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Production improvement using kanban system

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Abstract
The aim of this study is to study the implementation of industrial engineering tools in selected manufacturing company to identify the highest defects occurred at the company production lines and propose new methods to the selected manufacturing company for defects reduction and thus improve the productivity of the company. The chosen company is VISA Steel Industries. In the thesis work, we have consider flows of material as well as flows of kanbans. The many models given in the literature contribute to the confusion and debate that often characterize kanban research. The only element common to all kanban systems appears to be finite buffer capacities. The blocking has been described by total queue size, blocking by part type, and kanban card systems. We review the kanban literature and organize it by type of system and decision area. First, elements of system design, including setting kanban numbers, performance measures, material-handling frequencies, and container sizes has been discussed and later the production control topics of sequencing and sending it to assembly line has been done. We conclude kanban methods has a greater production control and is a very good system for production improvement for industries.

Keywords: Kanban, Production, Matlab/Simulink.

Introduction

In this modern and competitive world, manufacturing industry is one of the sectors, which can takes turns under all types of economic systems such as free market economy and collectivist economy. All of the products generated is competing to gain demand and satisfactory from customers. Kanban is a system to control the logistical chain from a production point of view, and is an inventory control system. Kanban became an effective tool to support running a production system as a whole, and an excellent way to promote improvement.

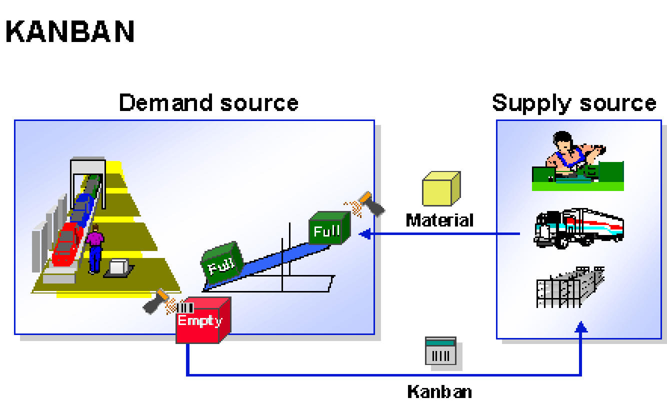

Fig 1: Kannban System

Data for the selected assembly line factory are collected, studied and analyzed. The defect with the highest frequency will be the main target to be improved. Various causes of the defect will be analyzed and various solving method will be present. The best solving method will be chosen and propose to the company and compare to the previous result or production. However, the implementation of the solving methods is depending on the company whether they wanted to apply or not.

Productivity improvement is to do the right things better and make it a part of continuous process. Therefore it is important to adopt efficient productivity improvement technique so as to ensure individuals and organization's growth in productivity. The aim of this paper is to introduce and understand productivity improvement, various techniques of productivity improvement, work study and its relation with productivity improvement.

In the late 1940s, Toyota started studying supermarkets with the idea of applying shelf-stocking techniques to the factory floor. In a supermarket, customers generally retrieve what they need at the required time—no more, no less. Furthermore, the supermarket stocks only what it expects to sell in a given time, and customers take only what they need, since future supply is assured. This observation led Toyota to view a process as being a customer of one or more preceding processes, and to view the preceding processes as a kind of store. The "customer" process goes to the store to get required components, which in turn causes the store to restock. Originally, as in supermarkets, signboards guided "shopping" processes to specific shopping locations within the store.

Kanban aligns inventory levels with actual consumption. A signal tells a supplier to produce and deliver a new shipment when material is consumed. These signals are tracked through the replenishment cycle, bringing visibility to the supplier, consumer, and buyer.

Kanban uses the rate of demand to control the rate of production, passing demand from the end customer up through the chain of customer-store processes. In 1953, Toyota applied this logic in their main plant machine shop

One key indicator of the success of production scheduling based on demand, pushing, is the ability of the demand-forecast to create such a push. Kanban, by contrast, is part of an approach where the "pull" comes from demand. Re-supply or production is determined according to the actual demand of the customer. In contexts where supply time is lengthy and demand is difficult to forecast, often, the best one can do is to respond quickly to observed demand. This situation is exactly what a kanban system accomplishes, in that it is used as a demand signal that immediately travels through the supply chain. This ensures that intermediate stock held in the supply chain are better managed, and are usually smaller. Where the supply response is not quick enough to meet actual demand fluctuations, thereby causing potential lost sales, stock building may be deemed more appropriate, and is achieved by placing more kanban in the system.

Taiichi Ohno stated that, to be effective, kanban must follow strict rules of use. Toyota, for example, has six simple rules, and close monitoring of these rules is a never-ending task, thereby ensuring that the kanban does what is required.

Kanban cards are a key component of kanban and they signal the need to move materials within a production facility or to move materials from an outside supplier into the production facility. The kanban card is, in effect, a message that signals depletion of product, parts, or inventory. When received, the kanban triggers replenishment of that product, part, or inventory. Consumption, therefore, drives demand for more production, and the kanban card signals demand for more product—so kanban cards help create a demand-driven system. It is widely held by proponents of lean production and manufacturing that demand-driven systems lead to faster turnarounds in production and lower inventory levels, helping companies implementing such systems be more competitive.

