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Optimizing Inventory Control at PT. Total Pack Indonesia by Using Kanban System

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Abstract. One of the problems that happens in almost every company is inventory control. Inventory control is the process of managing an inventory so that the business derives the most overall benefit from the existence of the inventory. PT. Total Pack Indonesia is one of the packaging companies in Indonesia. PT. Total Pack Indonesia uses push system in their process of production system in which their concept is as long as they have raw material to be processed and demands from customers, they will produce it without considering the Work-in-process (WIP) level in their company. For this reason, the level of WIP in this company is high and not properly controlled.

The objective of this research is to prove that the Kanban system can help by eliminating the problem of material waiting in the station, control WIP in production line, and reducing inventory cost by reducing the inventory stock in the warehouse. This research is to analyze the Kanban system in the implementation of Just In Time theory at PT. Total Pack Indonesia. By implementing Kanban system, resulting in WIP that can be controlled to be consistent in this company, there are no waiting material in production line and save holding cost.

Keywords: Kanban, inventory control, simulation, Tecnomatix™ plant simulation, WIP

1. Introduction

There are many companies in Indonesia, whether local investors or foreign investment companies. Most Indonesian companies work in the fields of manufacturing, food, clothes, and raw material processing. Every company has their own activities from production process until distribution, where problems can occur at any time. One of the problems that happens in almost every company

is inventory control.

Inventory control is the process of managing an inventory so that the business derives the most overall benefit from the existence of the inventory. The problem that faced by companies is they cannot manage their inventory well, there is always material waiting to enter the next process, so that affect the long waiting time and WIP in company will be high too, to resolve that problem, companies need a strategy to manage inventory control. The strategy normally involves such functions as setting limits on the actual size of the inventory, while also taking care to maintain enough items on hand to allow the business to operate at maximum efficiency. When conducted responsibly, inventory control also helps businesses to manage their tax obligations more effectively, and thus add to the overall profitability of the operation. PT. Total Pack Indonesia is one of packaging companies in Indonesia and this company has problem with inventory control and WIP management which this company use push production system.

2. Literature Review

2.1. Inventory

Inventory defines as "Materials and spare parts that are held for future use without knowing exactly where and/or when the item will be used". It is very important that manufacture should keep material stock based on customer orders. [1]

According to production needs, there are various form of inventory system, for example there are raw material, finished goods, Work In Process (WIP), etc. However, inventory system will be unnecessary for JIT (Just-In-Time) Manufacturing because JIT have a concept having the right items of the right quality and quantity in the right place and at the right time. [2]

2.1.1. Inventory purpose

While an inventory system can be a waste for JIT manufacture, on the other hand it can be very important for another types of manufacturing with less control or bad cash flow. There are various reason for this type of manufacturing to have inventory control, such as:

- Predictability
- Fluctuation in demand
- Unreliability of supply

- Price protection

2.1.2. Type of inventory

Inventory in common, usually devides in several type of categories such as raw materials, finished goods, and Work-In-Process.

• Raw materials: This is utilized to produce goods.

• Finished product: This is a completed product and ready to sale. This product can be kept as a stock.

• Work-in-process (WIP): Items are considered to be WIP during the time raw material is being converted into partial product, subassemblies, and finished product. WIP should be kept to a minimum. WIP occurs from such things as work delays, long movement times between operations, and queuing bottlenecks.

There are also several type that can be used in Inventory System, such as:

• Consumables: Light bulbs, towels, paper, tape, envelopes, cleaning material, printing ink, etc. These goods are often included as raw material.

• Service, repair, replacement, and spare items (S&R Items): these items can be included as maintenance needs for manufacture machine or device handling. [3]

2.2. LEAN

The popular definition of Lean Manufacturing and the Toyota Production System usually consists of the following it is a comprehensive set of techniques that, when combined and matured, will allow to reduce and then eliminate the seven wastes. This system not only will make ther company Leaner, but subsequently more flexible and more responsive by reducing waste.

The TPS (Toyota Production System) is often used together with the terms Lean Manufacturing and Lean Production. It is called Lean because, in the end, the process can run:

- Uses less material
- Needs less investment
- Uses less inventory
- Consumes less space and
- Uses less people

Even more importantly, a Lean process, be it the TPS or another, possess a predictability character that able to reduce chaos and uncertainty at a manufacture industry, phisically, financially and emotionally.

