Improving Medical Devices Manufacturing
From the Push System to the Pull System

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Abstract

A manufacturing subassembly line at medical devices company currently supplies two sites with manufacturing lines. The subassembly line has high inventory levels which reduce cash flows for potential investments. The high inventory levels come in both finished goods and work in process (WIP). Work orders will now be created in the manufacturing software in order to move to a pull system. By moving from the push system to the lean manufacturing method of pull system, the company will be able to reduce its inventory levels by more than $140,000. This lean manufacturing method will also help in the increase of capacity at the subassembly line. This project proves that manufacturing logistics can be improved by performing simple changes in order to implement the lean manufacturing system.

Key Terms

Build Plan Inventory, Lean Manufacturing, Subassembly, WIP

Introduction

Medical devices company XY has a subassembly line designed to meet the needs of its regular manufacturing lines in two sites. The current manufacturing technique used is the push system. With the push system, the subassembly reacts to volume predictions that are based on demand. If the demand predictions are high, then the manufacturing rate will be high and vice versa.

Meanwhile, the pull system is another manufacturing method that has been associated with lean manufacturing. With the pull system, the production is based on current demand. By using this system, the manufacturing lines avoid overproduction and reduce inventory levels. Instead of producing large quantities which could later stay stuck as inventory, the manufacturing company could produce the quantities needed at any point in time and thus reducing high inventories which result in reduced cash flows.

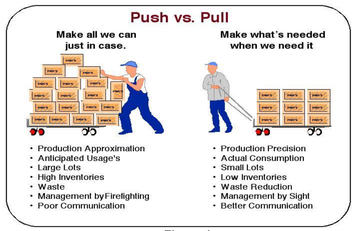

Figure 1
Push vs. Pull [1]

Figure 1 illustrates the advantages of using the pull system against the push system. In this figure, the advantages of the pull system are symbolized by a more organized cart. This project looks to improve manufacturing logistics and reduce inventory levels for the XY Company subassembly line and to improve its cash flow by moving from the push system to the pull system.

Problem Statement

Actual inventories (work in process and finished goods) at the XY Company have soared in the past months due to demand changes. The assembly lines being supplied, which are very dynamic by nature, have seen constant demand changes which have forced the subassembly line to produce units that were not part of the original demand.

Analysis

Reducing inventories is one of the current challenges experienced by medical devices company XY. Corporate headquarters have seen how increased inventories are significantly cutting cash flow. This translates to lower investment capital which could be used to improve efficiency and productivity while maintaining excellent quality records. The challenges for the subassembly line are a high finished goods inventory and a high work in progress (WIP) inventory. Both situations are due to the currently implemented manufacturing system, the push system. Since the subassembly line has a build plan that was based on demand predictions and the demand has changed in the past months, there is excess inventory of product which went from a high demand to a low demand.

The current inventory goal for finished goods inventory is 7,000 units at any given point in time. Each unit has a cost of $33.00 which yields a goal of no more than $231,000 in finished goods inventory for the subassembly line. As seen in Figure 2, the weekly averages, using the first four weeks of January 2013, have been well above the 7,000 unit mark. Averaging the past four weeks, the result is a weekly inventory average of 11,265 units. This means that the subassembly line is on average 4,265 units above the set goal. Converting the units above the goal translates to an average of $140,745 which is the potential cash flow XY Company ceases to have on a weekly basis.

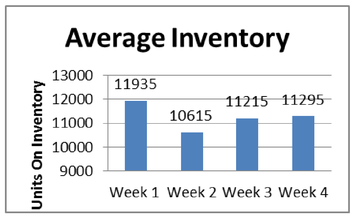

Figure 2
Subassembly finished good weekly average inventory

Meanwhile, the WIP goal at any given point in time is 760 units. Since these are not completed units there average cost is around $25. This means that the goal for the WIP inventory is no more than $19,000 at any given point in time. As seen in Figure 3, the weekly averages, using the first four weeks of January 2013 as reference, have been well above the 760 unit mark. Averaging the past four weeks, the result is a weekly WIP inventory average of 2,199 units. This means that the subassembly line is on average 1,439 units above the set goal. Converting the units above the goal translates to an average of $35,975 which means the average WIP inventory is almost three times as much as it should be.

Analysis (cont.)

