Improving Dilator's line Capacity, Inventory and Management Control

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Abstract

This poster addresses operational challenges in Inari Medical's Dilator line, integral to Venous Thromboembolism (VTE) treatment devices. The project focuses on inventory control, line capacity, and management control to improve customer demand fulfillment. The analysis reveals issues in inventory replenishment, line efficiency, and communication forums. The literature review stresses the significance of inventory control systems, reduced manufacturing lead time, and tiered management. Utilizing tools like demand plans, production throughput measurement, and kanban formulas, the project achieves improvements, including a 300-second cycle time reduction and enhanced communication forums. These outcomes enhanced overall the operational efficiency, cost savings, and Inari Medical's industry position, ensuring timely product delivery and meeting high-quality standards.

Introduction

Inari Medical product are high quality medical device for treating patients with Venous diseases. To meet the customer quality standards, is essential that all manufacturing lines meet efficiently the requirements, such as Dilator. This assembly line builds the most important component that makes all different products. Improvement efforts are needed to achieve organization success.

Objectives

Based on the organization and manufacturing needs for the Dilator line, the main objectives for the organization were to achieve customer demand, reduce lead time, and improve tier management and inventory control. To accomplish these objectives, it was required to improve multiple components that were behind to succeed. For this it was necessary to focus on inventory control, line capacity and management control.

Dilator Line Current Processes

Inventory Control

Dilator supplies four product lines including Packaging. There was a lack of signal to replenish the inventory. The demand for these products has been analyzed and it has been identified a monthly increase in the demand up to 10%. The Opex team evaluated the replenishment process flow as shown in Figure 1. The production team builds material, getting the signal from the planner but without having consideration the units on WIP

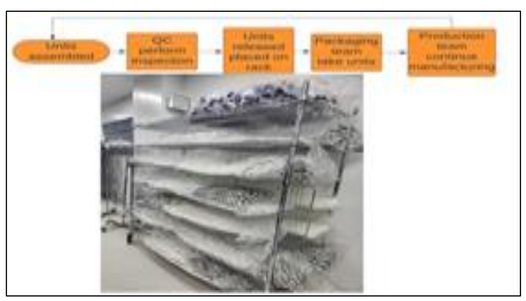


Figure 1. Dilator Current Replenishment Process

Line Capacity

Based on the gap of 20% vs the plan, the Opex team performed a time study for all the process stations. The Takt time for Dilator line is 150 seconds, which means that the line will run at that pace to build customer demand. On table 1 presents the takt time identified as a green column and the process cycle times are the rows that help to graph by segregating each cycle time into the different categories of manual, auto, wait, walk. The dilator line was composed of 11 stations with a total cycle time of 1,409 seconds to build a unit. This graph shows that some of the stations, such as 1, 3 and 6, were above the required cycle time. Some improvements were required to make a positive impact on the line.

Table 1 Current Line Balancing

Management Control

The planner conducts daily production meetings, which on these sessions, are mainly discussed only production output, difficulties, and other announcements.

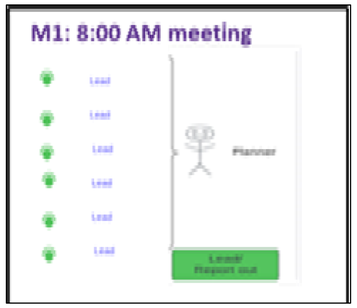


Figure 2. Current Daily Production Meeting

Tools Used

For the measurement of inventory at Dilator line, the Demand Plan and production throughput are the main spreadsheet that helps to interpret the data. In addition, the kanban formula described in Equation 1, helps to determine the signals.

$$N = \frac{DT\,(1+X)\,(1+Y)}{c} \qquad (1)$$

N = Number of kanban cards needed before replenishment
D = Demand (parts per day)
T = Lead time, length of production (begin-end)
C = Capacity of containers
X = Safety factor (Safety stock) %
Y =Variation factor (variation buffer) %

Improvements

Inventory Control

With the help of determining the kanban size , the result of the required quantity of kanban cards and lots can be obtained, which will predict the inventory limits based on the number of units that can fit in a work order and build plan.

