WHITEPAPER

RFID TRACEABILITY SOLUTION FOR LAUNDRIES - FLAT LINEN

CONTENTS

INTRODUCTION

Although the numbers vary significantly based on the individual hotel, **an average of 20% of the linen** placed into service are replacing product that was incidentally lost or stolen.

At **an average cost of £300 per room** for a four par of basic sheets, duvet covers and pillowcases, the UK hotel industry **invests around £270 Million in flat linen** alone. Without effective traceability solutions premature **replacement costs are in excess £50 Million per year** with a loss factor equivalent to **£60 per bedroom**. Maintaining adequate inventory of linen in circulation and **taking steps to secure product and reduce abuse and theft are crucia**l to an efficient laundry supply chain. Theft of textiles are **a significant cost that should be budgeted** for since these costs may not always be controllable but loss through a lack of inventory visibility and management is a careless cost.

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£270 Million

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£50 Million

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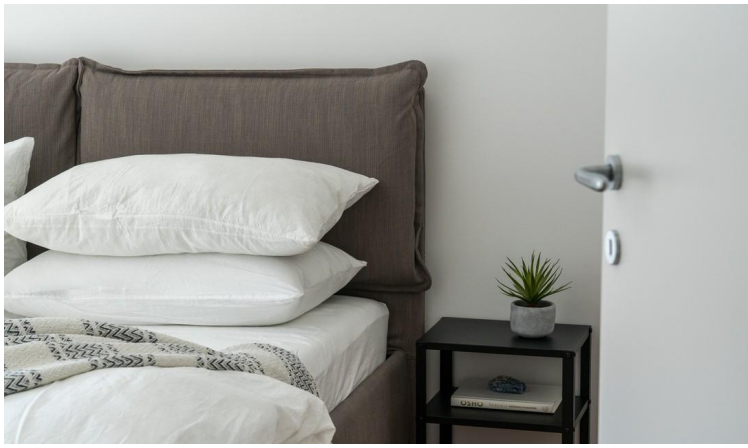
£60

loss factor per bedroom



Traceability solutions at unique item level in the linen supply chain **controls and analyses how linen is processed, distributed, utilised, returned, and managed**. To be able to extract impacting information **a big data analysis solution is indispensable** for driving efficiency and reducing costs.

Collecting and managing loss data has become fundamental to textile asset management and new levels of automated, **intelligent track and trace solutions are making the process faster and more accurate**. With such solutions, laundries can **visualise the different flows of linen** directly through a cloud-based platform with big data processed to provide real time reporting to support **smart decision making**.

Automated traceability allows procurement and operational teams **to forecast and control inventory costs, budget annual linen needs, schedule new stock, and manage effective utilisation** so they can focus efforts on educating users to prevent abuse. Intelligent item level data helps provide a more accurate picture of total linen inventory and cost.

TRACEABILITY SOLUTION

Traceability solutions can **drive efficiencies and cost savings** at all points in the supply chain regardless of the supply chain model. Contracted full service is when all linen supplies and all subsequent laundering is provided under a single contract with an external contractor. Here the contractor has a very vested interest in the management of their inventory as **any new efficiency gains deliver top and bottom-line benefits**, but any loses are their costs to recover. Full service in-house is where all linen supplies and all subsequent laundering is undertaken internally. Therefore, the ability to drive operational efficiency, reduce spend and prevent careless costs are **the priority of the end user customer**. A hybrid model exists where linen and laundry services are a combination of in-house and contracted services where the end customer may purchase all linen, but all laundering is undertaken by a contractor. In this model **both end customer and service provider share a mutual interest in inventory management and control, operational efficiency**, and the need to prevent careless costs. Real time visibility at item level through **automated track and trace** has the additional benefits of a more integrated and visible supply chain and **reduces any disagreement between service provider and end customer**.

