WHITE PAPER

Leveraging RFID Asset Tracking Technology to Reduce Re-Usable Bakery Tray Loss

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THE KENNEDY GROUP

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ABSTRACT

This case study addresses the use of RFID (Radio Frequency Identification) asset tracking technology to reduce tray loss in the bakery industry. It defines the issue of tray loss, RFID asset tracking technology, and the methodology used. It also provides case study results and RFID asset tracking benefits to the bakery industry.

Introduction

Reusable asset loss is a global issue that impacts world-class bakery companies each and every day, resulting in significant tray loss every year. For decades, the bakery industry has been using reusable trays to transport product from bakeries to distribution depots and ultimately to retail. According to the American Bakers Association, there is $100 million in tray loss annually.

Today's bakery supply chain is more complex than ever – with additional retailers and more brands challenging the distribution network, compounded by high volumes of transactions in a short period of time. Currently, there is no industry program in place that provides visibility and tracking for these lost trays.

Before the case study, the participating commercial bakery, based in Chicago, believed tray loss occurred primarily at delivery to the end customer. Trays were often retrieved from customers by other bread companies, or stolen, at a staggering cost. The combination of no tracking system and significant tray loss impacted their operations in three ways:

- **Increased inventory costs:** Lost trays required the bakery to purchase and carry extra inventory of corrugated boxes.
- **No accountability:** For drivers or customers.
- **Increased labor costs:** To move available trays to locations with tray shortages.

To address tray loss problems, the commercial bakery collaborated with The Kennedy Group, an asset tracking technology provider, and ORBIS Corporation, a tray manufacturer, to define the tray loss issue; pilot a technological and process-driven

solution; and identify action items for a sustained reduction in tray loss with an RFID asset management solution.

Case Study Participants

Commercial Bakery – The baking company consists of multiple bakery locations, distribution points, and a bakery supply chain with nearly 130 ship-to locations throughout the United States. The bakery used a system of trays and dollies to distribute its products with nearly 350,000 stackable, nestable trays.

The Kennedy Group – An asset tracking system provider with RFID technology, integrated software, hardware and technicians with RFID systems implementation experience. The Kennedy Group has a tailored solution, TrackRite™, specifically for the bakery industry, and a 7,000 square foot RFID testing lab.

ORBIS Corporation – A tray manufacturer and leading provider of reusable assets to bakery, food, beverage, dairy and consumer products goods companies. ORBIS has 11 manufacturing sites and 15 service centers around the globe and provided RFID tray/tag interface and project management for the program.

Case Study Methodology

Three critical components led to a successful pilot RFID implementation and case study:

- A Statement of Expectations to define roles and responsibilities, pilot project scope, costs, and expected outcomes, as well as conflict resolution, and planned project review milestones.

- A Planning Process with a detailed review of the affected bakery supply chain nodes for the pilot, including pre-implementation activities and set up, such as tagging the assets or trays and setting up the infrastructure (portals, readers, etc.).

- The Reusable Packaging Association's four-phase process for reusable packaging solutions: Current Process Review; Identifying Tray Loss Locations; Alternative Ways to Manage Assets; Asset Management Solutions.

The case study started with one objective: tracking trays into and out of the bakery's production plants. But it was soon determined that RFID could also be used to track trays at different levels within the distribution channel, including the depot, the route, and customer levels.

The team assigned ORBIS Corporation the task of creating a “Control” group of 23,000 RFID tagged trays, representing a statistically valid portion of the bakery’s total tray inventory (about seven percent) to yield acceptable results to extrapolate theories regarding tray loss and usage. All tray types were used in the study measured the same in terms of width and length, but differed in interior depth, from 3.5 to 5 inches deep.

The pilot was set up to:

- ***Determine percentage of tray loss by Ship-To location***
- ***Quantify tray turn times by Ship-To location***
- ***Quantity daily outbound and inbound tray flow***

Radio Frequency Identification Technology

The Kennedy Group developed and implemented the tracking system used for the pilot program and case study. The ability to track the location of assets, inventory and equipment continues to garner attention by businesses as a way to increase production, streamline processes, and save money.

Powerful features and benefits of RFID technology, and how the technology is different from traditional barcode systems, make RFID ideal for the challenges facing the bakery industry.