In the last few years, systems sending kanban signals electronically have become more widespread. While this trend is leading to a reduction in the use of kanban cards in aggregate, it is still common in modern lean production facilities to find use of kanban cards. In Oracle ERP (enterprise resource planning) software, kanban is used for signalling demand to suppliers through email notifications. When stock of a particular component is depleted by the quantity assigned on kanban card, a "kanban trigger" is created (which may be manual or automatic), a purchase order is released with predefined quantity for the supplier defined on the card, and the supplier is expected to dispatch material within a specified lead-time.

Kanban cards, in keeping with the principles of kanban, simply convey the need for more materials. A red card lying in an empty parts cart conveys that more parts are needed.

Proposed Method

A case study

The chosen company is VISA Steel Industries. In the thesis work, I have consider flows of material as well as flows of Kanban. In VISA steel, I have completed my project on improvement of production using KANBAN system.

In KANBAN, the signal for material replenishment can be triggered, for example, by the work center that requires the material (demand source) by sending a card to the work center that is responsible for manufacturing the material (supply source).

This card describes which material is required, the quantity of the material required and where the material is to be delivered. The name KANBAN originally stems from these cards, which are called "Kanban" in Japanese.

Objective

- ✓ Eliminate disruptions
- ✓ Make system flexible by reduce setup and lead times
- ✓ Eliminate waste, especially excess inventory
- ✓ Make the process smooth

Overview

This model simulates a production system that uses kanbans to manage production activities. Analysis of simulation results highlights problems of the system and suggests ways to improve its performance.

Formula for determining the number of cards used in the system

Below is presented a formula which is using in production to show how kanbans could flow between a customer cell and a supplier cell.

$$\text{No. of kanban cards} = \frac{\text{kanban quantity}}{\text{lot size}}$$

$$\text{Kanban quantity} = \frac{\text{Design daily production rate} * \text{replenishment time}}{\text{Available time}}$$

Step 1: $\dfrac{90\ pieces \times 15\ hours}{7.5\ hours} = 180\ pieces,$

$"A"\ parts = 1/2\ day\ demand,\ or\ 45\ pieces.$

Step 2: $180\ pieces \div 45\ pieces = 4\ cards\ .$

The modeled production system includes two part suppliers and an assembly line. The part suppliers use raw materials to manufacture parts. Finished parts are transported to the assembly line to fabricate final products. Completed products are shipped to distributors to fill production orders.

At the top level of the model:

- The Generate Production Orders subsystem simulates the generation of production orders.
- The Assembly Line subsystem fills a production order by assembling two types of parts (referred to as part A and part B) into final products.
- The Part a Supplier subsystem and Part B Supplier subsystem manufacture the parts needed for final assembly.

The Material a Supplier subsystem and Material B Supplier subsystem replenish the raw materials consumed during parts production.

