communications. Over the past five years Les has been involved with local forestry companies in a number of projects including real-time data communications in the field and more recently real-time data capture for despatch of finished wood products.

Sanderson Logistics has won a number of international awards for "innovative application of technology". Many of the solutions developed are described by the logistic exponents as "best practices" and "world class" practical examples of technology in use.

Introduction

Although the paper is headed Alternatives to Barcoding for Logging Operations, it is intended to be a discussion paper to look at the use of barcoding individual logs. I propose to take a step back from the technical challenges of the past five years and look at what needs to be achieved from a business perspective then look at how, in the light of technologies today, we can meet those objectives. In the past the object has been to focus on getting the technology right for the job. Both suppliers and forestry staff have worked together solving the issues of finding barcodes which will withstand the environment, and barcode reader technology able to ensure reliability in the field. I must confess to being closely involved with this technology focus.

Tracing and recording of log production has been a challenge for a number of years. In the early days, as little as five years ago, finding an appropriate label that remained readable in the conditions was one part of the challenge. The other was to find barcode readers capable of reading the barcodes, complete with soil samples, outside in bright sunlight and which have the resilience of a McCulloch chain saw. Now, some five years on, labels and technology are providing reliable and results consistent.

Now the question is, are barcodes on logs providing the information that users expected from them? Today the logistics industry as a whole has a better understanding of the application for barcodes. There are now excellent benchmarks against which users and potential users of barcode technology can measure their application. In many instances these can be part of international standards for barcoding. The EAN standard is a good model to compare the use of barcodes in logging operations.

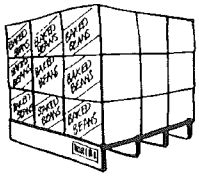
The EAN Standards

Like most standards EAN started out as a simple way to track items, but as it reached further down the supply chain it grew into a maze of overlapping options in an effort to accommodate various business sectors. However, for our logging comparison we will look at the concept behind the maze to obtain an understanding of the way it is intended to be applied.

We see EAN standards in operation every day. They appear on a majority of consumer items we purchase from food to clothing. EAN standards are designed to go right back through the supply chain to the point of manufacture.

Retail Unit

Trade Unit



Logistic Unit

In essence each barcode in the supply chain is designed as a number plate, or license plate, for a physical unit of measure. Each barcode number plate is unique in the world, unlikely to be replicated outside of the originating company. Product information is captured at the time the product is made. Information about the product is held electronically in a database and "attached" to the product. The attached information is generally transmitted electronically to the point where it is to be reattached, or called up, when the barcode is scanned. In the case of the baked beans example this is how it would work:

- At the retail level, which is the selling unit, the product will have a default description "Uncle Sams Baked Beans 200gr tin". Other information captured would include date of manufacture, a batch number, and an expiry date. All useful information for processes further down the distribution chain.

- At the next level, the trade unit or carton level, the above information is ADDED to the number of retail units per carton.

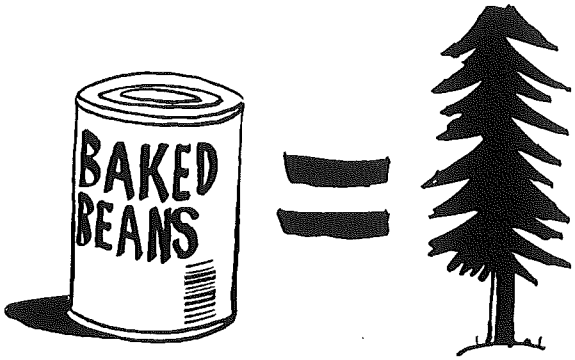
- At the Logistic Unit Level, the pallet has a unique number electronically attached to it and is ADDED to the number of cartons on the pallet.

When the license plate barcode is scanned at any of the processes leading up to and including the point of sale, other information can be recalled to assist with the next step.

How does this compare with how barcodes are currently used for logging?

