



## RFID for Construction Sites And Facilities Management

Construction sites are challenging environments to manage with many critical questions to answer:

*'Where is Frank? - We need him right now.'*  
*'How many Part ABC are currently on hand? - We need twenty or we can't start the next phase.'*  
*'Where is Part 123? - The crew is waiting.'*  
*'What is the Warranty date on that part?'*



To meet these challenges, more and more construction companies and site contractors are benefiting by integrating RFID technology in their day-to-day operation of construction sites and projects.

The ROI is amazing for so many aspects of this industry. When RFID is used properly you will end up utilizing all of your resources more effectively. The impact to the bottom line will be dramatic.

RFID has found its way into almost every corner of today's fast moving, always looking for increased efficiency, world. FSN has the right RFID technology for your construction business requirements. By combining the latest in passive and active RFID with Omnitrol's edge appliance and middleware solution available from FSN, your operation will quickly enjoy the benefits of this new enabling technology.

You know your business the best. Here are some common 'pain points' that the construction industry is wrestling with and that can profit through the use of RFID:

- Labor Efficiency/Productivity
- Out-Of-Stock Management
- Inventory Management
- Receiving Shipping Accuracy
- Reduced Claims
- Reduced Non-usable Items
- Reduced Diversion
- Product Recall Management
- Better Visibility
- Better Fulfillment
- Product Integrity
- Reducing Product Obsolescence Costs
- Tracking and Managing Spare Parts Inventory
- Facilitating Statistical Process Control
- Enabling Lot/Batch Track and Trace
- Ensuring Worker Safety
- Reducing Returns and Warranty Claims
- Reducing Scrap, Waste and Obsolescence
- Better Planning and Forecasting
- Better Processes in Vendor Managed

- Increasing Capacity Utilization and Yield
- Reducing Cycle Time
- Improving Product Quality
- Ensuring Timely Preventative Maintenance
- Inventory Systems Related to Reordering
- Traceability and Safety of Products by Avoiding Counterfeiting
- Better Asset Management and Handling of Returnable Assets

*Increasingly, developers and building owners are seeing the benefits of integrating RFID into the construction phase with a view that such RFID and sensor enablement will automate many aspects of the facilities management, especially energy management, once the building is operational.*

*With Omnitrol’s built-in middleware and set of customer defined business rules, actions are implemented automatically when the RFID Readers detect certain real-time threshold conditions.*

In various reviews of the Construction Industry, a number of potential application areas for RFID technology have emerged. These included component tracking, inventory management (small tools as the example) and equipment monitoring.

Suggested applications for the future include guided control of equipment and maintenance applications, tags that can communicate temperature, vibration, fatigue or excessive stress in concrete and steel members, and concepts for safety management.

As a result of large allocations of R&D investments, the technology has rapidly evolved and improved in quality in just the last 2 or 3 years as well as witnessing significant cost reductions.

Ideally, the RFID tags for construction applications could also be planned for utilization for management of the completed facility, thereby further enhancing the justification for the expenditure on the RFID system and, importantly, adding value to the facility by automating or at least simplifying the facilities management process. Indeed, asset tagging and tracking and energy management are frequently cited as applications from which real value could be added to the management of facilities.

Before examining individual applications, it is instructive to note the broader picture and understand the implications of introducing RFID technology into the construction sector generally. Three broad areas are involved:

1. Value and supply chains in the construction process, including the subsequent management of facilities.
2. RFID technology – its practical implementation and the results produced.
3. Handling the large quantity of data generated by RFID systems and the use of agent technology.

## **THE CONSTRUCTION SECTOR VALUE CHAIN**

### **1. Recognizing the value chain**

The drive towards more efficient construction is well illustrated by examining the value chain, which follows the lifecycle of a building from raw materials through to the management of the completed facility. Construction projects today more and more less frequently follow the conventional (i.e. linear) model where completed buildings were handed over to the owner.

Today, it is not uncommon for the constructor to retain a measure of control either as part-owner or as the operator of the asset or facility, as would occur under various integrated procurement routes. In this way, the cost efficiency of the completed facility becomes the constructor’s responsibility and so it is as important to manage the facility as if it were the construction phase – perhaps more so.