2.3. Just In Time (JIT)

JIT was first developed and perfected within the Toyota manufacturing plants by Taichii Ohno as a means of meeting consumer demands with minimum delays. This has made Taichii Ohno referred to be the father of JIT. By applying JIT, Toyota realize that JIT would only be giving benefit if every individual at the organization was involved and committed to do it, if the plant and processes were arranged for maximum output and efficiency, and if quality and production programs were scheduled to meet demand exactly. Just-in-time (JIT) manufacturing is a Japanese management philosophy applied in manufacturing which involves having the right items of the right quality and quantity in the right place and at the right time. It has been widely reported that the proper use of JIT manufacturing has result in increases in quality, productivity and efficiency, improved communication and decreases in costs and wastes. The potential of gaining these benefits has made many organizations question and consider this approach to manufacturing. For these reasons, JIT has become a very popular subject currently being investigated by many worldwide organizations. According to Sarker in many production lines, Just-in-time (JIT) manufacturing technology is implemented both to improve the productivity of the line and to reduce the manufacturing cost. [4]

2.3.1. JIT goals

JIT target is to achieve zero point in inventory throughout the entire supply chain. JIT have terms called seven zero which are required to achieve zero inventories, there are [5]:

1. Zero defects
2. Zero lot size
3. Zero setups
4. Zero breakdowns
5. Zero handling
6. Zero lead time
7. Zero surging

2.4. Kanban

Kanban found in Toyota Production System as a device to manage the flow of

production and materials in production system. In Japanese, Kanban means card, ticket, sign, or signboard. Kanban system described as "a pull system in which work centers signal with a card that they wish to withdraw parts from feeding operations or suppliers". The Association for Operation Management (Chicago, 2010) describes Kanban as "a method of just-in-time production that uses standard containers or lot sizes with a single card attached to each". Kanban process aimed to balance work- flow by signaling production of a part, component, or subassembly only when the next operation in the process has begun.

Kanban is a tool for realizing just-in-time. For this tool to work fairy well, the production process must be managed to flow as smoothly as possible. This is really the basic condition. Another important condition is leveling production as much as possible and always working in accordance with standard work methods.

2.5. Tecnomatix™ Plant Simulation

Tecnomatix™ is an integrated portfolio of digital manufacturing solutions that brings innovation by linking all manufacturing disciplines together with product engineering – from process layout and design, process simulation and validation, to manufacturing execution. Built upon the open product lifecycle management (PLM) foundation called Teamcenter™ manufacturing platform, Tecnomatix™ provides the most versatile set of manufacturing solutions on the market today. The digital manufacturing solutions provide you with a single source of

knowledge, allow you to optimize and validate process performance before production, and help you eliminate inefficiencies for faster time-to-volume and consistent quality results.

Tecnomatix™ can address the most pressing needs and get products to market faster, while simultaneously meeting the demands of customers. Tecnomatix™ solutions are available to address a variety of manufacturing disciplines. Select specific solutions that meet and also gain the confidence in knowing that someone can expand Tecnomatix™ to meet needs tomorrow as well.

Siemens® PLM Software's digital brand Tecnomatix™, offers world class solutions covering the entire breadth of your product's lifecycle helping companies quickly identify the best strategies for boosting productivity and lowering cost. [6]

3. Methodology

This chapter highlights the proposed methodology applied for developing the application in this researchs. The methodology itself is divided into four sub-categories or phases: data requirement phase, design phase, analysis phase and implementation phase.