Looking at both Figures 2 and 3 it is evident that the inventory levels are not "healthy." Having these high inventory levels not only reduces cash flow, but it also reduces inventory turns since the manufacturing lines do not have the demand or the capacity to consume that amount of inventory.

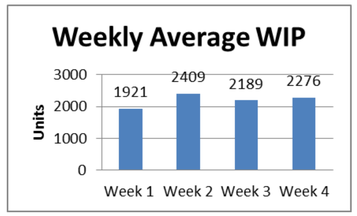

Figure 3
Subassembly WIP weekly average inventory

Proposed Solution

The first step to reduce inventory levels is to control the product being started in the first operation of the subassembly line. Medical devices company XY uses software which enables the control and tracking of the products it manufactures. In the subassembly line, this software is currently set up so that the operator chooses what product he will be working. Since every unit is its own lot, every time he starts a new lot, he has to select the product to be manufactured. This means that at an average of 90 seconds per unit, the operators at this station selects the product to be manufactured a total of 600 times per shift.

In order to eradicate the decision making process for the product to be manufactured by the operator, the first phase is to start generating work orders in the manufacturing software so that they know at any point in time what build plans are still open and how many units are remaining for a specific product. This change will not only control what is introduced to the line, but it will also increase the station capacity. Out of an average time of 80 seconds per unit in the station, 15 seconds are spent performing transactions in the manufacturing software. This is because the operator has to choose the product out of a drop down menu (which has a list of thousands of products), the qualification level, and has to generate the lot. With the work orders, they would only select the work order number (from a list of no more than 50) and the lot would be automatically generated. This reduces system transaction times by 10 seconds which yields a production increase from 600 to 686 units per shift. Since the subassembly line has two shifts that run 5 days a week, this represents an increase of 860 units per week.

Considering now the pull system. "Demand "pulls" the product along the production stream, thus reducing waste. The flow of resources in the process is regulated because there is now replacement of only what has been consumed and no more than is immediately deliverable. In this way, overproduction, resultant delays, and excess, resource-consuming inventory are avoided" [2]. With the manufacturing lines demanding product from the subassembly line, increased capacities result in lower lead times that turn into quicker response to the demand.

Proposed Solution (cont.)

As part of the work order implementation, the current line WIP has to be consumed. The change encompasses modifications to the system used by the finance department which requires the line WIP to be zero (0) before releasing the changes in order to keep the finance records with the right consumption amounts. As seen in Figure 4, having to empty the line would mean that it should take about two weeks to stabilize the average WIP in order to run at optimum condition.

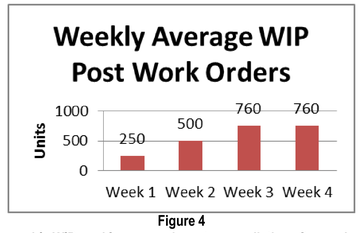

Figure 4
Subassembly WIP weekly average inventory prediction after work orders

By controlling the units being produced and producing based on the current demand and not on a premade plan, the finished goods inventory will see a reduction. The current inventory contains high volumes of low-running models which might delay the process of achieving a healthy inventory of 7,600 units. As seen in Figure 5, the inventory depletion should take about one and a half month. The red line illustrates the subassembly production, the blue line the inventory goal and the tan area the actual inventory.

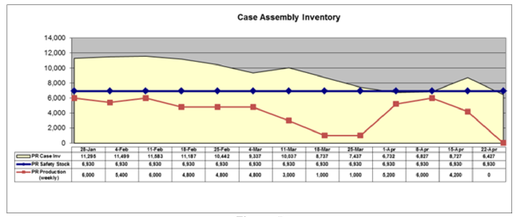

Figure 5
Finished goods inventory depletion prediction after work orders

Conclusion

Manufacturing logistics can be improved by implementing lean manufacturing techniques. In this case, the lean manufacturing technique used is the pull system. This system enables the manufacturing companies to respond to user needs instead of pushing product to the user. With a simple change in the system the benefits are:

- Lower inventories resulting in higher cash flows
- Capacity increase to meet quickly meet the demand

References

[1] "Push vs. Pull." Push vs. Pull. N.p., n.d. Web. 05 Feb. 2013.
[2] "Lean Manufacturing Pull Vs. Traditional Push." Articlesbase.com. Articlesbase.com, n.d. Web. 28 Jan. 2013.