## **2. Value chain modeling**

A company's core competences can be determined by using a value chain model to analyse where cost advantages can be gained in performing activities. Value chain modeling separates the business system into a series of value-generating activities subdivided into primary and support activities

## **3. Security – control of access to facilities**

Management of facilities requiring control of access may use RFID tags attached to employees' ID badges; this method is already in use in hotels and commercially sensitive sites to permit/control staff access to specific areas. Safety requirements also requires real-time data on all personnel on site at all times.

FSN can integrate the RFID location system with infrared motion sensors which trigger tracking cameras enabling, for example, the identification of unauthorized access.

## **4. Inventory**

Control of inventory is one of the widest application areas of RFID technology, and is used for applications ranging from hand-tool logging on construction sites to parts and building materials.

## **5. Construction site delivery logistics and materials tracking**

Materials tracking management systems are able to provide site managers with the ability to determine construction progress and materials delivered from centralized reports or by simply walking around a site where all materials are identified and tagged using an RFID system. This would guarantee more accurate estimates of the number and quantity of delivered goods and enable reliable monitoring of 'percentage construction complete'.

The RFID system is seen to show the way to several improvements.

1. Reduction of costs incurred from wastage of materials, theft and check-in waiting times for material.
2. Agent technology enhances communications by informing the driver immediately where the material is to be placed. The agent will confirm delivery of the material with the supplier via the internet and the supplier's website or e-mail address as soon as the material is sent through the delivery gate. The site engineer will be informed as soon as material has arrived on site and can respond and issue further instructions if necessary. If there are any discrepancies, the driver will be informed as will the supplier. The key point to note is that this communication will be immediate, so any problems can be resolved as soon as they become apparent.
3. Time savings will result due to efficient document management. There should be less paperwork, no invoices for the delivery personnel to complete, as all will be automated by the system. Information will be in electronic form and include instructions for the vehicle driver to follow. Multiple handling of documents will be significantly reduced.

## **6. Document tracking**

RFID technology can be used for rapid document tracking, essential in the construction phase to identify the latest version of files and drawings, and also in the facilities management phase to locate original build specifications and layouts. Each document is tagged with an adhesive smart label (RFID printed circuit) that contains a unique ID together with human readable information. The file description is entered into a database along with its tracking number and can be assigned certain parameters like expiration date, permitted movement and personnel authorized to see it. Over time, the database could build up an audit trail of the handling and workflow history of each document file.

## **7. Product life cycle tracking**

Manufactured components of all kinds are already using RFID tags for tracking their progress through production and delivery processes. The same tags should be suitable for continued use during the life cycle of the component. A useful illustration of this development comes from the Michelin tire company, which is now providing product lifetime identification for automobile tires. UHF RFID tags embedded into tires are being used to

identify the manufacturer's name and plant, store the time and date of manufacture, tire dimension and pressure specifications. Once the tire is installed on a new vehicle the tire identification number and the vehicle's VIN (vehicle ID number) are downloaded to a computer database enabling manufacturers to make targeted, quick recalls.

The automotive industry will extend this application to provide vehicle maintenance and service records by means of the RFID tags embedded within tires. Such information in conjunction with the car's odometer could track the mileage of the vehicle and alert the driver when the tires need to be rotated. Since the tags are rewritable, international standards would enable the car to have an up-to-date service and maintenance record regardless of the mechanic or station that has provided work.

This application is automotive, but clearly could be applied directly to buildings and facilities for use with virtually any equipment that requires regular servicing, functionality checking and logging, safety inspection and recording etc. The safety application is significant, as automated electronic record keeping can provide regular unbiased records that are virtually tamper-proof. RFID tags containing pertinent safety information, including regular test records, could be attached to safety equipment such as slings, safety harnesses and belts, scaffolding and hardhats. Similarly, containers of hazardous materials can carry their own handling instructions and usage records in an attached read-write tag.

### **8. Location of buried services**

Buried pipes and cables can be located using attached RFID tags, so long as the read range is not exceeded. For plastic pipes, a more suitable technology uses magnetic nanoparticles during production of the pipe. It is possible to introduce conductivity into plastics by simply mixing in conductive nanoparticles in the production process. Thus, magnetic nanoparticles can be used to introduce a unique magnetic 'signature' to plastic items, which can then be scanned like barcodes. In the construction field, this would allow simple and accurate location and identification of underground services such as gas and water pipes, communications cables etc. If the magnetic signatures are repeated at regular intervals along the entire length of the pipes and cables, they could be tracked throughout the site.