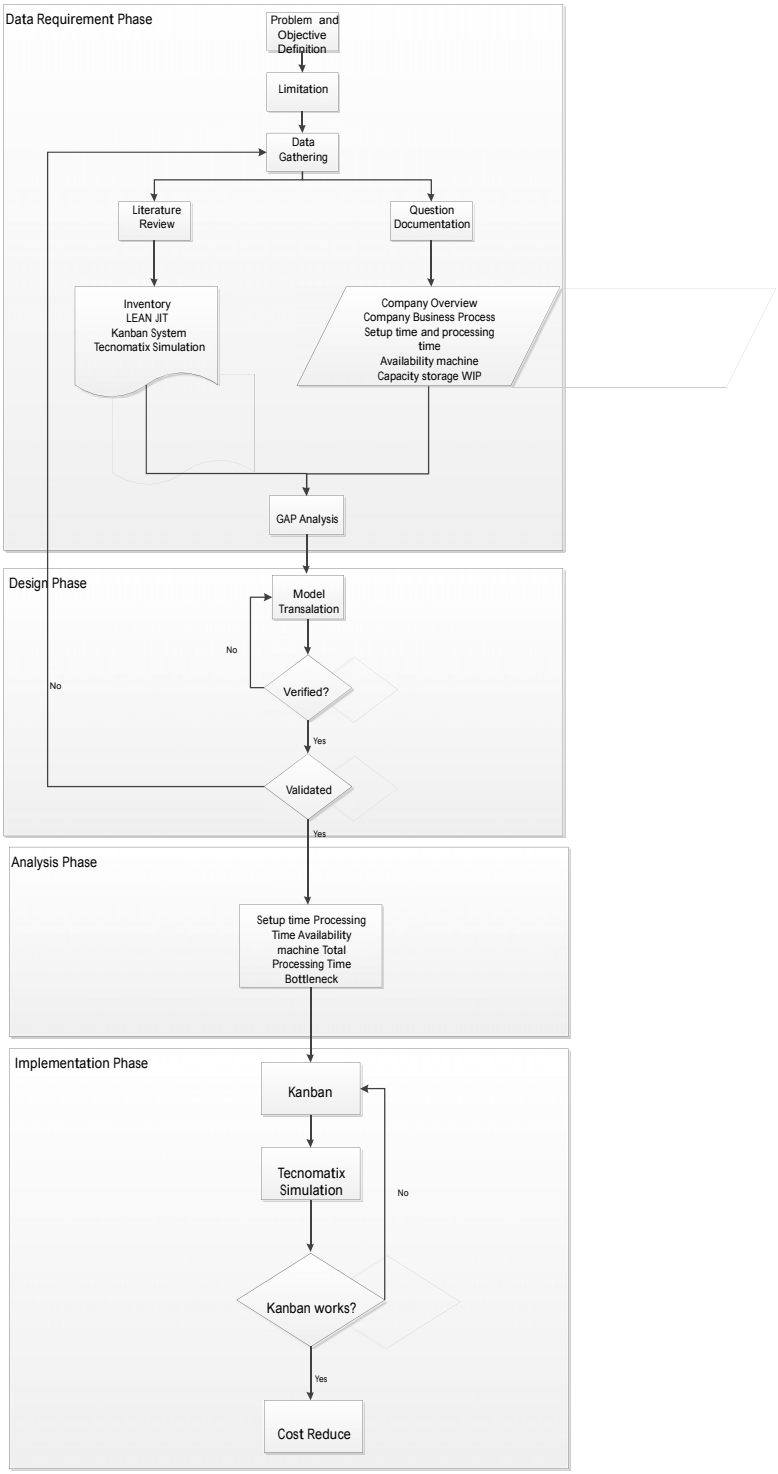

Fig. 1: Research Methodology

3.1. Analyzing Input Data

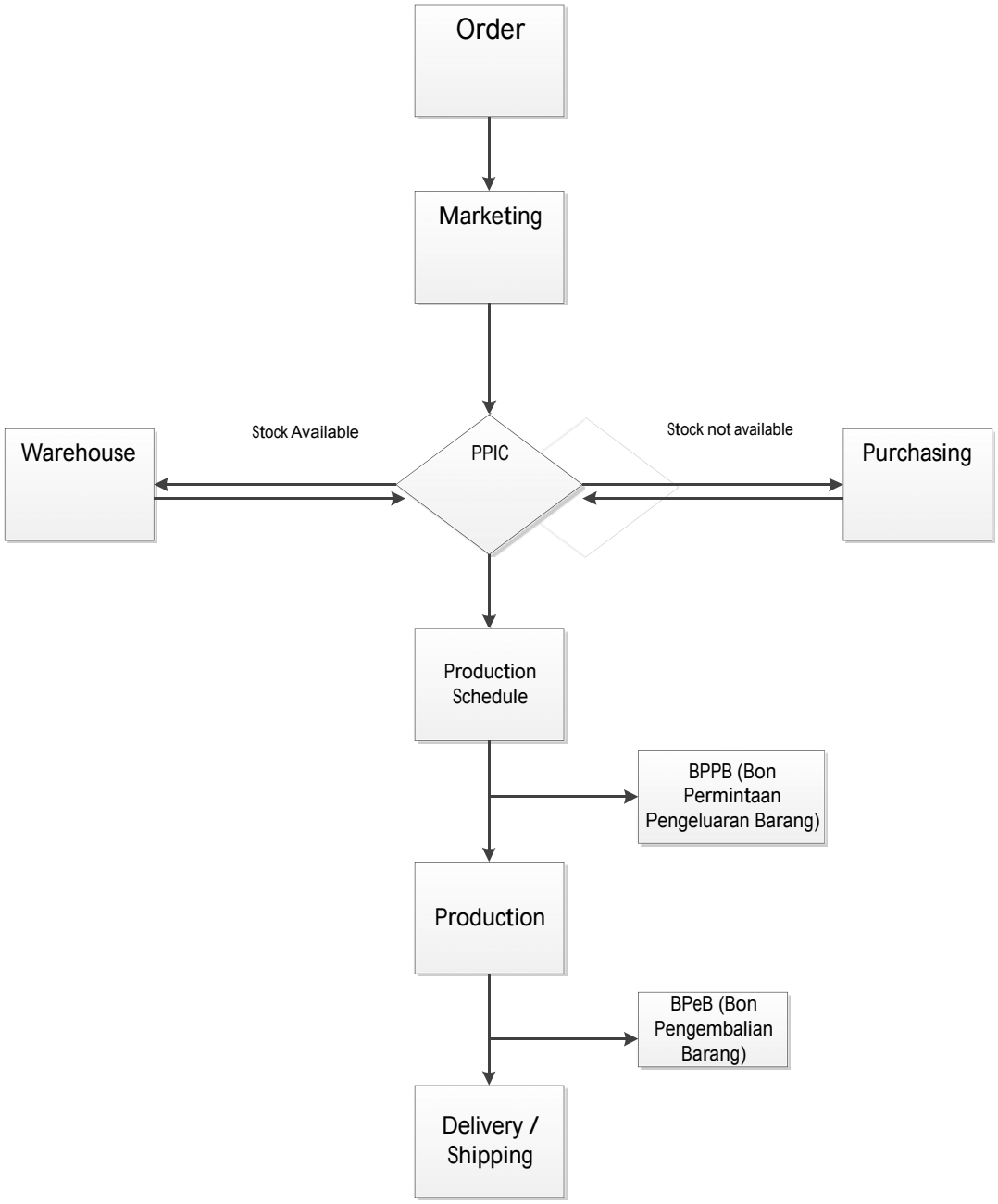

Fig. 2: Business Process Model

3.2. Kanban and Inventory System

As long as this research limitation is focused in stock inventory level, the Kanban system support JIT framework to control WIP in the company. Kanban is a key component to a well-established lean manufacturing environment, it is only part of the system. Kanban is way for teams and organizations to visualize their work, identify and eliminate bottlenecks and achieve dramatic operational improvements in terms of throughput. The basic concept of a kanban is a hand sized card that moves with the product or material. It signals when product is to be built or when material can be moved. A company disciplined in lean manufacturing methods will not build product or move material without the proper kanban. Never produce more parts than you have kanban for. Kanban are used to control inventory for many reasons. Producing parts without a kanban will create waste of inventory.

3.3. Experimental Design

The purpose of experimental design is to find out comparison of the stock inventory level between current situation and new simulation Kanban. The reason doing simulation in tecnomatix simulation planning because in there it can be showed with data graphic. With Kanban simulation hopefully it can reduce stock inventory level in that company.