RFID and barcodes are two different technologies suited for different applications, which sometime overlap. In many circumstances, RFID offers advantages over traditional barcodes because a barcode requires a direct line-of-sight reading and RFID does not. That is, a scanner has to "see" the barcode to read it, which means people usually have to orient the barcode toward a scanner for it to be read.

Because RFID technology does not require a direct line of sight, multiple uniquely numbered tags can be read as they pass through a field powered by radio waves. Passive (or non battery powered) RFID technology can read hundreds of tags in a field at a distance of over 35 ft. This technology brings tremendous value to users in many ways and allows companies to use existing workflow, while collecting important data, to manage valuable assets more effectively. At the same time, because RFID does not require human intervention (reading bar codes), accuracy is increased and labor costs are reduced.

Considering the volume of trays to be tracked and the frequency of movement within

such short time periods, the bakery recognized that an asset tracking system driven by RFID technology was the most practical and logical choice to meet its needs.

RFID Tags, RFID Readers and Software

RFID Tags are an integral part of an RFID system because they store the information that identifies the assets being tracked. RFID tags come in a variety of different form factors to meet different applications. They must be durable enough to withstand water during washing, as well the range of temperatures and conditions trays are exposed to in harsh environments and outdoor climates.

Following extensive lab testing, a UHF Passive RFID tag was selected for the bakery. A durable multi-layer film structure, almost the thickness of a credit card, with a powerful bonding adhesive, ensured tags would stay affixed to high-density polyethylene trays during the pilot. The selected tag was ideal because of its small footprint and tremendous read performance and the amount of trays to read in a single pass.

RFID Readers are available in three different hardware options. The information stored in the memory of the tag is accessed via the radio signal of RFID readers. Data is transferred between a tag and a reader via low-power radio waves. There are three types of readers:

• Handheld readers look similar to traditional handheld barcode readers, but can read multiples of tags at distances of 7-to-10 ft.

• Mobile readers can be affixed to a forklift. They can read multiples of tags, but are generally used for reading pallet IDs or rack locations.

• Fixed based readers are generally mounted at dock doors and are ideal for reading hundreds of tags in a single pass.

Software is vital to the life of RFID systems to process the data, manage the devices, and provide a user interface so that the information is readily accessible and easy to interpret. Software and reporting capabilities implemented at the bakery are described in more detail later in this case study.

Start-Up Issues and Implementation

Tray Management is an important aspect of daily operations in the baking industry. It is a constant challenge to have enough trays at each plant location when needed. Until now, a technology-driven program to facilitate and control inbound and outbound tray activities has not existed.

Because of the unique requirements of a system to track and manage reusable trays, we first wanted to verify and fine-tune the solution on a smaller scale by running what we called a Proof-of-Concept at The Kennedy Group's RFID testing lab. We identified challenges to be resolved in a simulated environment before we launched the full-fledged, eight-month pilot.

For example, a number of original work processes duplicated reads or missed them altogether, distorting the findings. We discovered that moisture in the bread product was absorbing radio waves, which in fact, interfered with the RFID tags and transmission of data. With extensive lab testing, we not only selected the most optimal RFID tag, but also determined that two tags were required on each bread tray, and we identified the optimal RFID tag placement and orientation.

We also experienced malfunctioning RFID readers. Some readers identified trays we wanted to read and track, but they also read trays we did not want read at that given time. We term these reads as "stray" or "cross" reads. In response to this challenge, we adjusted hardware settings and the physical location of the hardware to filter "stray or unwanted reads," ensuring a high degree of accuracy at all fixed read points, such as dock doors.

Upon completion of our Proof-of-Concept testing of the proposed RFID solution, we took three months to establish parameters and develop the infrastructure for deploying the pilot at the bakery' selected locations. These critical areas were addressed:

1. Plant Layouts – The Kennedy Group installed 20 readers at four different plant locations in three different states. Each location is engineered differently, with a variety of workflows, requiring a flexible RFID system.
2. Product Flow – To capture RFID reads in an efficient and accurate manner, thorough understanding of the outbound flow of finished goods, as well as inbound empty trays was critical.
3. RFID Infrastructure – We designed different RFID layouts at each of the plants, respective of product flow. Readers were installed as needed.
4. Ship-To's Identified – All ship-to locations, 130 total, were identified, including depots, customers and routes. Ship-to tags were created.
5. Employee Buy-In and Training – Past efforts in this area did not produce lasting or meaningful results for the bakery, so employee buy-in was critical. Additionally, the pilot program required changes to existing outbound and inbound procedures, as well as employee training about the new procedures and RFID operation in their respective plants.
6. Follow-Up – Shipping management staff were instructed to observe local work practices and initial findings.

