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Abstract

Within the manufacturing industry, the inventory represents an area of continuous improvement. The study focuses on the processes of distribution of finished material between the supplier and the customer's first point of consumption. Through the DMAIC (Define, Measure, Analyze, Improve and Control) research method the problem of inventory in the manufacturing areas is evaluated and the processes of supplier or customers are connected through the implementation of a Kanban system to reduce the inventory available and shorten the time it takes to distribute the material from its manufacture until it is consumed

Introduction

Flow thinking is the focus on shortening lead-time from the beginning of the value stream to the end, and on removing all barriers that impede the creation of value and it's delivery to the customer.

Pull is the concept of matching the rate of production to the rate of customer consumption (demand). Each downstream activity (customer consumption) triggers upstream activity (supplier production/replenishment). Yet pull is not feasible or cost-effective without flexibility and short lead times.

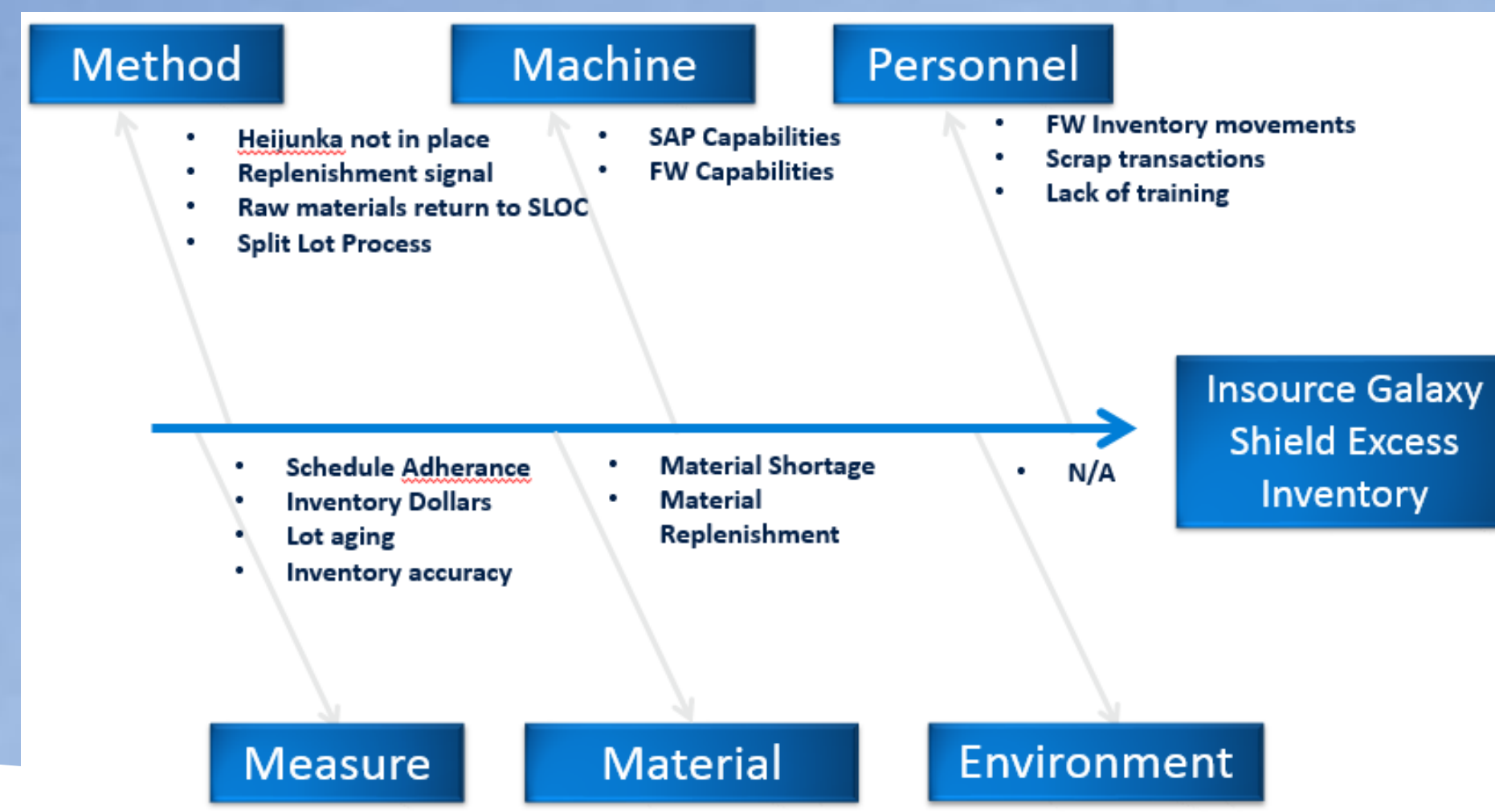
Flow and pull create enormous positive benefits in all aspects of business performance. Focusing on flow will lead to improvements, including better safety and employee engagement, more consistent quality with fewer defects, increases in on-time delivery and flexibility, and lower costs without running into the traditional trade-offs. Most importantly, daily and weekly results become more consistent and predictable