4. Result and Discussion

4.1. Current situation

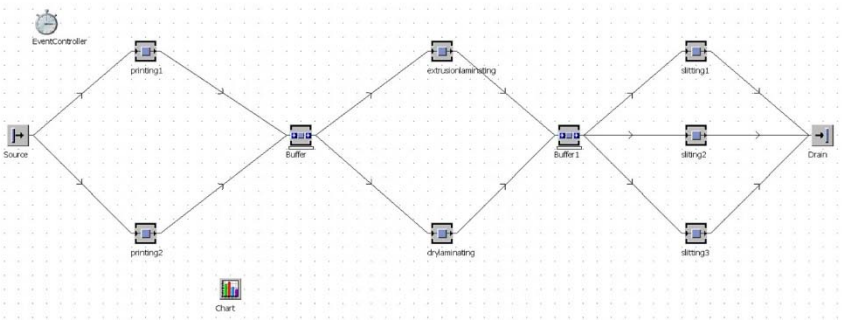

Fig. 3: Current situation production process at PT. Total Pack Indonesia

This production line actually depends on demand customer and according type of production, this is pull production system, but the raw material supply from storage every three hours continuously. Raw materials go to printing machine for six hours, there are 2 printing machines in this company, 8 colors and9 colors but it is same process, after that it must be dried for at least six hours, the material which must be dried will be located in buffer place. Next, go to laminating machine approximately 6.5 hours until seven hours, there are 2 laminating machine : extrusion laminating and dry laminating and it must be dried again at least 24hours processing time at buffer place. The buffer place after printing section and laminating section is in the same location separately. After the material already dry it will be slitted in slitting machine, there are 3 slitting machine in this company and the processing time about 8.5hours. Last step is packing finish product and deliver to customer.

The result from that production system is there are many waiting material in production line. Actually buffer for printing is 6 rolls but sometimes it overload and it came out worse in buffer after laminating process, that buffer is only for 6 rolls too but it sometimes overload until 24 rolls. Because of buffer place can't handle overload waiting material so waiting material is located near buffer place or beside printing and laminating machine. That make WIP in this company too high, waiting material that cause high WIP is useless because it can't be processed, only wait in line production.

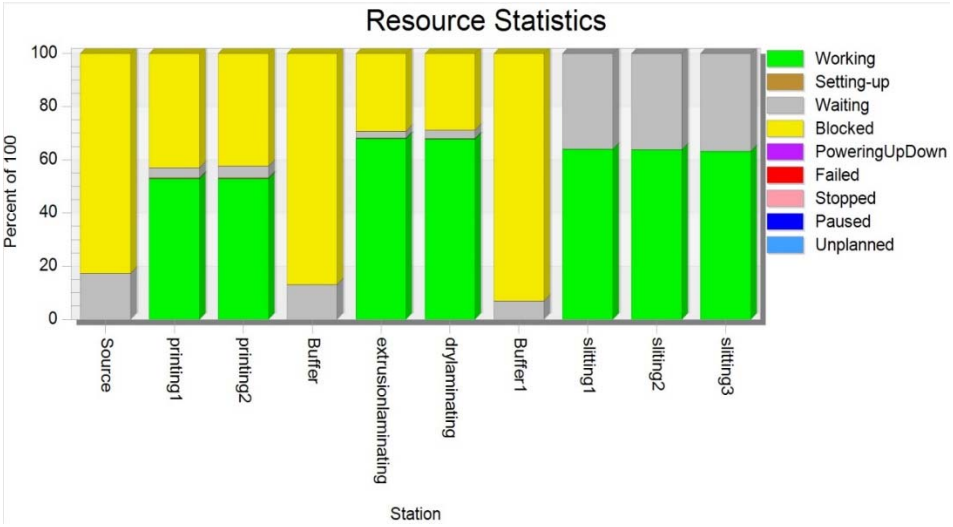

Fig. 4: Graphic chart current situation production process at PT. Total Pack Indonesia

Most of the waiting material happen in buffer place after laminating process, because in this station material must wait until it dries up for 24 hours. The drying process is too long and the capacity that the buffer can handle is only 6 rolls which makes this station often becomes overload and the bottleneck happen. The waiting of source shows that raw material must wait but it can't go to printing process, but it was already stocked before and ordered from supplier. This situation is not efficient because it wastes money and space (storage is very big).