The eight-month pilot consisted of tracking trays from the bakery to depots, routes, and directly to stores. The main objective was to help the bakery identify where tray loss

was occurring and gain greater visibility of their trays, which allowed them to better utilize these valuable assets.

After ORBIS Corporation applied RFID tags to the trays, we turned on the readers and deployed The Kennedy Group's web-based software tool, TrackRite, specifically designed for the baking industry. TrackRite software manages RFID devices at all locations, processes information obtained by the readers and provides a user interface with readily accessible information, as well as organizing and displaying data in unique reports. The reports provide a comprehensive view of tray activity, identifying where losses are occurring and significantly improving tray visibility, providing a way to better manage inventory.

Each bread tray used in the pilot was uniquely identified with two multi-trip RFID tags. In addition, an RFID "ship-to" (destination) tag was created for every outbound location. When trays are aggregated and staged for shipping, a destination tag is attached to each stack of trays. As the stack travels through the portal, the ID number of its "ship-to" tag is married to each tray's ID, thereby indicating where that tray is destined. All the information gathered goes into a central database that logs all activities and delivers asset movement. This valuable data is then transferred into a variety of reports that the bakery uses to effectively manage trays throughout their supply chain.

Reports

By using the six reports described below, the bakery is able to identify areas of tray loss, as well as better manage and deploy the trays because of the information the RFID system provides.

The **Asset Distribution Report** provides a real-time view of each tracked asset's location. A tiered display shows asset counts by plant or ship-to, and by individual asset type (i.e., bread trays, bun trays, etc.). Parameter settings allow for adjusting time periods, providing the opportunity to filter for assets not seen in a lengthy timeframe. From this report, a user can flag the assets as "Lost." Each loss is associated with a specific ship to, and the **Loss Report** provides a summary of identified tray loss by time.

The **Turn Report** is an accurate measure of cycle time. It details the number of assets sent out during a defined time period, and how many were returned and in what amount of time. It breaks down the numbers by asset type and by ship to and provides average turn durations for each. The report also shows the number of assets returned within specific time periods, as well as identifies assets at risk of not being returned.

The **Out Report** is a straight count of assets sent out from ALL plants to a specific ship to during a given time period. It is NOT a count of assets at a particular location. It shows volume of shipments based on asset counts.

The **In Report** shows counts of assets received by each plant within a specific time period. Not a count of assets positioned at a plant, but rather what was received as empty returns, regardless of location.

The **Damage/Retire Report** details the counts of assets identified by the RFID system as damaged or retired. The assets are pulled out of circulation and no longer tracked.

Case Study Results and Benefits

Tray Management is an important aspect of daily operations in the baking industry. It is a constant challenge to have the correct number of trays at each plant as necessary.

Using RFID technology is this pilot yielded factual tracking results that helped the bakery take corrective action to improve tray management. The pilot measured tray activity for eight months before looking at the project's first objective: "Where are we losing trays?"

We measured tray loss as the percentage of trays shipped out, but not returned. Second, we tracked the number of days it took for a shipped out tray to be returned.

Using the **Asset Distribution Report**, the pilot identified outbound tray usage by category, as follows:

1. Retail Clubs 15.63%
2. Ship-To Direct Customers 9.59%
3. Identified and Measured Retail Routes 1.28%
4. DSD Identified Routes 1.68%
5. DSD/Retail Route Depots 62.11%
6. Outside Agencies 3.37%
7. Suppliers 6.34%

Then we sorted the percentage losses by category of annual tray loss:

1. DSD/Retail Depots 66.23%
2. Suppliers 13.83
3. Retail Clubs 6.69%
4. Ship To Direct 6.0%
5. Outside Agencies 4.91%
6. Identified DSD Routes 1.76%
7. Measured Retail Routes .59%

The bottom-line indicated that two areas of the bakery's business account for 80% of the company's annual loss. DSD/Retail Depots tray activity accounted for 62.11% of overall tray usage and 66.23% of our overall loss, an in-line percentage of non-returning trays because of the large percentage of trays used in the DSD/Retail Route system.

Suppliers, on the other hand, account for only 6.34% of the bakery's tray usage, but were responsible for 13.83% of overall annualized tray loss.

