

## Increase Your Food Manufacturing Efficiency with RFID

One of the easiest, most cost effective ways to increase your efficiency is through the use of RFID technology. RFID makes data collection easy and can eliminate the human dependency and errors. In the food industry, RFID can increase traceability and reduce spoilage, shrinkage, and over-buying. Strict FDA regulations outlined in the Food Safety Modernization Act require that finished products must have a detailed documentation trail through the whole production process. If done manually, tracking goods is expensive, time consuming, and prone to errors. Barcodes are still time consuming, not as effective as RFID, and require line of sight reads. RFID readers provide instant scans of tags and the ability to upload that information to a database instantly with limited-to-no operator interaction. RFID tags do not require a line of sight to read, making data collection easier. Ingredients can be tracked from the minute they enter your facility. Readers can note exactly where any ingredient is stored and what time it is taken out of storage. They can track it throughout the entire production process until it is packaged and shipped. This audit trail would be extremely beneficial in the case of any recalls, as specific groups of finished products could be accurately matched with specific batches of ingredients, leading to smarter, targeted recalls.

Traceability is not the only benefit RFID can bring to the food and beverage industry. It can be used to increase automation of processes by collecting and delivering accurate information at each stage of production. RFID can provide real time tracking of products, giving you a glimpse at how quickly products are moving through production and where things could be improved to increase speed or efficiency. The collection of data is essential to improving the efficiency of any production facility. Not only does RFID increase the amount of data collected, it can be used to ensure the data is of a high quality. Manual pencil and paper data collection is slow and open to errors and barcode readers are often not practical for a conveyer belt or production line.

Imagine seeing a display showing the flow of production across your entire facility. You could see the rate at which your product was being produced, and have accurate estimates of what the day's final production would look like. You could glance at a different screen and see real time warehouse levels for different ingredients, without a single person having to do inventory. You could look at scheduled deliveries and know immediately when they came in and be alerted if they are late. Another display could show the day's scheduled shipments, and provide a warning if they were going to be short on product or delayed. Most companies already own an ERP system with these capabilities, but are not capturing the data to make use of these features. All of this and more is possible with RFID technology. Businesses are always looking to get smarter, and right now one of the easiest ways to do that is through automatic data collection using RFID systems. It is easy to start small and have RFID in just one segment of your enterprise and expand from there. The more you utilize RFID, the more the benefits compound. Having your receiving systems talk to your warehouse, which is communicating with the production line, which in turn is talking to the shipping docks, provides numerous benefits and can truly increase the efficiency of any business.



## Receiving

- ) Log items as soon as they enter your facility
- ) Save time unpacking and unloading
- ) Improve inventory management
- ) Save \$0.03 per every case received
- ) Process ingredients based on expiration date
- ) View time/location harvest information

RFID technology can increase the efficiency of your manufacturing processes from the moment you receive your raw materials.

This is especially true in the food and beverage industry, where FDA requirements make traceability of all food products a top priority for businesses. RFID



systems can help you track what ingredients you receive and when you receive them, reducing FDA compliance costs and improving the ability to selectively target products affected in recalls. If RFID is employed in the production or harvesting of ingredients, you can see essential information as soon as you receive those ingredients, allowing them to be categorized based on information such as location or time harvested. Bins can be processed based on expiration date, instead of first in, first out. By reading RFID tags as soon as goods arrived, it is possible to know instantly if shipping took too long. Goods can be rejected immediately instead of farther down the production line, which is more expensive and time consuming. Even if the goods you receive aren't tagged with RFID, you can still become more efficient by applying RFID tags at the receiving station. By tagging your raw materials as soon as they come through the door, you make it easy for every station down the line to know what they are receiving and what to do with it.

Here is an example of how RFID can save you money at your receiving station: Say you unload a truck of spoiled ingredients, but don't know about it because they aren't inspected right away. Later on down on the production line the product has already been finished and ready to be shipped, when it is discovered it has spoiled. If RFID was being utilized at the receiving dock it could have been immediately discovered that the truck took too long to arrive and that the ingredients it delivered were bad. To find out how much could have been saved with RFID in this situation, try this formula:

(1)

$$\{\text{Number affected}\} * \{\text{Selling price of product}\} - \{\text{price of bad ingredient}\} = \{\text{\$ amount saved}\} \text{ by catching problem at receiving with RFID}$$

For example, assume \$0.25 tomatoes are being used in a can of sauce that will sell for \$5. After the sauce is finished and the cans are filled, it is discovered that a whole batch of 5000 tomatoes originating in one batch is contaminated and must be destroyed. If it was found at the receiving dock, it would have saved \$23,750. In addition, EPC Global, a RFID and business standards organization, estimates that utilizing RFID at your receiving docks can save you \$0.03 per case received. This results in significant savings, even for small operations.