### **9. RFID – sensor and network combinations**

RFID active tags can be interfaced to networked sensing systems to add further capability to the basic read or read/write tag data function. Wireless networks within a facility, a hospital for example, will allow real-time location of vital mobile assets. This provides an ability to find equipment immediately and also improves asset utilization, as well as reducing theft.

RFID tags with integrated sensors provide not just simply 'electronic bar code' data, but measurements of physical parameters such as temperature, shock (acceleration) and even GPS-enabled tracking. Such sensors can be applied to civil structures, buildings, dams, bridges and tunnels to prevent or, at least, warn engineers of fatigue or failure. Sensors will be deeply embedded within these structures, supplying data when scanned for shear, strain, pressure and other forces that can affect them, using wireless networks to return the scanned results to a data centre, thereby saving the expense of sending out safety inspectors and engineers to monitor the structures.

### **10. Building Energy Control**

Networked RFID devices with physical sensors complement other developments in sensor networks. These combine recent advances in sensor miniaturization, wireless communication, and micro-system technology to form networks of tiny autonomous sensors that can make accurate measurements of environmental parameters such as temperature humidity, light, acceleration etc. without the necessity of laying cables. Building energy control systems have been generally restricted to prestige projects, as the wiring and signal conditioning costs for the many sensors are prohibitive; but the development of these relatively inexpensive devices using radio communications across their network brings the possibility of accurate climate control for all buildings down to individual house level.

Once distributed around a building, the sensors would form a network relaying data about each room's temperature, light, humidity, occupancy etc. to a central computer that would regulate energy usage in the building, optimizing the energy delivery to each room and using passive heating and ventilation control methods wherever possible.

## CONCLUSION:

The breadth of example applications given above indicate that RFID and its associated sensing and networking technologies are having a major role in facilities management.

The goal of using RFID on the construction site for material flow management is to speed the flow of materials and make sure work days are not lost due to the proper materials not being on hand. In addition, RFID can help manage the official safety documentation required by authorities after certain building steps are finished, because RFID allows building components to be tracked after construction is complete.



*A truck carrying tagged facade elements passes an RFID gate.*



*Tagged crates loaded with tagged facade elements.*

*When a driver moves his vehicle through a portal erected at the construction site's entrance, a RFID interrogator was used to read the casing tags.*

*EPC Gen 2 tags are also attached on facade elements, and on the crates in which they were transported, in order to track them during the transportation phase. They also applied a passive tag on the facade element's frame, for tracking the elements following installation.*

*When a truck loaded with crates of facade elements passed through the RFID portal erected at the construction site's entrance, the portal reader interrogated the UHF tags. Once the facade elements were installed onto the building, workers could use a handheld RFID interrogator to identify each tag. Facility managers can subsequently interrogate the tags on the installed facade elements to track their maintenance history.*

## FALKEN Secure Networks(FSN)—Your partner for RFID automation

If you choose to pursue RFID implementation in your organization, here is the FALKEN Secure Networks commitment to you:

- FSN will provide solution architects to work with you to define system requirements for your particular installation. Multiple locations can be networked together for a central and real-time view and centralized management.
- FSN will do a RFID site survey to validate radio frequencies, tag types, system design and performance
- FSN will provide all necessary hardware and software to make the system work for you
- FSN will integrate the system with your existing enterprise management software
- FSN will provide documentation for the system, including operating procedures
- FSN will train your people
- FSN will provide warranty and continued system support

For RFID-enabled Document Tracking and Management, FALKEN Secure Networks (FSN) and partners bring together the right technologies to give you control over your files and make your office run more efficiently. Our automated and secure processes save time and labor, and prevent problems before they occur. With FSN ,you get the latest, non-proprietary secure RFID technology with the most powerful and flexible RFID file tracking software available.

## Contact Us

FALKEN Secure Networks is a specialized System Integrator, RFID Solution Architect, and Value-Added Reseller with focused expertise in the RFID site survey, cost-effective design, and turn-key project implementation.

Contact FSN at [sales@falkensecurenetworks.com](mailto:sales@falkensecurenetworks.com)



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