The use of calibrated scales, for example, for receiving and shipping laundry is **one method in practice to account for inventory movement** between locations in the supply chain. This is **faster than a manual count** and acceptably accurate with clean laundry. The lack of integration into ERP systems reduces the visibility benefit and requires human intervention processing data which is time consuming and open to error. There is no exact accuracy with soiled linen though and there is no way to knowing the condition of each soiled linen item. The **accepted solution is to weigh them and apply a soil-to-clean factor** to compare the returned volume with the previously delivered volume. Typically, **soil adds 10% to 12% weight to hospitality linen** but by no means fully accurate

This paper focuses on **automated identification of individual linen using Radio Frequency Identification (RFID)**, a wireless non-contact use of radio frequency waves to **transfer data**. Tagging linen items with RFID labels **allows users to automatically and uniquely identify, count and track inventory**. RFID tags sewn into each item, usually at source, are designed to **withstand high-temperatures and repeated washing, drying, and ironing**.

Fenotag, our trusted partner for several years, is a French company specialized in **manufacturing high-quality textile tags**. Their products are recognized for their **reliability and precision**, making them indispensable to our system. By working closely with Fenotag, we have been able to seamlessly integrate their solutions into our processes. This collaboration allows us to fully benefit from Fenotag's expertise in textile tag technology, ensuring **precise and efficient identification of items**, while guaranteeing an optimal user experience.

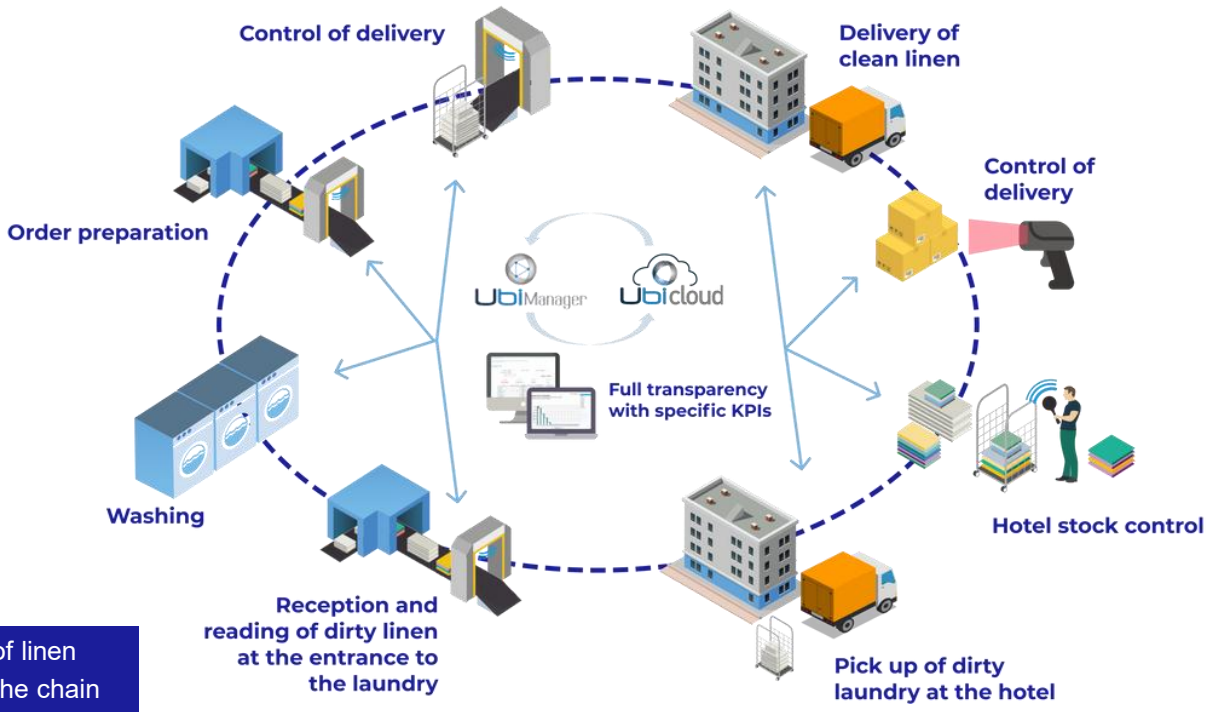
Fixed RFID "readers" can be installed in doorways, entrances, exits, on conveyors and even integrated into laundry machinery to **interrogate tags at different points in the supply chain cycle**. Item information is read, without line of sight to the tag, in vast numbers simultaneously, storing and processing unique data on linen movement. **Mobile handheld RFID devices provide additional flexibility to read** whole location inventories, anywhere in a matter of seconds.