## Production

- ) Increase visibility into production processes
- ) Accurate production counts
- ) Eliminate over/under production
- ) Improve manual processes
- ) Increase traceability
- ) Increased automation capabilities

Tracking products as they move through production stations can be difficult. They can be hidden from sight on conveyer belts, or obscured for some time in ovens or freezers. This means it can be hard to know the total amount of production, the rate you are producing products, or the flow of goods throughout production facilities. By tagging and tracking products with RFID, you increase their visibility and traceability as they move from process to process. Readers placed at different stations are able to read tags placed on passing products. The nature of RFID means that tags can be read at any orientation within a given range. They can also be read at high speeds on conveyor belts. This is impractical with barcodes and barcode readers given their line of sight nature. RFID readers can tell if one production line was moving slowly and be able to automatically divert materials to other lines. RFID scanners placed at the end of production lines can give an accurate, real time count of output, eliminating accidental over or under production.



For manual processes, measuring output with RFID allows you to see which employees or teams were working most effectively without forcing them to manually record any data. Self reporting is inaccurate and time intensive, so utilizing RFID is a significant improvement. Manual processes can be improved by tagging all WIP goods with information regarding their current stage of production. Workers can then read the incoming goods and be given instructions based on the final goal and the current level of completion. When they are done, employees can then update the products status in the database and send it to the next station.

Utilizing RFID during production can also assist with traceability. Knowing exactly which products went through which process at a certain time allows you to do targeted recalls instead of a complete recall in case something went wrong. This is only possible by tagging and reading products throughout the entire production process. Consumers like to know where their food comes from, and tagging it with RFID makes labeling with things like date and location harvested easier, because that data would already be attached to RFID tags from the receiving station and could be read before packaging.



An example of how RFID can save resources during production involves a product made on a production line that utilizes a particular machine. At the end of the day it is discovered that the machine was malfunctioning for a certain period of time, and the products made during that time are ruined. The

products are then packaged and stored randomly, so it is impossible to tell which products were damaged and which are good. In this scenario every product made that day is worthless, since you can't tell the good from the bad. However, if they were tagged with RFID, you can read the tags, see when the product was finished, and determine if they went through the machine when it was broken. Then only the damaged products could be removed from storage instead of everything made that day

For this example the savings could be quantified as:

(2)

$$\{\$ \text{ Savings} \} = \{ \text{Price of product} \} * \{ \# \text{ made per hour} \} * \{ \{ \text{Total production time} \} - \{ \text{amount of time machine was broken} \} \}$$

So for a machine that outputs 500 products per hour that sell for \$5 each over an 8 hour day, you would save \$15,000 on that day if the machine was malfunctioning for 2 hours.

### WIP Storage

- ) *Keep track of WIP goods*
- ) *More efficient storage*
- ) *Improve WIP processes*
- ) *Prevent WIP processes from occurring for wrong products*

Food production often needs WIP goods to be stored for some amount of time while a process, such as baking, cooling, freezing, ripening, aging, or maturing occurs. RFID technology makes storing products during production easier and much more efficient. Readers can read tagged products as they enter, ensuring only the right product undergoes whatever process is occurring. Tags allow the goods to be found more easily if they are removed manually, or they can be sent out automatically based on the time they entered. On exit, they can be scanned again and sent to the correct next stage. RFID can also be used to help transport WIP products from station to station. Specialized RFID carts or bins can hold tagged products, and then be tagged to label them with their contents. Upon arrival at the next station, the carts can be read, informing the workers of what the product was, and production on the items can continue. If readers are stationed periodically throughout facilities, it becomes easier to find WIP goods that are stored for any amount of time, as you only have to look at where the last read occurred.

Suppose you have a product that is fed by a belt into an oven for an hour to be baked, and a certain number of the goods on the belt are actually the wrong kind and will



be ruined by entering the oven. If all the goods had been tagged, then scanned as they entered the oven,

the wrong goods will be found and sent to where they belong before they are destroyed. This example works for any WIP storage unit, and you could quantify the savings like so:

(3)

$$\text{Savings per day} = \{\text{Product going through storage per day}\} * \{\text{percentage of wrong product on the belt}\} * \{\text{price of wrong product}\}$$

If you produce 1000 of product 1 a day, but 5% of those are mistakenly product 2, which is sold for \$5, you would save \$250 per day, or over \$91,000 per year.

