

Radio Frequency Identification's Impact on Lean Manufacturing Waste

Take your new or existing waste initiatives to the next level

It might not take a Six Sigma Black Belt to be aware of the seven common wastes in lean manufacturing: overproduction, waiting, transportation, inappropriate processing, unnecessary inventory, unnecessary/excess motion and defects. Knowing where excess costs sit in a manufacturing environment is step one. Step two is being diligent and continuously examining all areas of your operation, even some areas that may have already been addressed by a lean team, because the real challenges lie in implementing long-term fixes. Are these long-term fixes already deployed in your facility?

Lean Manufacturing was founded on the principles of reducing what doesn't create value for the end customer. It works to eliminate steps, processes or mistakes that the customer is not willing to pay for (wastes). Many large manufacturing companies have pursued Six Sigma training and other programs in order to learn what they can do to reduce some of the wasteful practices. However, the presence of a Lean or Six Sigma program in an organization doesn't necessarily mean that all wasteful practices cease, unfortunately valuable resources and sometimes even product are still wasted.

Lean Initiatives

Many companies start their lean initiatives in the waste areas of overproduction and excess inventory. Overproduction is defined as manufacturing an item before it is required. Before Lean Manufacturing, companies "overproduced" components under the premise that demand would increase; the typical foundation for this practice was to ensure that orders were fulfilled in a timely manner. Overproduction often resulted in the waste of excess or unnecessary inventory; components sitting on storage shelves cost the company money every day they are not sold. Additional value is lost using warehouse staff to execute regular inventory of the overstocked product.

"RFID is the only technology available that can drastically reduce manufacturing wastes in all seven [Six Sigma Defined Waste] areas and beyond."



Just In Time

A typical remedy to overproduction and excess inventory is JIT (Just in Time) production; creating an item as it is needed to meet a paying customer's order. While JIT has many positives, it is not an "end all" solution, because it creates a different type of manufacturing challenge - tracking quickly moving WIP (Work in Process) to make sure the right product gets to the right customer. Not having excess inventory on-hand to fulfill orders puts more pressure on lead time, cycle time and quality for the WIP. When production is increased due to a JIT order, tracking components becomes vital to maintaining workflow and good customer service.

There are times when several components in a client's order need to have the same critical operation completed at the same time, in order to put the order together. In instances like these, if one of the components is diverted from the normal flow, all other items are quarantined until the last one arrives. Depending on the client and the processes, a variety of new waste impact items could be created, such as:

1. Remakes occur when a component is rejected; a new component is created and usually flagged for special attention. The new component is often "walked-through" the production process.
2. Component Hunting or an "all hands on deck" mentality is used in an attempt to locate the missing component and return to flow as rapidly as is possible.
3. Key changeovers in equipment are needed to help finish the missing component. Many pieces of equipment are either skipped or placed in a state of waiting while they are used to create a missing component for catch-up.

These are just some examples where implementing a classic lean initiative – JIT, subsequently spawned new and different areas of waste that required attention.

How can you take existing or new initiatives to another level... and know it will last?

Visibility into key areas of the manufacturing process is vital to rapid and precise intervention and elimination of the common areas of waste. But how much is ongoing monitoring of this process (training/black belts/measuring and metering) costing a company that is trying to eliminate wasteful costs? Unlike any other technology, RFID (Radio Frequency Identification) has the ability to provide

continuous and 'hands-free' information during each critical step of a manufacturing operation. An RFID tag placed on or embedded in an item, component, subcomponent or product can indicate when it needs to be started, added/replaced due to inspection pass/fail, or can even initiate an automated back flush when consumed. RFID tracking and reporting is done without adding costly manual and human based interactions; resulting in a more efficient facility. The item, once tagged with RFID, auto-reports its location, processes required, and processes completed from origination through customer delivery.

For example, in the wood cabinet industry an RFID tag can be inserted into the various components (carcass, face-frames, doors, drawer fronts) to track them throughout the production process. If a component fails a quality inspection, its RFID tag is immediately scanned as it is pulled off the line. Based on the defect, either the repair is completed and tracked, or an automatic transaction creates a re-make ticket. At any typical point where a product could be diverted from normal flow, automatic unattended, visibility scans can provide accurate data as to which components have progressed through these key areas. Finished cabinets can be scanned as they are loaded on a truck to verify what cabinets have been loaded, and to make sure they are loaded in the proper order. This example and type of process correlates to most manufacturing environments for all types of processes and products.

How RFID Impacts Six-Sigma Defined Wastes

Waiting

Waiting is defined as goods that are not moving or being processed. In many manufacturing facilities items in production could be caught up in the 'waiting game.' Waiting to be checked in as a receivable, waiting to start processing, waiting for the next stage of processing, even waiting to be placed with an order to be shipped. Much of the waiting in manufacturing is due to poor system flow and long production runs. Items are also removed from production as defective or for repair, which also greatly disturbs the flow of a facility and prolongs the wait for related or added to items.

RFID tagged product allows for immediate seamless visibility into measuring wait time, queue and WIP storage. If an RFID tag is attached to an object in production, you will be able to

identify how long each process takes. You will also be able to identify where production is moving quickly or where the product just sits waiting for the next step. Identifying and addressing these potential bottlenecks with RFID will allow facilities to address the 'wait' areas and therefore improves process efficiencies.