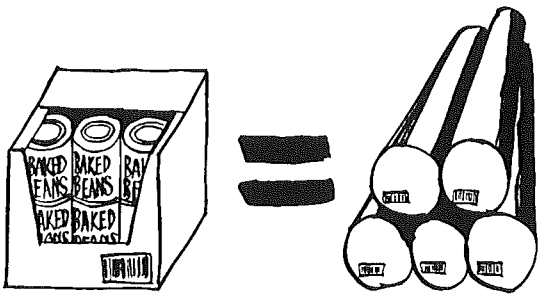
If we take the above example and apply it to a logging operation it means more information must be captured about the base unit. In this case the tree itself. Essentially the growing of the tree is the production cycle. This is the point of manufacture of the product before it enters the supply chain. At the level of the tree information about its genetic strain (G28 for example), date of

planting, possibly a grid reference where the tree was grown in the forest, and possibly the pruning regime used to maintain the tree throughout its life.

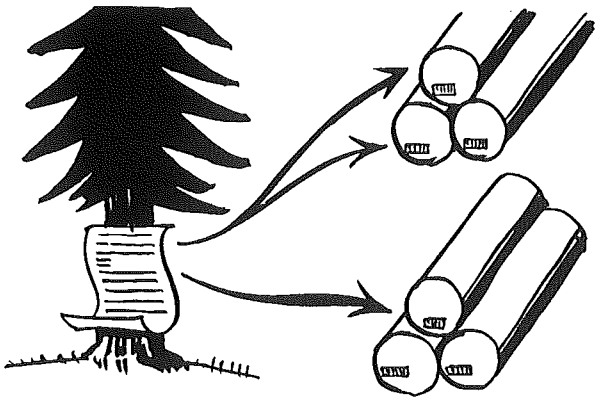


This base information about the tree itself may not assist to the same degree as the EAN model with the downstream processes, however, it is useful for analytical work to predict and improve future yields from real estate. Also the information is useful in calculating asset values.

At the next level, at time of harvesting, the information collected about its life in the manufacturing cycle can then be compared with the actual yields of product. This differs from the EAN model in that quantity and quality are variable from tree to tree. There is also an X factor that must be applied to the equation to compensate for the operator's ability to identify the best yield value from the tree.

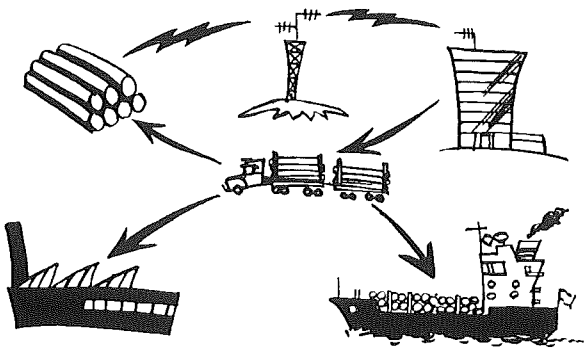


At this point the tree loses its identity and becomes several logs ready for transport. Accordingly the EAN standard there should be a parent/child relationship between the tree from which the logs came and individual logs, for traceability. It is at this point that our barcode is traditionally applied. But what now happen is that the information about the log is attached plus the information about the parent is also transferred and attached for the next stages.

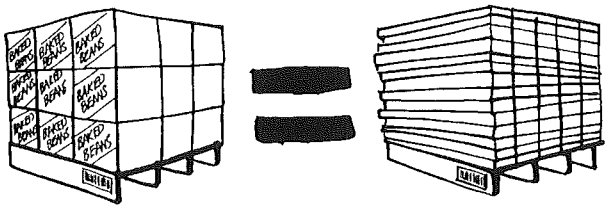


To digress for a moment, the life cycle of a tree is long in business terms. Therefore, it does make sense to capture as much information about each tree over its life span, analyse the data and apply the lessons and benefits to the next crop. Once data is available it is possible to predict yields from different parts of the forest and more importantly plan maintenance programs over the growing years. Also, if the rate of growth is predictable across a forest then the asset value is more accurately known.