## Shipping

- ) Automate shipping
- ) Eliminate over/under shipments
- ) Eliminate shipping fines
- ) Become compliant with large retailers

RFID readers and tags can help ensure your product gets where it needs to go as quickly and as inexpensively as possible. RFID can help automate and speed up packing



and shipping, as well as reduce shipping errors. By placing an RFID reading portal on a loading dock, any tagged box that goes through it could be instantly read and checked to make sure it was being loaded onto the right truck. This is significantly faster than scanning every barcode going onto a truck. Having 100% accurate shipments leads to several different savings. It reduces fines, over-shipments, and the need for extra shipments to make up for shortfalls. Specific products can be marked for specific destinations, triggering a warning if the box is loaded onto the wrong truck. RFID can increase automation at loading docks, as products can leave the production line and be directed straight to the designated truck or shipping area. In fact, some companies have developed fully automated shipping systems, using robots to load pallets and trucks, using RFID technology.

Another way to save money is to switch from disposable shipping containers to sturdy, reusable ones. By tagging these containers with RFID you could accurately know their whereabouts within your facility and ensure each container was brought back by logging them as they

leave and are returned. Many retailers are now requiring large suppliers to tag all shipments with RFID. By becoming RFID compliant as soon as possible you ensure that your company is ready to do business with some of the largest stores in the food industry.

Consider a small, jumbled loading dock, where similarly marked boxes and a small space create confusion and result in boxes being loaded onto the wrong truck. These products are essentially lost, since getting them shipped back and sent out again is often just as expensive as simply losing the product. If an RFID portal was mounted in front of each dock this would essentially eliminate shipping mistakes, as all tagged boxes would be read and analyzed before they were loaded onto the truck. To quantify these savings, you could use this formula:

(4)

$$\{\% \text{ of shipping errors}\} * \{\text{number of an item shipped per day}\} * \{\text{cost of item}\} = \{\$ \text{ amount RFID would save by eliminating shipping errors}\}$$

Suppose you do a study and find that you have a shipping error rate of 5% for a particular item that retails for \$5. If you ship 1000 of them a day, eliminating these errors with RFID would save you \$250 a day, or around \$90,000 annually.

In addition, many large retailers, such as Wal-Mart, impose penalties on suppliers for late, early, or inaccurate shipments. These penalties can be harsh. For example, Wal-Mart takes 3% of the value of the shipped goods off of an invoice for deliveries that miss their four day window, either late or early. By organizing your shipping dock with RFID, you ensure that shipments get out on time and end up at the right places, eliminating penalties and lowering shipping time.

## Warehouse

- ) Increase inventory accuracy
- ) Improve cycle count efficiency
- ) Automate purchase requests or generate work orders
- ) Find items easier
- ) Reduce spoilage and shrinkage

One of the most difficult tasks for any company is tracking the items it has in storage. Keeping an accurate inventory is essential to remaining productive, and is especially important for businesses in the food and beverage industry. For food products, losing track of

items for a week or even a day can mean the food is spoiled and ruined. This is why taking inventory is essential, but it is time consuming and expensive. Manual cycle counts can be inaccurate and take a great deal of time. RFID can help your warehouse and storage run much more smoothly and give real time, accurate inventory counts. There are several ways you can employ RFID in a warehouse. If every case or pallet is tagged, readers placed at the doors could track every case or pallet that goes in or out, giving an accurate, up to date count of inventory. For better, more up to the

minute counts of an item's location and amounts, employees could continue cycle counting, but with RFID readers instead



of paper and pencil. This decreases errors and man power. Instead of going to each box, reading the label, writing it down, and later entering it into the database, employees can read tagged items quickly. Results can be uploaded immediately, and the tagged boxes could be scanned without needing line of sight. This speeds up the process and is much less prone to errors, as the readers have a very high read rate. These RFID systems would drastically reduce shrinkage and spoilage and ensure you have the ingredients you need. With accurate inventory counts all residing in a central data base, you can even program the system to automatically send out purchase requests or generate production orders if it sees a particular item or ingredient getting low. Knowing exactly where items were stored and for how long also helps with FDA traceability requirements and helps pinpoint affected products in case of a recall.