Background

This design project was conducted in a Medical Device Company located in Juncos, Puerto Rico recently the company evaluated the opportunity to manufacture one of the most important components in the manufacture of their medical devices. This component was manufactured by a non-local external supplier. In recent years the demand for medical devices (Orion and CRT-P) has increased drastically, which represents great challenges for suppliers when it comes to increasing their capacity to meet the requirements of each of these components. To mitigate the impact caused by the lack of components in the manufacturing area, the company designed a new manufacturing line that builds the shells that are used in the manufacturing line of the Orion and CRT-P devices, which are assembled in the same manufacturing area. One of the company's biggest concerns is the high inventory that is stored to meet customer demand, manufacturing lines of Orion and CRT-P models. The manufacturing process of shields has a lead time less than the time needed to assemble an Orion or CRT-P device, which adds flexibility to the manufacturing of shields and allows to establish a smaller volume inventory model, even to explore the possibility of approaching a just-in-time.

Problem

We identify as the Y of our project the high level of inventory of shields behind the manufacturing area, the areas that require the most attention are the X or the inefficiencies that make it necessary to load this amount of inventory. This information was worked through a Fish Diagram which allows grouping the X impact areas.



Methodology

The methodology which will be followed is the Six Sigma project solving model called DMAIC which stands for: Define, Measure, Analyze, Improve, Control.



DMAIC consist in the involve of different areas and it's commitment to obtain sustainable changes to a process or solving a problem. DMAIC abbreviations have a purpose that is aligned with the vision of this method.