Fixed RFID reader

Mobile RFID device

Using RFID technologies, it is now possible to **track hotel and hospital linens and workwear** thereby automating the inventory process and the life-cycle management of individual linens or textiles and reducing loses. For laundries, hotels, hospitals, and healthcare facilities, it can be challenging to **manage the massive inventory of linen and workwear**.

Investment in RFID is too often viewed as expensive but with streamlined, **automated laundry processes** to drive accuracy and efficiency and reduces loses the ROI is incredibly fast, often just a few months. Through RFID traceability, you will always have **complete visibility of laundry inventory**, as well as reliable and accurate information about the usage and total lifecycle of every item



Tracking of linen throughout the chain using RFID

TRACEABILITY SOLUTIONS IN THE LAUNDRY SUPPLY CHAIN

An RFID system for flat linen will **generate millions of records**. The more RFID reading points a system has **the more data is generated**. With such a solution, laundries **can visualise the different flows of linen directly** on the cloud-based platform. By knowing the flow, you **can limit the losses and optimise the stock** is a more profitable way.

Solution Architecture

The **local middleware UBI Manager** makes it possible for different elements of the traceability network to exchange data with each other. This management software has the task of **collecting data from a wide range of reading devices**, connecting to third party applications like ERPs Sofware but also Production Analytics Software, even Ironers or Industrial machinery. UBI Manager monitors, supervises, and aggregate data, filtering it for the Cloud.

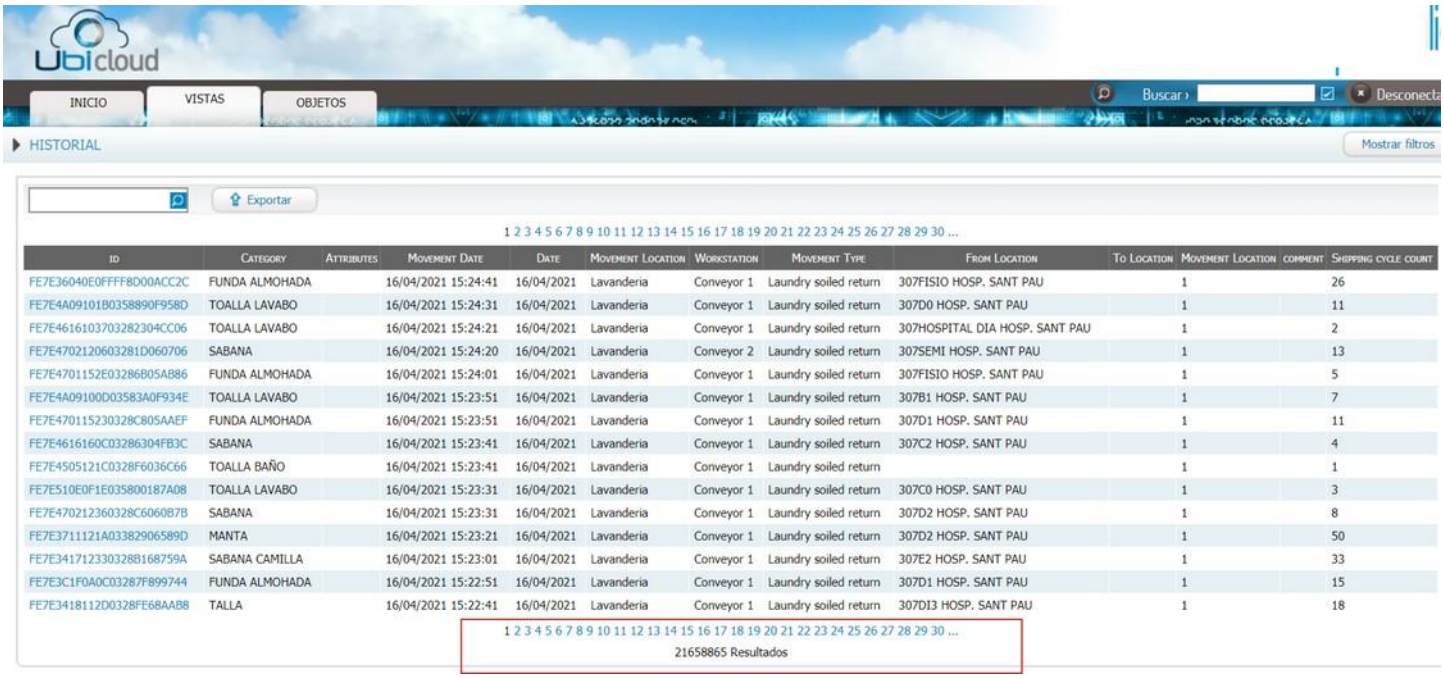
UBI Manager is the key element of the solution, it is the element responsible for **"filtering" the 10s millions of readings** that are made during the normal operation of a laundry group including all reading at customer sites. It displays the readings made by the different devices in UBI Cloud.