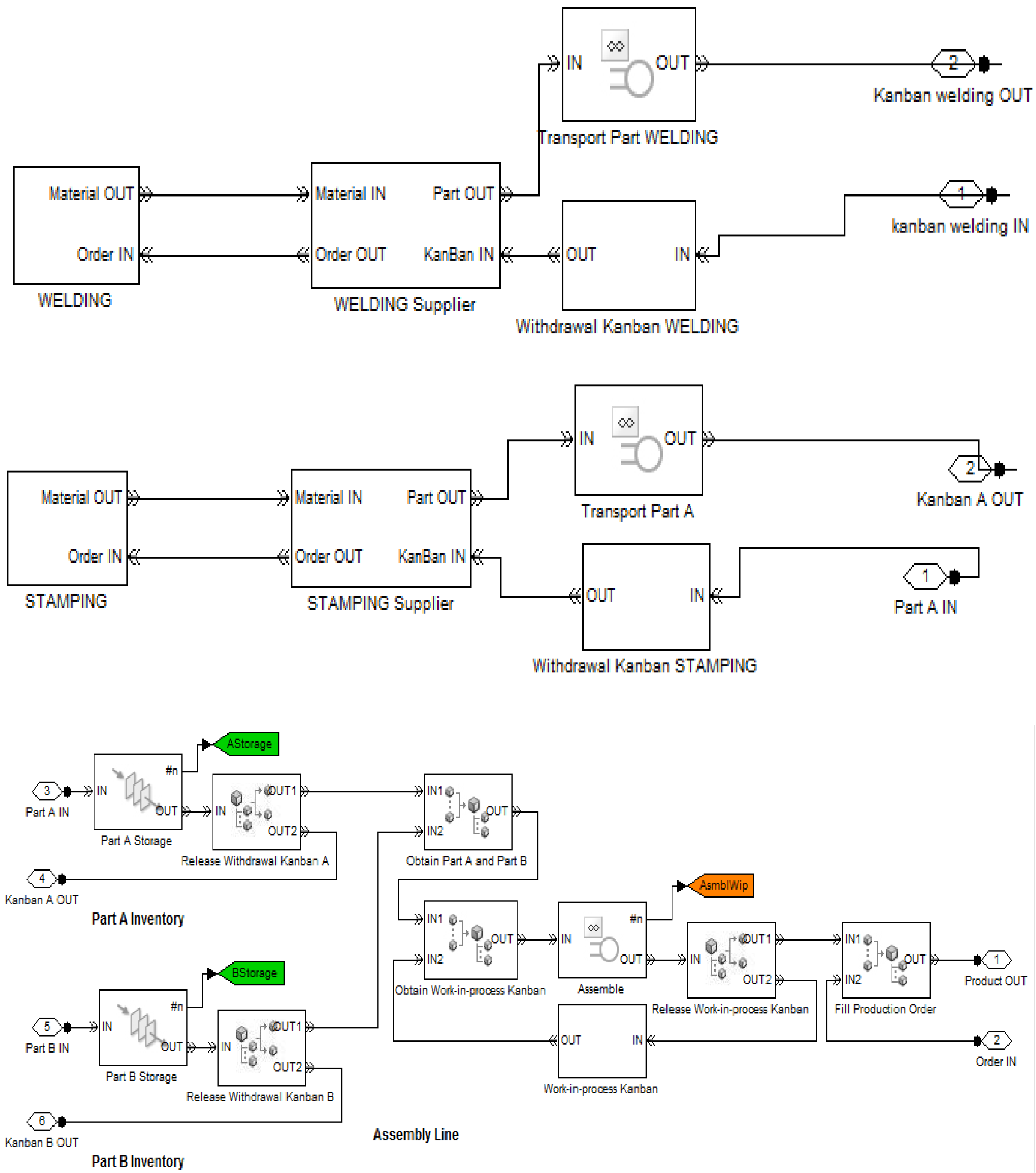

Fig 2: Kannban System MATLAB/SIMULINK Model

The model uses a preloaded queue technique to model the group of kanbans. To learn about this technique, see Preload Queue with Entities. To learn about the Kanban request and release technique in this model, see Resource Allocation from Multiple Pools.

Simulation Result

Results and Displays

During simulation, the Data Display subsystem displays these scopes to demonstrate the performance of the production system

• Part A Withdrawal Kanban Backlog • Part B Withdrawal Kanban Backlog • Number of Part A in Process • Number of Part B in Process • Number of Products in Final Assembly	• Number of Part A in Storage • Number of Part B in Storage • Product Demand • Number of Dropped Orders • Number of Completed Orders

A Display block at the root level of the model provides a numeric view of the number of orders completed as well as the number of orders dropped.

Using the Model for Performance Analysis

The model with the original configuration represents a Kanban production system with significant lost sales in months when demand is at a peak. Analysis of simulation results suggests solutions to address this issue. The following graph shows how the solutions are developed.

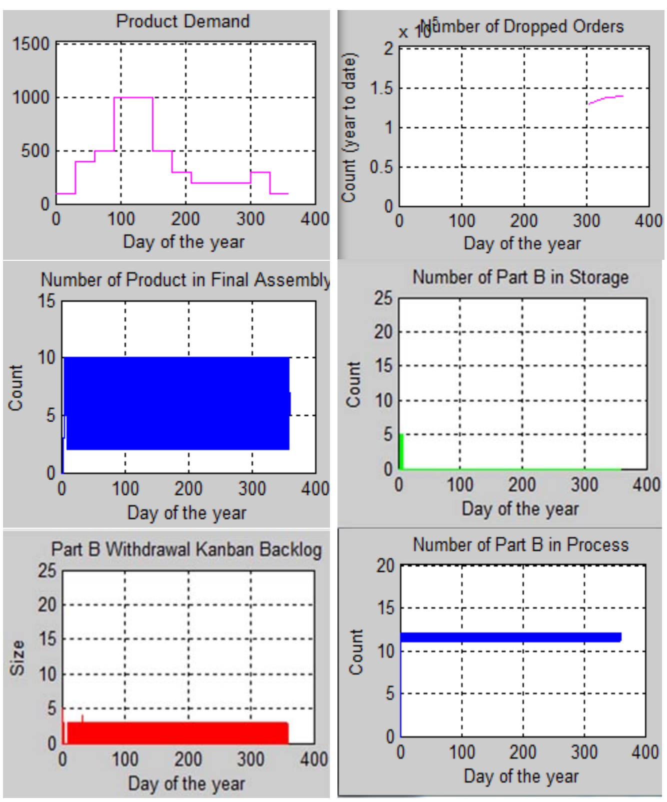

Fig 3: Kannban System Results

Conclusion

In the proposed work, we have consider flows of material as well as flows of kanbans. The many models given in the literature contribute to the confusion and debate that often characterize Kanban research. The only element common to all Kanban systems appears to be finite buffer capacities. I describe blocking by total queue size, blocking by part type, and Kanban card systems. We review the Kanban literature and organize it by type of system and decision area and finally conclude a Kanban method are a greater production control and is a very good system for production improvement for industries.

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