Unlike a standard distribution, operation forestry requires the production to be transported off the skid site as soon as possible. This requires a skilful match between demand and production. The trick is to pick up and deliver from multiple skid sites to multiple drop off points with minimum travel for a fleet of logging trucks. This in itself is no small feat to achieve manually. We now begin to enter the realms of real-time data capture and radio frequency transmission of data back to a office-based scheduling system that co-ordinates a fleet of trucks and so manages the balance between production and demand. This is a subject in its own right, however, we touch on it here as it is necessary if we are to follow the EAN model, where manufacturing data is available immediately.



The final level is likely to be at a mill site, or a port waiting transport to the end user. At a mill the log is likely to be turned into saleable lumber. The EAN model would link each stick of timber cut from a log back to the parent log. The log would then lose its identity but information about the log would be transferred and added to the information about each piece of timber, and a new barcode applied. Although this satisfies the EAN model, I must say it adds nothing to the supply chain management, it only satisfies the EAN concept of traceability for the end user back through the supply chain to the tree from which it came. In the world of EAN a parent/child relationship should also exist between the log and each individual stick of lumber produced.



At a port the same principles apply. Acceptance at the assembly yard and load-out information should be attached to the log barcode to give a complete history of the log to the end customer overseas.

The above model is an ideal. However, technology to capture information and transmit it in real-time to a scheduling system is still in its infancy. Although components of the technology such as mobile data infrastructures and the remote data collection devices that are required can be seen working in other industry sectors. Forestry is yet to make the investment in an integration project to come up with a solution to meet their specific needs.

Business Requirements

Having looked at the ideal application of barcodes on logs, if we now look at how barcodes are used on logs today we find a noticeable gap. Although the industry has looked at incorporating log barcodes in a wider picture it hasn't gone much further for a number of reasons. Cost and availability of technology are part of the reason holding up greater use of the existing barcodes.

I mentioned at the beginning of this paper that it is not my intention to table alternative methods to the current method of barcoding, but to stimulate industry discussion on the subject from the point of view of satisfying business requirements first. I would like to start the discussion by presenting a process I went through with some colleagues in forestry companies. At the conclusion of that discussion an alternative concept was outlined and became the "Alternative to Barcoding". The question presented to each participant was ***what information do you need to operate your logging operations?*** From the answers we obtained a list of business requirements. They included the following:

- **Production information** – Information from each of the skid sites on quantity and grade of logs ready for collection. Information about production is required to schedule transport operations. However, it is useful to have actual production details captured at the skid site, although for the record it is not required immediately.

- **Transport information** – Contractors haul logs from skid site to nominated drop points. They are paid on the number of trips made, therefore it is useful to capture this information automatically as a check against contractors charges. Conversely if the number of trips is captured automatically and reliably then the forestry companies are able to pay contractors without paperwork.

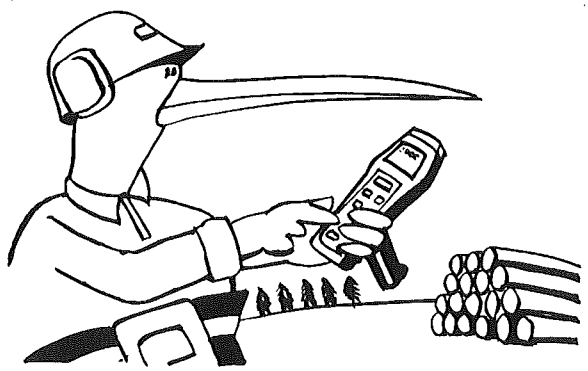
- **Quantity Delivered** – This acts as a final check on production delivered to each point. As these points are fixed (where as skid sites are only temporary) more technology can effectively be installed. One problem that surfaced when the discussion came around to delivery points, were the queues that built up at the main gates to mills and port operations. This occurs as a result of the time to scan all barcodes. In some cases not all barcodes were on the same end of logs and other barcodes

fell off in transport. The time to sort out and record each load took some time creating traffic jams at the main gate.