RFID can be utilized in storage of ingredients as well as finished goods. It is important to have exact counts of raw materials in a warehouse. This can be accomplished with RFID using the techniques outlined above. RFID is especially helpful in raw ingredient storage since there is a high rate of turnover, with ingredients moving in and out quickly and continuously. RFID can be scanned and read much more quickly than barcodes, ensuring you won't need to slow down production just to keep your inventory up to date. RFID also provides you with a way to track the freshness of ingredients. If crates of ingredients are read when they entered the warehouse, you can note the time they came in to see how long they had been sitting. A warning can be triggered after a certain amount of time has passed for a particular batch

so you can get those ingredients into production before they spoil. Finding items can also be much easier with the use of RFID. When an item is stored, its scanned location in the warehouse can be uploaded to the database. Then, to find the item, you simply need to pull up its information from the database and see the location of the item.

To calculate the cost of using RFID to keep an accurate inventory, you can use this formula:

(5)

$$\text{\$Cost per year} = \{\text{times cycle counting per year}\} * \{\text{time it takes to do one cycle count}\} * \{\text{number of employees needed}\} * \{\text{hourly wage of those employees}\}$$

RFID Journal estimates that using RFID in cycle counts can reduce the time needed by around 90%.

(6)

$$\text{\$Cost per year (with RFID)} = \{\text{\$Cost per year}\} * (10\%)$$

Subtracting the cost with RFID from the cost without gives you your total savings by using RFID for your cycle counts. Consider a company that cycle counts 50 times per year with 5 employees that make \$20 per hour. If each cycle count takes 8 hours, your yearly savings would be \$36,000. Another option is to spend the same amount on cycle counting as before. Since you are spending the same amount total but each cycle count is cheaper, it allows you to do more cycle counts throughout the year. This would result in much higher inventory accuracy. A higher inventory accuracy will have a direct result on production practices and can also help improve your ordering and inventory replenishment practices, which can be an added cost if you accidentally over order or under order and need to rush shipments.

## About Element ID, Inc.

Element ID is a specialty integrator focusing on full turnkey RFID solutions for manufacturing and warehouse customers. The company can help in all aspects of the project from design through sourcing of all required equipment and tags, setup, service, and support. Element ID also supplies and integrates barcode scanners, scales, dimensioners, and IOT appliances. A key feature of Element ID projects is the ability to directly integrate with the customer's existing ERP, WMS, MRP, asset tracking, or other proprietary software solutions.

## Summary of Formulas

<b>Receiving</b>	$\{Number\ affected\} * (\{Selling\ price\ of\ product\} - \{price\ of\ bad\ ingredient\}) = \{\$ \text{ amount saved}\}$ <p>by catching problem at receiving with RFID</p> $\$0.03 \text{ saved per case}$
<b>Production</b>	$\{\$ \text{ Savings}\} = \{Price\ of\ product\} * \{\# \text{ made per hour}\} * (\{Total\ production\ time\} - \{amount\ of\ time\ machine\ was\ broken\})$
<b>WIP Storage</b>	$((\{number\ of\ hours\ per\ day\ machine\ is\ used\} * 60) / \{amount\ of\ time\ process\ takes\ in\ minutes\}) * \{number\ made\ with\ each\ process\} = \{amount\ made\ if\ ran\ continuously\}$ $((\{number\ of\ hours\ per\ day\ machine\ is\ used\} * 60) / (\{amount\ of\ time\ process\ takes\} + \{time\ spent\ looking\ for\ items\})) * \{number\ made\ with\ each\ process\} = \{actual\ amount\ made\}$ $\{\$ \text{ each sells for}\} * (\{continuous\ amount\} - \{actual\ amount\}) = \{\$ \text{ savings}\}$
<b>Shipping</b>	$\{\% \text{ of shipping errors}\} * \{number\ of\ an\ item\ shipped\ per\ day\} * \{cost\ of\ item\} = \{\$ \text{ amount RFID would save by eliminating shipping errors}\}$
<b>Warehouse</b>	$\{\$ \text{ Cost per year}\} = \{times\ cycle\ counting\ per\ year\} * \{time\ it\ takes\ to\ do\ one\ cycle\ count\} * \{number\ of\ employees\ needed\} * \{hourly\ wage\ of\ those\ employees\}$ $\{\$ \text{ Cost per year (with RFID)}\} = \{\$ \text{ Cost per year}\} * (10\%)$ $\{\$ \text{ Savings}\} = \{Cost\ per\ year\} - \{Cost\ per\ year\ with\ RFID\}$

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