Each time an item is read by a device, the management software gets the following information:

- **The tag ID: the EPC identifier unique to the linen item**
- **The date-time of the read**
- **The device that made the read**
- **The "movement type": For example, each time an item is read at the Soiled entry of a laundry, it is doing a "Laundry Soiled Return" movement**
- **Location: where the read has occurred**

The information will be processed and **makes a first filtering and pre-calculation of indicators**. For example, when a device is scanned at Soiled reading portal, it will check where it was sent last time, and will calculate the downtime of the item, meaning how much time it has spent in the customer's site and can generate automated delivery and billing notes.

A **Cloud platform and a central management software will centralise all the information** within the linen cycles. **UBI Manager will act as a translator** for local ERPs and information systems. This architecture **can prove very effective** in a wider project, where different laundry units in the value chain may use **different ERPs and information systems**.



ID	Category	Attributes	Movement Date	Date	Movement Location	Workstation	Movement Type	From Location	To Location	Movement Location	comment	Shipping cycle count
FE7E36040E0FFFF8D00ACC2C	FUNDA ALMOHADA		16/04/2021 15:24:41	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307FISIO HOSP. SANT PAU		1		26
FE7E4A09101B0358890F958D	TOALLA LAVABO		16/04/2021 15:24:31	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307D0 HOSP. SANT PAU		1		11
FE7E46161037032823O4CC06	TOALLA LAVABO		16/04/2021 15:24:21	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307HOSPITAL DIA HOSP. SANT PAU		1		2