Table 2. Kanban Size

N	N lots (150 units) each	N Lot (Agreed Kanban Size)
442	2.95	3
213	1.42	1
1,458	9.72	10
711	4.74	5
380.30	2.54	3
840	5.60	6
84	0.56	1
26	0.17	0
33	0.22	0
559	3.73	4
641	4.27	4
327	2.18	2
51	0.34	0

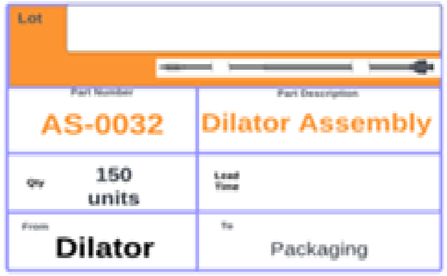


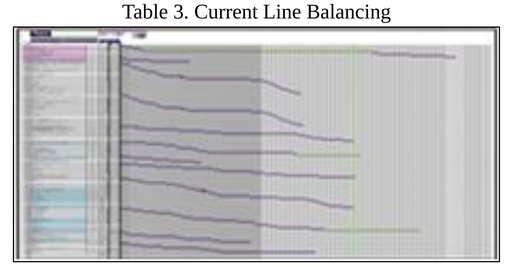
Figure 3. Kanban Card

The kanban formula generates the number of cards required for each model. The process emphasizes the use of the kanban card as the main item for communication. Units are assembled and passed through quality control inspection with a kanban card. Once the units are being inspected, the kanban card will be along with the WO built. The units built will be placed on the rack with the kanban card visible. Once the team from Packaging picks material, they will place the kanban card in the card holder. The lead will be routinely checking the cards placed throughout the day and communicating with the planner to issue or request materials every time a kanban card is placed.

Line Capacity

To achieve customer demand, a line balancing for the stations was needed considering the cycle times obtained and takt time. Based on the balancing chart shown in Table 3, will be required 12 stations to achieve customer demand. Station 1 will be assigned for production setup. Stations 3 and 6 will change their work content as one step will be consolidated into one operation where equipment will be duplicated. As a result, by cutting down on idle time, one of the stations will concentrate on 100% inspection. In the balancing the 'green bars' are the Automated machine that push above the purple bars. The manual cycle times will be reduced by the automated equipment.

Table 3. Current Line Balancing



Tier Management

To enable problem solving and cross functional communication, Dilator will have daily tier meetings. At this meeting will be participating the Group leads, engineers, supervisor, and planners. The topics discussed at this meeting will be based on Key Performance Indicators. The meeting will be performed every morning at the line with the functions as shown in figure 4.

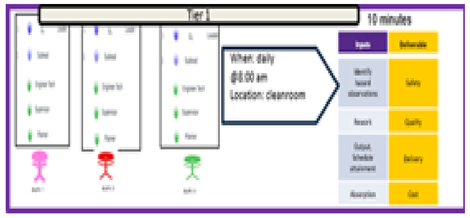


Figure 4. Improved Tier 1 meeting

Achievements & Conclusions

The Dilator project has achieved outstanding results, leading to significant improvements in overall operational efficiency and cost savings. As project savings, is the reduction of Cycle time of 300 seconds per unit, reducing material shortage and improve communication forums with production.

Additionally, the dilator, engineering and Opex teams have worked successfully in a timely manner to complete the improvements made. The project is within the budget established primary of $27,500. The duplication of equipment helped to reduce the manual time and improve line efficiency. On the other hand, the preparation of materials before running a product helped also with optimizing the line. In addition, the Kanban system helps to control the inventory and avoid material shortage along with the tier management.

The improvements demonstrated in Table 4 contributed to Inari Medical and the patient's life by delivering the product when is needed. Overall productivity, efficiency, and cost-effectiveness improved, strengthening the company's position in the industry and delivering high-quality products to customers.

Table 4. Improvements Achieved

Improvement	Highlights	Impacts
Inventory Control	Create a replenishment signal with inventory limits.	Reduced the risk of material shortage by 75%. Increased the inventory levels considering WIP units for the next forecasted months.
Line Capacity	Rebalance the line for 12 stations, reduce idle time.	Improve CT by reducing 306 seconds of manual time per unit.
Tier Management	Establish Key Performance Indicators and functions to support efficiently the line.	Communicate and solve problems based on the line needs.