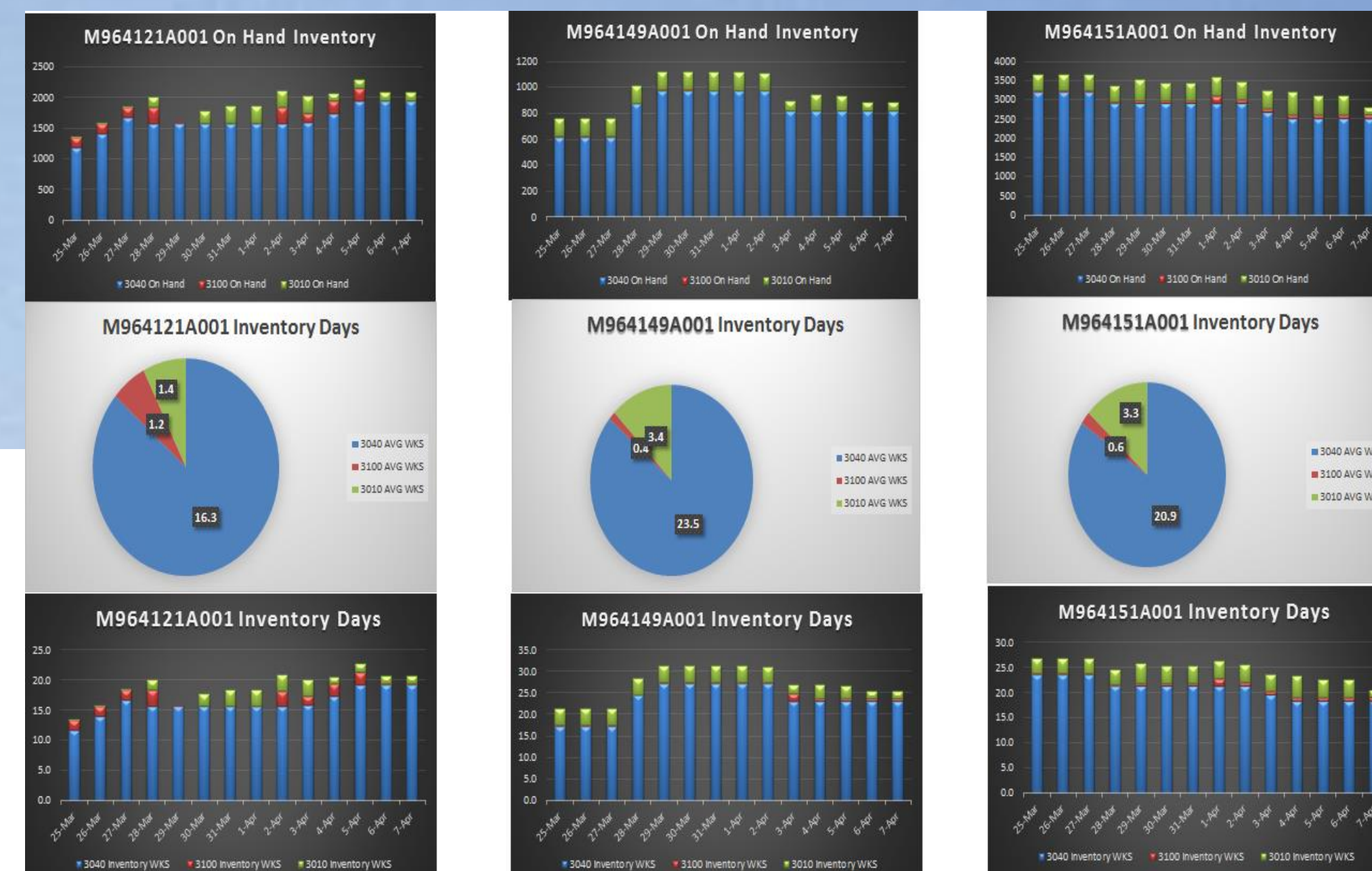
Results and Discussion

As part of a Material Replenishment system, Kanban is a specific tool for controlling information and regulating materials conveyance between production workflows or processes. Kanban is coupled with Takt Time, flow processing, pull production, and level scheduling is what enables just-in-time production to be achieved in a value stream. Typically a Kanban is used to signal when product is consumed by a downstream process. In the simplest case this event then generates a signal to replenish the product at the upstream process.

Kanban provide a physical schedule tool that tightly links and synchronizes production activity between upstream and downstream workflows. Kanban combines control over movement of material with respect to both time and quantity dependent upon signals from downstream workflows. Kanban controls production in a value stream by controlling material and information flow.

To reduce inventory between the supplier and the customer a connection workflow and a Kanban need to be implemented in the manufacturing line of shields two different products, FT Shields and Shields Top, constructed in 2017 on average 23.8 days of inventory were charged for mode to FT and 24.8 days for

the Top model. By segregating this inventory through the inventory locations, an average of 3.4 days of inventory tied to the transactions and movements of materials between supplier and customer are identified



In the evaluation of the hypothesis to establish the appropriate connection between the supplier, the type C connection is considered since this model allows to have available inventory which adds flexibility to the replenishment process and capable to absorb variability of demand in the client. Also introduces the concept of build to order at the time of supplying the replenishment signal. This is possible since the lead time of the supplier is less than the lead time of the client

Kanban can be a simple card with basics information such as part name, part number, Pack quantity, Storage location and Consuming location. In this case a virtual Kanban dashboard will provide specific production instructions between workflows based on upon replenishment principles. Kanban achieves this by governing both, the timing of material movement and the quantity of material conveyed. Kanban serve as visual control tool, making flow visible. See normal and abnormal status in real time.