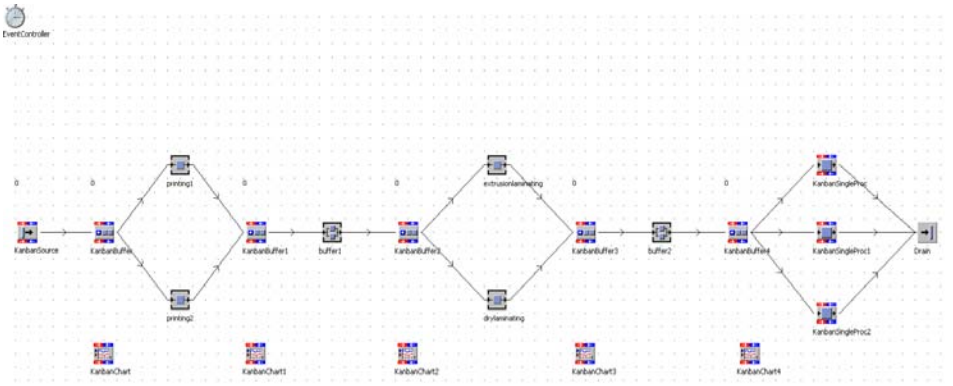

Fig. 5: Kanban card implementation in production process at PT. Total Pack Indonesia

The different between the current situation and Kanban system is that in the Kanban system Kanban source and Kanban buffer are used. Kanban buffer follows the Kanban principle, it only moves parts on to its successors when the other object, usually other Kanban buffer or station order these parts. The Kanban

Buffer maintains a threshold value for each part, the minimum inventory. When the inventory falls short of this number, parts are ordered from the Supplier of this part. The ordered amount is calculated like this: ordered amount equals maximum inventory minus current inventory minus still open, but already ordered amount.

4.2. Kanban card implementation

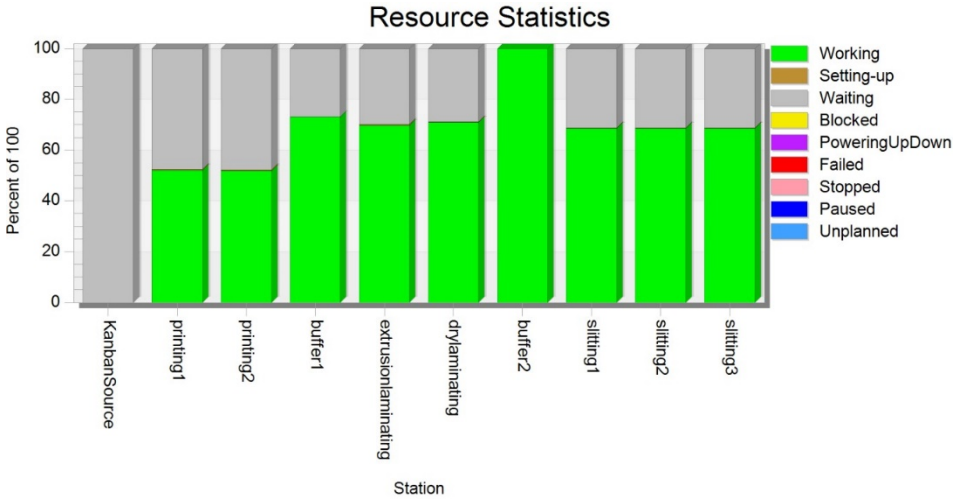

Fig. 6: Graphic chart kanban card implementation in production process at PT. Total Pack Indonesia

It is very different from graphic chart of the current situation production line, in Kanban system production line there isn't any yellow color, meaning there aren't any materials waiting to be processed in the next station. The bottleneck that happens in drying section 2 after laminating, in here it can be seen that there isn't any yellow color again but fully green color, which means that the drying section 2 (buffer) is used optimally without any waiting material in line again. This graphic also shows the difference at source station, if in current situation production line graphic there are much yellow color and that means the company must have stocked many raw material in inventory storage, in Kanban system graphic the source graphic is grey, which means the company doesn't need to keep any storage because if the company wants to order raw material from the supplier, it depends on when and how many raw material that the company needs based on requirement of Kanban system that was implemented.