FE7E4702120603281D060706	SABANA		16/04/2021 15:24:20	16/04/2021	Lavanderia	Conveyor 2	Laundry soiled return	307SEMI HOSP. SANT PAU		1		13
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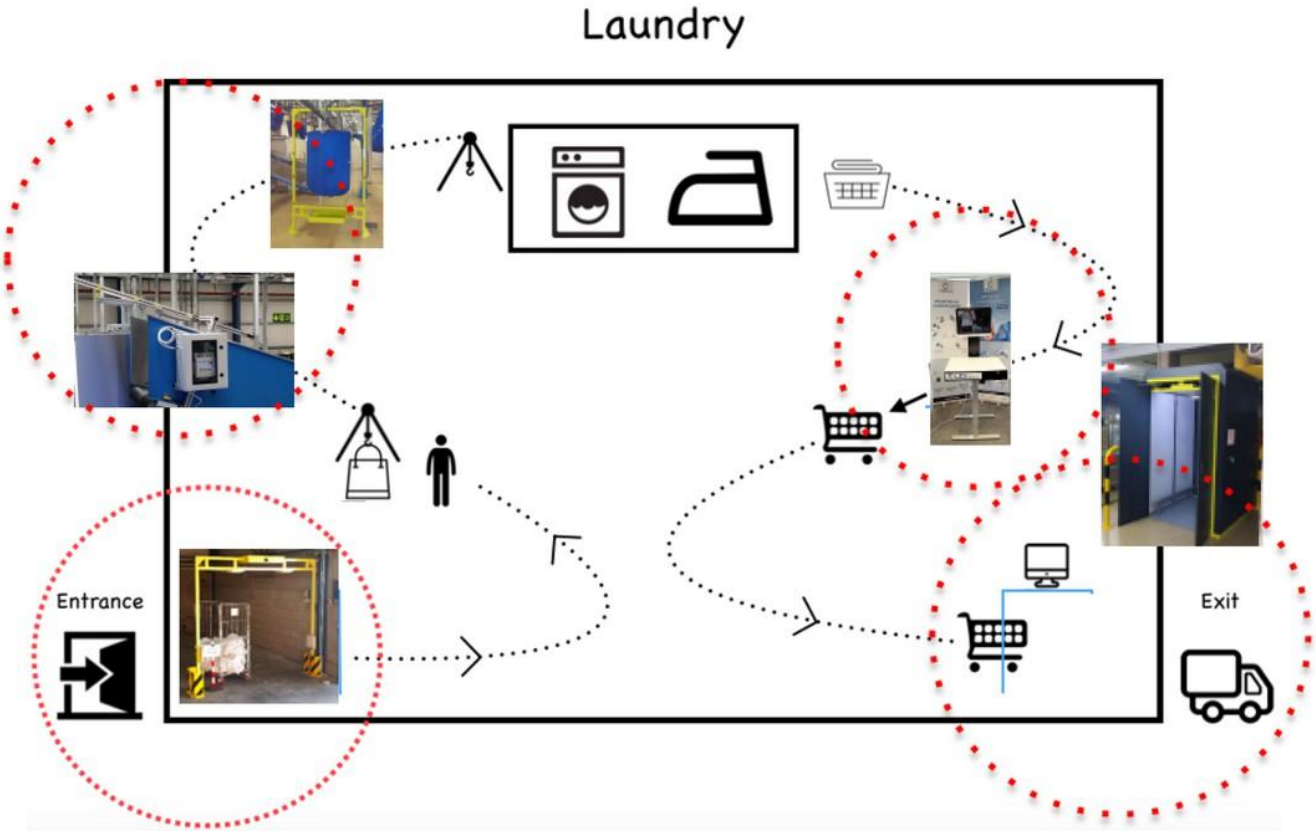
FE7E4A09100D03583A0F934E	TOALLA LAVABO		16/04/2021 15:23:51	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307B1 HOSP. SANT PAU		1		7
FE7E470115230328C805AAEF	FUNDA ALMOHADA		16/04/2021 15:23:51	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307D1 HOSP. SANT PAU		1		11
FE7E4616160C03286304FB3C	SABANA		16/04/2021 15:23:41	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307C2 HOSP. SANT PAU		1		4
FE7E4505121C0328F6036C66	TOALLA BAÑO		16/04/2021 15:23:41	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return			1		1
FE7E510E0F1E035800187A08	TOALLA LAVABO		16/04/2021 15:23:31	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307C0 HOSP. SANT PAU		1		3
FE7E470212360328C6060B7B	SABANA		16/04/2021 15:23:31	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307D2 HOSP. SANT PAU		1		8
FE7E3711121A03382906589D	MANTA		16/04/2021 15:23:21	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307D2 HOSP. SANT PAU		1		50
FE7E3417123303288168759A	SABANA CAMILLA		16/04/2021 15:23:01	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307E2 HOSP. SANT PAU		1		33
FE7E3C1F0A0C03287F899744	FUNDA ALMOHADA		16/04/2021 15:22:51	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307D1 HOSP. SANT PAU		1		15
FE7E3418112D0328FE68AAB8	TALLA		16/04/2021 15:22:41	16/04/2021	Lavanderia	Conveyor 1	Laundry soiled return	307DI3 HOSP. SANT PAU		1		18