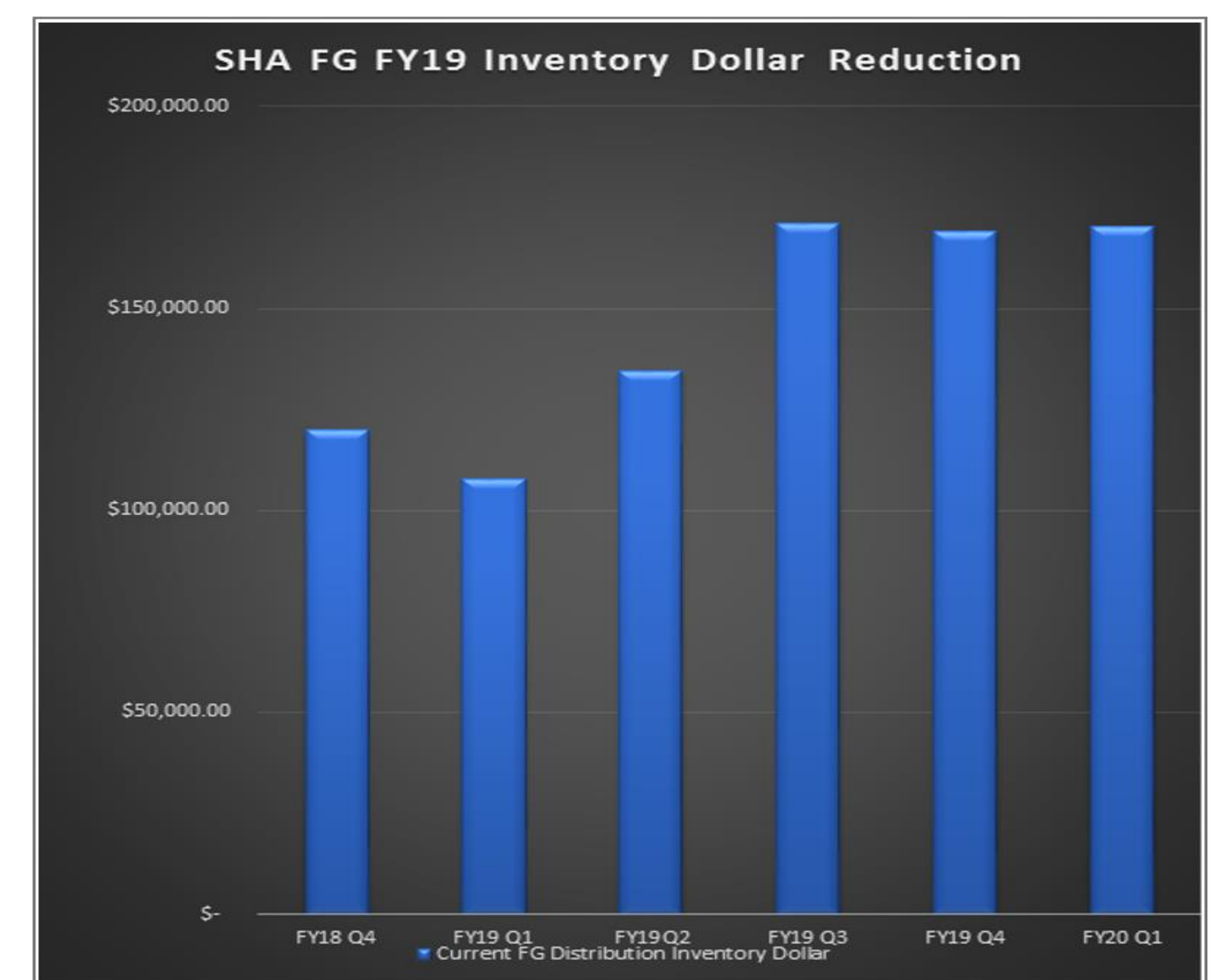
E – Kanban Dashboard

PRODUCTNAME	MODEL	STEPNAME	COMPONENTQTY	MinTarget	MaxTarget
M964121A001	CRTP	InvEmaAssyEM	390	161	322
M964149A001	CRTP	InvEmaAssyEM	410	50	100
M976698A001	ORION	InvEmaAssyEM	694	543	1,085
M976699A001	ORION	InvEmaAssyEM	627	43	87
M976702A001	ORION	InvEmaAssyEM	973	586	1,172

PRODUCTNAME	MODEL	STEPNAME	COMPONENTQTY	MinTarget	MaxTarget
M964121A001	CRTP	InvsvFinishedPack01	845	272	545
M964149A001	CRTP	InvsvFinishedPack01	277	117	233
M976698A001	ORION	InvsvFinishedPack01	3,424	1,408	2,816
M976699A001	ORION	InvsvFinishedPack01	112	112	224
M976700A001	ORION	InvsvFinishedPack01	867	430	860
M976701A001	ORION	InvsvFinishedPack01	176	67	134

Conclusions

Implementing Kanban between shields manufacturing line and CRT-P and Orion customer shortened lead time in the finished goods distribution workflow. Through the connection of the two manufacturing lines, the client has the material available for consumption in his work area and provides information of his level of inventory to the supplier in real time.. After connecting the manufacturing processes of shields with your customer you get an 18% reduction in inventory costs available without generating a risk to the supply of these materials.



Future Work

- Reduce shields finished goods inventory targets
- Amplify connection scope and include more supplier and customer processes
- Establish similar replenishment systems with external suppliers

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