RFID SOLUTIONS FOR MANUFACTURING
Supporting lean manufacturing

MOJIX
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The Lean Manufacturing Movement

Lean manufacturing has been around for decades but it is only in recent years that modern data collection and management techniques have made it possible for businesses of all sizes to implement a lean philosophy.

This document, brought to you by Mojix, Inc., an established expert in RFID applications in various domains including lean and just in time manufacturing, gives an overview of lean manufacturing using RFID and how businesses could go about selecting and implementing their solutions.
While the principles of lean manufacturing have been known to managers for years, the term ‘Lean Manufacturing’ itself was first introduced by John Krafcik, a researcher at MIT in an article published in 1988. Here he showed how automobile plants that operated under a lean philosophy were able to handle short production runs, change models frequently, stay flexible and yet attain high levels of productivity and quality.

Lean manufacturing focuses very heavily on identifying and minimizing any activities that do not add value to the final product. It also refers to using less of anything that is involved in the production process - less labor, less inventory and less space and so on. An important aspect of lean manufacturing is managing product flow through the manufacturing process. Each step of the process produces its product in response to a ‘pull’ demand of the next process in the chain. As a result, there is no accumulation of excess inventory, fewer overtime hours, less scrap and discarded material.

Many lean manufacturing concepts originated in Japan and a prominent thinker on the process, Taiichi Ohno who is credited with inventing the Toyota Production System, has said that waste accounts for 95% of costs in a traditional (not lean) manufacturing system. Only 5% of the costs go on to contribute to the product! Eight different types of wastes have been identified -

- **Overproduction** - making more or faster or earlier than the next process actually requires. This results in added costs.
- **Wait periods** - workers or machines waiting idly for the output of the previous process to arrive.
- **Needless transportation** - poor planning of storage and shipment will lead to needless movement. Lean manufacturing asks for materials to be provided from the vendor directly to the assembly line ready for use.
- **Needless inventory** - storing unnecessarily large quantities of inventory ties
up space, money and handling resources. It is said that the Toyota Production System keeps just about two hours worth of inventory!

- **Needless movement** - any movement that does not add value to the product. Examples are searching for tools, equipment or inventory, poor layout of shop floor etc.
- **Defects** - these add to waste due to additional inspections, handling costs, repairs and the time lost in making the product in the first place.
- **Wasted manpower** - poor workflow planning, poor hiring and training, high turnover etc.

### RFID & Principles of Lean Manufacturing

RFID can contribute to the elimination of waste in manufacturing in several ways. A scholarly article published by three researchers in the International Journal of Production Research brings out five value drivers that RFID can provide to eliminate waste in production. These value drivers are -

The table below shows the improvements manufacturers can achieve by embracing principles of lean manufacturing. The benefits are obvious.

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<thead>
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<tbody>
<tr>
<td><strong>Productivity</strong></td>
<td>Increases by up to 100%</td>
</tr>
<tr>
<td><strong>Throughput time</strong></td>
<td>Reduces by 40% to 90%</td>
</tr>
<tr>
<td><strong>Inventory</strong></td>
<td>Reduces by 40% to 90%</td>
</tr>
<tr>
<td><strong>Scrap</strong></td>
<td>Reduces by 10% to 50%</td>
</tr>
<tr>
<td><strong>Overtime</strong></td>
<td>Reduces by up to 90%</td>
</tr>
<tr>
<td><strong>Injuries from accidents</strong></td>
<td>Reduce by 50%</td>
</tr>
<tr>
<td><strong>Product development time</strong></td>
<td>Reduces by 30%</td>
</tr>
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</table>
• Better management of inventory - RFID helps optimize the inventory being held by a business by providing real time insights into goods being manufactured or in storage, tracking discarded items and reducing the safety stock being held.

• Better time and timing management - RFID allows managers to track the manufacturing process more closely by increasing visibility. This reduces lead times and improves visibility into the manufacturing process.

• Improvement in decision making - RFID implementation can lead to improved visibility into raw material states, better tracking of manufacturing processes and improved forecasting capabilities. This leads to better decision making support.

• Improved efficiency - there is considerable improvement in the information collection and analysis process - stock location being accurately known helps in the reduction of wasted time and effort. Stock rotation and use of components with defined shelf lives are better. All of these lead to improved efficiencies.

• Quality improvements - complete traceability of the goods under production lead to measurable improvements in quality. Equipment history is tracked more accurately, leading to higher serviceability rates and improved management.

There are many unquantifiable benefits of RFID deployment as well. Better quality and traceability of the manufacturing process leads to improvements in brand image. Customer satisfaction improves and lost sales opportunities are minimized. Employee productivity improves due to the elimination of a manual scanning task that would need to be carried out at multiple places in the manufacturing chain.

Selecting a Solution

Implementing an RFID solution to create a lean manufacturing environment is not a trivial matter. Those readers who are familiar with a complex manufacturing environment and long supply chains will know that implementing any major change in such complex activities is a challenge.