UBI Cloud : a Cloud Platform in which it is possible to access all recorded information

BASIC LINEN TRACEABILITY INSIDE THE LAUNDRY



The diagram above is the **basic level of traceability RFID**. In this example, four tag interrogation points are represented, but a solution design **depends on laundry layout, process, and volume of linen**:

- At the entrance of the laundry (gantry, portal readers)
- Between sorting and cleaning (sling bag, conveyor readers)
- Between cleaning and shipping (smart reading tables)
- At the exit of the laundry (gantry, portal readers)

Soiled linen normally arrives at the laundry in cages. Once the cages are lowered from the truck, an operator moves the cages one by one into the laundry. The cages go through the RFID reading gantry or portal where all tags are detected, read and processed **changing the status and location of each unique linen item in the database**.

With the RFID gantry, when the operator enters with the cage, the screen **can show the area of the room for soiled linen**, in which the operator must place the cage. Thus, if the screen displays "300 sheets, red zone" or "100 pillowcases, yellow zones", the operator places the cage in the area dedicated to the category of the container. It is possible to **interact between an ERP or a production system** in an interactive manner.

This feature is useful **to control which linen must be washed first** depending on the production program. This panel PC connected to the entrance gantry is not mandatory for traceability of the linen. However, this is an example of a **performance tool to help to optimise the stock utilisation** at the laundry.

Once the laundry is sorted into bags they can be delivered to the washing machine **via a rail system or conveyor**: the bag is suspended from a rail or sorted lose and placed on a conveyor. During this movement, the bag passes through a second RFID reader, a **Sling Bag gantry or Conveyor gantry**.

When **100% of the linen at the laundry is tagged** (or 100% of the linen for a specific customer is tagged and the laundry works on a per customer washing basis), additional reader stations can also be installed at the ironers. Reading point at the ironer means linen **can be rejected or managed during this process**. If the reader identifies that the linen is not the correct category or the belongs to another customer, then **the linen can be ejected from the ironer**. With the capability to integrate the readers and management software to specific industrial machines (Kannegieser, Jensen, etc...). the ironer will **understand automatically which linen is expected**.

Alternatively, the same can be achieved **using smart reading tables** placed after the washing / drying / ironing / folding and before shipping.
This ensures **a fast and accurate count and item category check** for each customer shipment. The operator can directly fill the cages without checking the actual contents of the linen packets manually.

By placing a linen packet on the smart table, a panel PC displays the product description and quantity of units. **The operator now knows exactly the characteristics of the packet**. Consequently, the operator can fill a cage with a specific number and type of items.

Shipping orders is critical for the traceability of the linen. This is where the linen will be allocated to a customer. The operator places the requested amount on linen per customer in **the RFID cabinet**. He closes the door, and the software **will count the linen through an RFID reader and antennas** (doors can be manual or automatic, depending on budget). The operator can then verify that the amount corresponds to the customer order. Multiple options are possible, especially when a connection to an existing ERP system is made. It is now possible to **compare automatically the quantity read with the expected quantities to be shipped**. Specific actions or discrepancies reports can be trigged.

The **RFID cabinet can also be used to assign brand new linen**, on mass, to specific customer ownership, book to stock or remove condemned stock from the database.

BASIC LINEN TRACEABILITY OUTSIDE THE LAUNDRY

The **linen room is the middle point** between the laundry and the end customer. In some cases, the linen room is directly at the end customer building. In a hospital, there may be several linen rooms each belonging to a service (pediatrics, emergency room, etc.). In many big hotels, there are **linen rooms at each floor** instead of one linen room for the entire hotel; each linen room **contains the linen for all the rooms** of its floor. .

The main role of a linen room is **to order linen to the laundry and redistribute it** to the end-customer. Each linen room has **a RFID Handheld**. A RFID Handheld **enables end customers to know the content of a cage** just by holding it close to the cage.