4.3. Kanban card implementation in new model

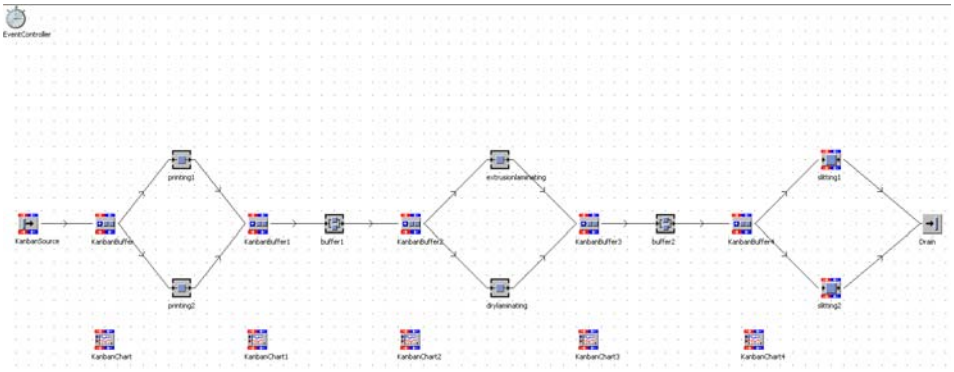

Fig. 7: Kanban card implementation in new model production process at PT. Total Pack Indonesia

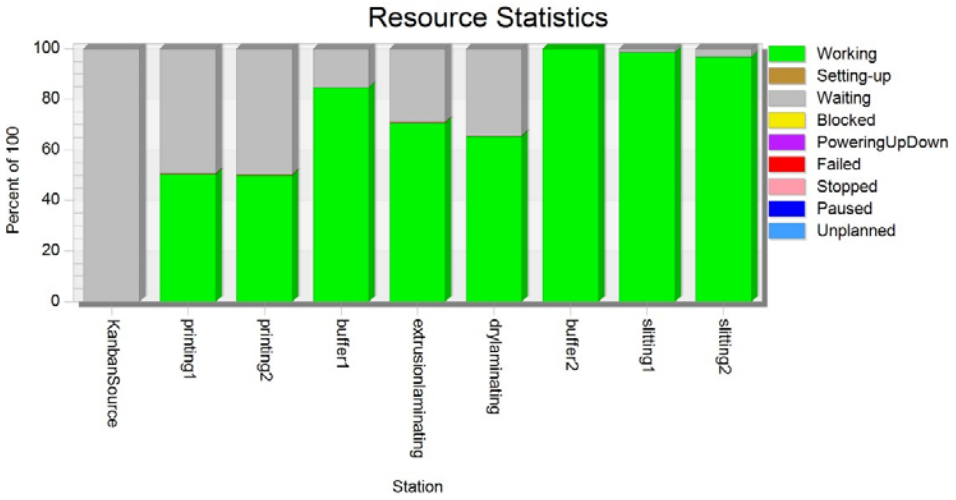

Fig. 8: Graphic chart kanban card implementation in new model production process at PT. Total Pack Indonesia

This new model graphic chart show about how much working machine in production line. Now, there are only 2 slitting machine in slitting area and work optimize. With only 2 slitting machine it is enough to handle production process without any waiting material. In printing area there are still have many grey area, but it is impossible to dispose or change production line in printing machine because these printing machine is too big. Because of dispose 1 slitting machine can affect to production line for example unbalance production line, so it will change little bit system in Kanban buffer station to balance line process in printing

area.

5. Conclusion

Kanban is a tool used for realizing Just In Time, which is based on pull production system. The Kanban system is used to control work in process (WIP), movement material, and reduce inventory level. PT. Total Pack Indonesia uses push production system in their production process, their concept is that as long as they have raw material in stock warehouse to be processed and demands from customer they will process the raw materials. From that reason, the company would not be able to control WIP in their production line and they also have high WIP, it can be seen from many materials waiting in the stations. PT. Total Pack Indonesia also stocks their raw material every month approximately 6.8 million until 7 million meters. Push system like this causes accumulation of stock in a big quantity in their storage.

This research will show how Kanban system works in production process at PT. Total Pack Indonesia with new model production process line, how to control WIP with Kanban system, how to eliminate the problem of material waiting in production process line, as well as how Kanban system can reduce inventory level and impact to inventory cost which all these are the objective of this researchs.

Tab. 1. Improvement result

	Current situation	Kanban system implement
WIP	Not controllable	Controllable
Material waiting	Many material waiting	No material waiting
Holding cost	1.428.000.000 IDR	0

In conclusion, there are suggestions for PT. Total Pack Indonesia to use Kanban system which is implemented in their production process and to use new model production process line by eliminating one slitting machine. These suggestions can optimize the work at this company. By optimizing production processes at PT. Total Pack Indonesia it can reduce the inventory stock level and will increase the company profit because of the elimination of the holding cost and electricity cost in one slitting machine.

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