Selecting a solution is but one part of this major change management exercise. RFID solutions come in a number of flavors and follow differing standards. Each is suited to a specific kind of manufacturing and supply chain environment. One needs to understand the technology and standards and from there lead on to specific business requirements. The steps that are generally followed include -

• Understanding the technology options.
• Understanding and deciding upon the RFID enabled processes to be used.
• Understanding integration methods to be used.
• Building the specific business processes to be used.

It has to be appreciated that these are strategic activities and need deep study and
planning. Great care also needs to be taken to grasp the standards that will be used. Different manufacturing processes have their own demands on RFID technology to be used. For example, different tag and reader performance is required if objects that are being tracked will be moving - say on an assembly line. Some hardware will work satisfactorily with a slow moving line, whereas if a line is moving rapidly or has multiple objects to be tracked, a different class of technology will be required.

Besides the above, there are two key areas of standards that have to be decided upon. These are protocols governing how readers and tags communicate and the data that tags will contain.

Once this is accomplished, businesses can get on with the actual process of selecting the solution to be used.

While this document can obviously not take you through the entire process of solution selection, here are some issues that must be kept in view.

- What objects will be tagged? What materials are they composed of and how does that impact the selection of the tag?
- What antenna types will be used?
- What types of readers will be required?
- Will the tags be optimally placed or will there be restrictions on how they will be used?

In any kind of manufacturing and supply chain situation, there will be a requirement to deploy the solution in varying environments. The solution will have to work in the premises of vendors, in delivery trucks, when cargo is being moved and when components are being assembled. This requires the solution to work over areas that are physically spread out. Previously, this would need battery powered RFID tags and their high cost was a major stumbling block. However, RFID service providers such as Mojix, Inc. have come up with solutions where passive RFID tags can be sensed over large distances thereby giving wide area capabilities to the solution at a fraction of the cost.

A Case Study

Cessna Aircraft has never been reluctant to embrace innovation. The company has moved into the RFID age, using cutting-edge technology to track the precision tools employed at its Wichita metal-bonding facility, where aircraft fuselage, wing and tail assemblies are manufactured. Prior to the introduction of RFID technology, locating the proper tools for specific tasks performed on the metal shop floor was an inefficient, productivity-sapping task, the company reports.

As the solution was being designed, Cessna knew that whatever was eventually deployed would need to meet the requirements of a complex schedule mandated by production lines in Wichita and Independence, running at different rates. The metal-bonding process is days long, so it was important to know when the tool is going to come out, where
it’s going to be and to get it cleaned up and back into the process flow. With certain production processes running faster than others, workers had trouble remembering and estimating where specific tools could be located at any given moment. It was discovered that over time, people in the process, such as operators, schedulers or tool controllers, were spending hours physically trying to track down these tools. Spending time tracking the tools down was taking workers away from solving problems and getting parts through the system.

The new RFID system, which began full operation in 2013, allows tools to be located within minutes. Cessna is accurately tracking the location of over 1,000 assembly tools, occupying over 50,000 square feet. The final deployment achieved Cessna’s goal of speed, accuracy and intuitive operation. Whenever a specific tool is required, a user types the item’s unique number onto a keyboard, after which a database matches that number with data supplied by readers mounted above production floor workspaces. The system is then able to provide the user with the last known location of the tool within a 20-foot range. With RFID now playing a critical role inside the metal bonding facility, Cessna is looking forward to using the technology in other areas as well.

Use Expert Help

While RFID technology is simple to understand, the key value lies in how it is implemented. Bringing this technology to a complex manufacturing organization and helping it implement lean manufacturing is not simple. Major strategic decisions have to be taken and the solution provider has to have great experience with the integration process. As with the implementation of other enterprise class solutions, integrating RFID
into supply chains and manufacturing requires expert help.

Businesses will get a faster return on investment if they team up with a proven player in the RFID space. Mojix understands the different aspects of your business and the unique characteristics of RFID systems and can create a solution that is perfectly tailored to your needs.

Mojix has proven expertise in long-range detection of RFID tags and associated management of RFID information. This expertise was developed when the founders worked with the US Space Program and developed ground terminals for use with NASA's Deep Space Network. By 2006, Mojix had demonstrated being able to read passive RFID tags up to 800 feet in a warehouse environment.

With its relentless focus on RFID and what it can do for businesses, Mojix is working to create applications that are at the cutting edge of RFID. Click [this link](#) if you want to know more about their range of solutions and see some typical (and not so typical) use cases. You are sure to find something that will solve the business issues you face.

To talk to a Mojix representative, call 1-877-886-6549 or send a mail to info@mojix.com. Working with experts will help you select and implement a solution efficiently and get your business the fastest possible return on the investment you make.
References

- Case study on RFID and Lean Manufacturing - [http://home.kku.ac.th/anuton/966892/5%20LEAN_2.pdf](http://home.kku.ac.th/anuton/966892/5%20LEAN_2.pdf)