First, the RFID Handheld will **allow the user to simplify the daily counting** when the cages arrive at the linen room. Secondly, this Handheld is **used to adding a control point** in the traceability of the solution.
Moreover, the PDA is **connected to the cloud via Wi-Fi or 2G/4G**. With the **tag number identified** through the Handheld, it is possible to check and change the status in the cloud.

RFID Handhelds also **allow laundry customers to perform inventories of their stocks** whenever they wish. Even though the linen is traced from one end to the other of their cycle, sometimes **some linen is not located where it should be**. Moreover, some hotels or hospitals keep too much clean linen in stock, **forcing the laundry to buy linen** to face the continuing demand. Other times the stock of linen is too low, **resulting in a shortage of laundry and consequently service disruption** at the customer locations.

ROI

Customers have achieved a very short ROI through **a reduction of yearly linen purchase and the level of stocks**. Customers have reduced their stocks and accelerate its rotation. The tracking of the linen and the information to all stake holders have had an impact of linen losses. With these two parameters, the laundries **have spent less at the end of the year on purchased new linen, increased their service to their customers and reduced the extra hours needed to deliver the appropriate quantities** in due time to their customers.

Within an existing operation, where it is not easy to change the production processes and existing customer contracts, the most profitable way of implementing an RFID solution is **to start tagging only the new purchased linen, or a new category or some specific customers or a mix of these 3 options**.

Over the years, the laundry will can keep replacing the linen, propose new types of customer contracts and step by step adapt the production process to fully take advantage of the possibility **to gain on production productivity**.

Such an approach gives the laundry the possibility **to analyse the complete flow of linen** with all categories and customers reducing the investment costs at the same time. It is then **possible to recognise which customer does not return the linen but also to see which linen is missing for a customer**.

The whole purpose of the exercise is to find the problem zones so they can be fixed.

That way the laundry **manages their stock more efficiently** and at the same time provides a better service. Customers have been **able to reduce the quantity of early textiles purchased by 20% to 30%** after just 12 months of RFID operation. Other improvements include **increasing the number of average washes per linen, reducing hours in the supply chain and a better rotation of the existing stock**.

CONCLUSION

The process of this RFID solution represents the basic linen traceability inside a laundry. Customise this process and make it even more efficient by adding additional reading points inside and outside the laundry. These reading points **provide the laundry with important KPIs** about their process.

The **hardware** (antennas, readers mounted on specific designed gantries and cabinets) **reads the tags and creates data associated** to this event. This **data is relocated in a cloud**. The cloud is the tool that **allows the laundry to have a global view about its flow**: quantity of linen ordered, location, downtime... The laundry is now **able to know very precisely the stock** of its customers. Stock circulates faster, downtime decreases, and losses reduce. There is an **increased transparency delivered by the cloud** because it is accessible by anyone, anywhere without putting the IT security of the laundry in jeopardy. Customers can see for themselves the flow of linen and manage their stock more effectively driving full value add/USP to the laundry and to the supply chain.

RFID Laundry traceability solutions:

Reduce Costs

full visibility and accurate data to understand exactly which items need to be replaced, allowing you to only purchase linen you need.

Stronger Customer Relationships

better information for you and your customers and eliminate discrepancies and disputes.

Increase Efficiency

automate and reduce most manual tasks. Orders packing, deliveries and collections are counted quickly and accurately.

Automate Inventory

a automate your inventory for maximum accuracy.

Eliminate Loss

RFID solutions help eliminate linen loss throughout the laundry supply chain.

UBI SOLUTIONS

For more than 10 years Ubi Solutions have **provided track and traceability solutions into more than 600 customers across 30 countries**. Our Cloud based solution is tech agnostic; we look at the exact needs and match the technology to this specific need and application for the best possible results. Ubi Solutions **collect, analyse, process and report on more than 1 billion transactions every year** using best fit and **best of breed technologies including RFID/BLE/GPS**. Every solution belongs to the exact needs and requirements of our customers **to deliver fully customised solutions** to support individual operations, data, and KPI/reporting.

SMART IOT FOR GREAT BUSINESS

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