Strategies for tray management improvement were clearly predicated upon these findings and action assignments were deployed. Month-to-month performance was tracked, and reports indicated both a quick improvement followed by a sustained effort to increase the number of returned trays.

Using the **Turn Report**, the pilot measured how long it takes for a tray to cycle to ship-to's and return to the right plant location. Cycle time determines bakery tray inventory needs. Any disruption to turn times gives a false tray read that indicates additional tray purchases are required when the more appropriate action may be to improve cycle times.

Before the use of RFID technology, this measurement was totally impossible to calculate. Management counted outbound and inbound trays from the back of delivery trucks and performed regularly scheduled physical inventories, which never measured turn times.

The bakery was surprised by the results of the first Turn Report, which indicated that trays turned on average in 5.54 days – higher than the estimated four days. The results follow:

1. DSD/Retail Depots 6.19 Days
2. Retail Clubs 4.70 Days
3. Outside Agencies 5.97 Days
4. Ship Direct Customers 5.65 Days
5. Suppliers 4.44 Days

A list of action assignments to address each ship-to experiencing poor return performance garnered improved results were satisfying.

1. DSD Depots 4.13 Days
2. Retail Clubs 3.65 Days
3. Outside Agencies 6.08 Days
4. Ship Direct Customers 3.81 Days
5. Suppliers 2.57 Days

This quick improvement was followed by steady and sustainable performance.

During the process of reducing tray loss and tray cycle times while running the pilot, the bakery discovered that every suspected source tray loss or tray turn delay denied their respective role(s) in our tray program. If a supplier, carrier, depot or a driver was questioned, they rejected our claims until we presented our findings.

The bakery contacted all suppliers exceeding two-to-three day return times. For example, when investigating two freight lanes experiencing return times of over 14 days, drivers advised us that trays were sitting on trailers in the service regions. When we showed the freight company our data, the carrier returned six trailers of empty trays.

In-house drivers were noted as being the greatest contributors to our nominal loss. Therefore, drivers that did not properly return all available empty trays were counseled in such a manner that everyone had a chance to learn.

Additionally, an In-House Committee was established to expand the focus company-wide, and Alpha publishes a monthly results by Ship-To tracking Tray loss and return times. We now had facts to share.

The third objective of the pilot was to identify daily tray movements using the **Inbound** and **Outbound** Reports. While the bakery maintained a consistent inbound and outbound flow throughout the week, a problem materialized with inbound availability two days prior to outbound sales orders. This was compounded by a down day in the delivery cycle, and the fact that daily needs are often volatile. Based on tray flows identified in the reports, the bakery was able to take steps to mitigate shortages when trays were needed to fulfill sales orders.

Case Study Conclusions and The Future

The RFID tracking system implemented at the commercial bakery worked. Trays with RFID tags told the story of their cycle throughout a supply chain that included multiple bakery locations, distribution points, and over 130 ship-to locations. Reports provided by TrackRite enabled the bakery to use the data to implement processes for tray management improvement:

• Tray inventory was better controlled, reducing replacement tray purchases and costs.

• Tray turns were reduced from an average of 5.5 days to 3.5 days.

• Tracking daily tray movements helped match inbound tray availability with outbound sales orders – ensuring that trays were available when needed.

The case study illustrates that the pilot program significantly reduced reusable tray loss and the associated costs of inventory replacement and increased labor.

Other bakeries, implementing TrackRite and building on the initial successes of this pilot program, can expand the scope of RFID asset tracking to include tracking at the depot and retail store levels. They can also consider installing RFID readers on trucks. These additions will provide bakeries with full visibility of the entire bakery supply chain.

At the tray level, functionality and traceability can be expanded to link bakery product to individual trays. Tags can be configured with batch dates and production locations to facilitate food product recalls, helping bakeries streamline recall contingency plans. Enhanced functionality will also help manage product inventory levels and identify unaccounted sales.

There is no doubt that TrackRite is ideal for bakeries and food distribution models in which returnable containers – such as reusable pallets, racks, and trays – are used in an open network with multiple collection points. This technology is also well suited for other industries. The Kennedy Group specializes in RFID technology for manufacturing and general industrial applications, as well as warehouse and logistics management.

For more information about TrackRite and other RFID technology available from The Kennedy Group, contact us at (440) 951-7660 or kennedygroup1@kennedygrp.com.