Transportation

Transportation is defined as excessive movement and handling of product in process. The meaning behind the waste of transportation may be deceiving. One might think that it refers to transporting a product to the end customer or to a distribution center, but in this case, transporting refers to the object in production moving from one process to the next. Some manufacturing facilities are spread out throughout a building or are even spread between multiple buildings. Moving WIP to these different areas or buildings causes not only wasted transport time, but also the potential for lost or misplaced product.

Two of the best ways to solve transportation issues are to organize and consolidate processes. Without expensive ongoing human intervention, how do you track transport time and then gauge improvements realized in your organization and consolidation? When placed on WIP, RFID will help track product between processes (close together or spread across multiple buildings); providing a hands free way to monitor/automate/streamline the movement of product without added labor costs.

Inappropriate Processing

The waste of Inappropriate Processing is defined as using overqualified and/or incorrect equipment to complete a processing step. Some products are also inappropriately placed on machines, therefore receiving the incorrect production step; resulting in scrapping the product or redoing/reworking as an added wasteful process.

The issue is compounded if subsequent operations cannot be located in the same proximity. RFID allows the items in production to be auto-identified with each machine, process or operator, to ensure that only required operations are performed and the flow to and from machines goes quickly and flawlessly. RFID can also enable the machines to be automatically setup with the proper process for each component.

Unnecessary Inventory

The waste of Unnecessary Inventory is defined as having excessive inventory, a direct result of overproduction and waiting. Creating too much product, letting it sit in a warehouse and requiring warehouse staff to conduct periodic inventory to make sure the unsold product is still there does nothing but drive up costs and reduce profits

RFID tagged WIP allows for seamless monitoring and auto-identification of all inventory. If monitored and identified as ready for next operation, then subsequent scheduling and processing can be triggered and measured. When your WIP is closely monitored as it can be with RFID, it increases your manufacturing efficiency and allows you to be able to produce a large last minute order quickly and efficiently... greatly reducing the need for unnecessary inventory. Finished goods inventory is sometimes a 'necessary evil' and cannot be eliminated by a just-in-time process. RFID can auto-identify products moved into and out of finished goods, thus updating inventory without costly periodic cycle counts. RFID can also help reduce cycle count and physical inventory counting, as implemented with fixed readers, mobile RFID enabled cards and RFID handhelds. Specific results can be obtained based on layout, flow and required finished goods processes.

Unnecessary/Excess Motion

The waste of Unnecessary/Excess Motion (too many steps) is defined in relation to ergonomics of employees. One operator has to stretch in two different directions to do their job and the operator down the row has to get up and turn around every time they process a part. The placement of parts, fixtures, machines, and the movement of employees can greatly affect the bottom line. Time spent on moving in various ergonomically incorrect directions, will not only waste time, but could also cause repetitive motion or strained motion type of injuries of employees, which could result in time off work and worker's compensation.

The use of RFID to track product and vehicle/forklift reach and position movements leads to a dataset which can be used for workflow analysis. After the analysis is complete, you can use the information to create a better workflow in your facility, not only for the basic step-by-step operation of the facility, but also for the ergonomics of the employees.

Defects

The waste of Defects is defined as quality defects resulting in rework or scrap. Defective product could be the result of a naturally occurring defect, such as a knot in a wood product, or it can be a defect caused in the manufacturing process. Regardless of the cause of the defect, one of two things needs to happen; the part either needs to be disposed of and a new part needs to be created to replace the defective part, or the part needs to be sent back through all or part of the manufacturing process to fix the defect.

RFID can help reduce or even eliminate manufacturing driven defects by allowing the product to automatically

identify itself to each process; confirming size, color, finish, coating, shape, machinery to be used, etc. In addition, RFID can help ensure that the right parts are at the right place for final assembly. The components can auto-identify themselves and immediately indicate or prevent the wrong item from being placed on the wrong finished product. And in the case of a naturally occurring defect, RFID can alert the system that the particular part is defective and a new one needs to be started to replace the defective part once triggered by an inspection or test process.

Deploying RFID

I've heard of RFID, but what does it take to deploy it? Can I just buy some tags and a reader/antenna package and deploy? In some cases companies will designate an RFID champion and support him/her with their IT staff to oversee the deployment of RFID. This is usually a key ingredient to a successful deployment. RFID, when implemented to its fullest potential, requires some additional ingredients.

Basic RFID:	Tag:	attached/embedded
	Reader:	fixed/portable/handheld to processes tag ID and information
	Antenna:	size, location and read distance
	Software:	A: To read process and translate tag ID and critically associated information B: Tie into existing business systems software

Next Level of RFID:	Interface devices that allow seamless critical manufacturing data to be collected and published
	▶ Tag/Label applicators
	▶ Mobile Cart
	▶ Visibility Stations
	▶ Quality Control Operator Interface Stations
	▶ Process Control & Operator/Machine Interface Stations
	▶ Material Handling Equipment
	▶ Handheld Readers

Integration of the above devices with effectively placed tags/labels can quickly address and support your ongoing initiatives, while also allowing for long-term data capture and seamless analysis tools to measure results and identify areas for Continuous Improvements.

In Conclusion

The wastes of lean manufacturing go beyond the seven mentioned in this paper. For lean initiatives to be successful, all areas of a plant need to be examined for possible wastes and these areas need to be addressed at the same time. RFID is the only technology available that can drastically reduce manufacturing wastes in

all seven areas and beyond. When properly deployed, RFID can track product as it enters into a facility, through production, quality/re-work and as it is shipped to the customer. This is all done with little human intervention; increasing company profits and saving time, resources and money.