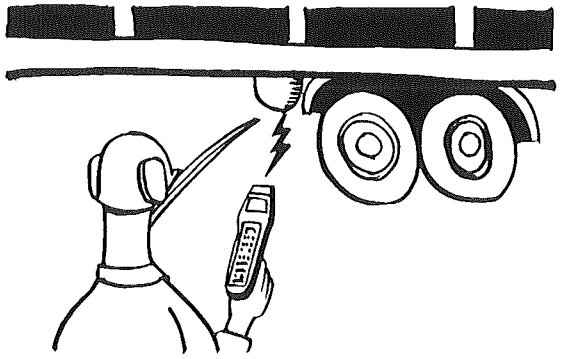
The Solution "Discussion Purposes Only"

In almost all of the business cases we examined the level of information actually required did not go below a truckload. From the business perspective yield in terms of grade and quantity is all that was really required, hence the question why put barcodes on individual logs?

Given that production information is not required immediately there is no need to get it out of the forest immediately, but leaving the collection of the data until one or several days later looses some of the benefits. The ideal is that the data arrives at the same time as the load at the point of drop off. In other words both the vehicle, its load, and the data travel together and arrive at the same time.



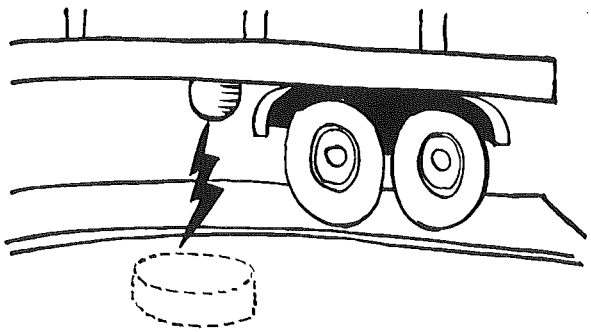
Besides the information relayed to the dispatch office for vehicle scheduling we need a hand-held device at the skid site to record what is loaded onto each truck and trailer unit. The device would record the quantity and grade of logs loaded onto each transport unit.



On the truck and trailer units a programmable RF tag device is fitted to receive the information from the hand-held unit. Each RF tag would contain a unique identification number allocated to the transport unit. The information about the load is downloaded by touching the hand-held terminal onto the RF tag. No electrical connection is required, just close proximity between the two units.

NB: Programmable RF tags are low cost devices. They do not require external power, and are self powering, receiving the power they need from the hand-held terminal at the time of transferring data and at the time an interrogator extracts the data at the other end. As there are no external connections they are totally sealed against the elements.

The RF tag now carries information about the load that it is hauling plus, when interrogated will identify the truck and trailer unit. The interrogation happens at the gate to the mill or port. Instead of the gate person scrambling over each load scanning the all the barcodes they can find, a weighbridge fitted with an RF tag interrogator is used and all the driver needs to do is drive over the weighbridge. The interrogator downloads the information about the load and the vehicle identity. The vehicle ID is used to look up the net axle weight of the truck or trailer to calculate actual weight of logs. The weight is used as the measure of the quantity and a check against what skid site operators believe they loaded.



Conclusion

There are a number of challenges ahead to make full use of barcodes at the level of individual logs, none of them insurmountable. But before the industry or individual forestry companies embark on a project of this magnitude it pays to look closely at the cost benefits of recording each piece of information at the various points along the supply chain. Taking the ideal presented in this paper the EAN model may go too far for an effective payback, and this is where standards devised with the best intentions meet reality.

I look forward to receiving your comments and ideas to so that we can mutually work towards developing better systems for the industry.

Les Wootton