

Lean Concepts and Methods : 3P

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ABSTRACT

Nowadays competitive business environments, introduce new products of the global market, ahead of the competition and evaluate optimized procurement of goods from the global point of view, are essential. Accomplish businesses develop and strengthen their market position by manufacturing the highest quality of finish products more efficiently, at the minimum cost, and bringing them to market rapidly. Review the development step of a new product and need to start production preparation process (3P) based on Just-in-Time (JIT) within a small amount of time and in a timely fashion. Production Preparation Process 3P is an advanced lean approach required simulation, visual thinking, and kaizen for quick design for manufacturability. This work focuses on to minimize wastage of product, process design and used to eliminate waste in existing processes. However, this method is using within companies such as metals, petro- chemical, automobile industry and similar industries due to the demand for new products have increased. The reason for this research was to show the lean concepts, which can be efficient, effectively planned and managed.

Keywords: Production Preparation Process (3P), Just In Time (JIT), Kaizen, Waste, Lean Concepts.

I. INTRODUCTION

The lean concept has many advantages which have helped many companies over the years to stay more competitive in global and national business [1]. The basic idea is to reduce the cost systematically, throughout the product and production process using a series of engineering reviews. The goal is to satisfy the customer with the exact quantity, product, quality and cost in the lowest amount of time. The Lean manufacturing is more than a cost reduction program or problem-solving approaches [3]. Lean experts typically view 3P as one of the most powerful and transformative advanced manufacturing tools, and it is generally only used by organizations that have experience implementing other lean methods. Whereas kaizen and other lean methods take a production process as a given and seek to make improvements, the (3P) focuses on minimizing the waste through product and process design. 3P seeks to meet customer requirements by starting with a clean product development slate to rapidly create and test potential product and process designs that require the least time,

material, and capital resources. This method involves a diverse group of individuals in a multi-day creative process to rectify different alternative ways to meet the customer's needs using different product or process designs [2]. The Production Preparation Process typically results in products that are simpler and easier to manufacture often referred to as design for manufacturability and easier to use and maintain. The 3P can also develop production processes that eliminate multiple process steps and that utilize homemade, right-sized equipment that better meet production needs. Ultimately, 3P methods represent a dramatic shift from the continuous, incremental improvement of existing processes sought with kaizen events. Instead, 3P offers potential to make "quantum leap" design improvements that can improve performance and minimize waste to a level beyond that which can be achieved through the continual improvement of existing processes [4].

1.1 Importance of the Study

This study is to reduce the operational cost, increase profit and to meet customer demand on time by

eliminating non-value-added work from the process in a systematic way. The impact of not doing the study could be inefficient and collaborate with an excess amount of work-in-process inventory which will result in higher operating cost, delays on delivery orders, loss of customers, and fewer sales revenue. This study will open the door to many new angles of research and researchers on lean manufacturing and Production Preparation Process moving forward.

II. METHODS AND MATERIAL

2. Literature Review

The concept of Kaizen started since 1930's but was implemented in several Japanese businesses after World War II. Kaizen is Japanese for improvement Kai means Change and Zen means Good. Kiichiro Toyota introduced the first Toyota vehicle and utilized Kaizen to establish fundamental guiding principles. Taiichi Ohno later developed the Toyota Production System, or as we know it today, Lean manufacturing. Kaikaku was also introduced as a spin from Kaizen. Kaizen is usually done through incremental changes to reach an improved state. The 3P is a method in which employee teams conceptualize, develop, validate, and deploy radical improvement in product or process design. It is a robust methodology that can help you achieve giant leaps forward in your industry in fact it often yields results that qualify as industry secrets and 3P projects can be processed or product-focused and can be done in both manufacturing and service environments. The main idea is that an efficient production can be achieved by a comprehensive approach to minimizing wastes. This means eliminating excess output and inventory, excessive movement of material, delays and waiting, excess worker motion, over processing, and the need for rework and corrections. The 3P takes the concept of Kaikaku in implementing the future state for a manufacturing process or product. It is a project based multifunctional activity that requires the involvement of organizational stakeholders (internal or external) who help identify problems, Kaizen opportunities and concerns [1, 5-6]. Some examples of projects include

1. New equipment
2. New products or new models
3. Changes in process layouts
4. Improvement in performance
5. Increasing Production Capacity
6. Transfer of equipment to another facility

The 3P process is typically intended for companies high in utilizing the lean tool for identifying the value added and non-value activities. These companies have gone through different stages in establishing stability, capability, and sustainability. These organizations have created a culture of problem solvers and have become highly recognized competitors in the market place [2].

2.1 Why 3P

Production Preparation Process 3P is a system designed to lead organizations to another level, from incremental Kaizen activities to break-through ideas that eliminate waste and reduce cost when implementing a new process or product. It is considered one of the most powerful and transformative advanced manufacturing tools of Lean Enterprise Transformation [2]. The 3P consists of simultaneously developing a new product and manufacturing system while also minimizing the development time. A key feature of 3P is that it simulates the actual product, components and production line during the early stages of the design process to learn about manufacturing or delivery requirements before making commitments to a floor plan or process flow. Production Preparation applies to the following situations [7]. The Figure 1 below shows, the Production Preparation begins at the point where the product concept is well enough designed to enable the development of the manufacturing process. It ends once production ramps up, but includes capturing lessons learned from volume production ramp up.

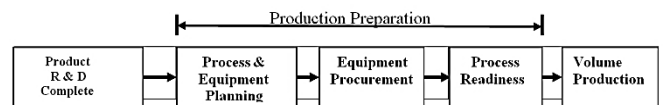


Figure 1: Production Preparation Stages

The Principles of the 3P include the following, which require close attention and adherence:

1. Integrated Product and Manufacturing Development: This brings together product and process engineering, vendors of equipment, front-line workers, and others to ensure simultaneous development with minimal rework.
2. Quality built into the System: This focuses on ensuring that the equipment and other processes

hold needed tolerances, pressures and temperatures other operating parameters.

3. Flexible Processes and Equipment: This ensures that the system is designed to meet current and future customer requirements, and can adapt to changing economic conditions.
4. Lean Principles: To ensures that the manufacturing processes will lunch with best practices from Lean Thinking.
5. Timing: In the 1990s, Motorola compared a 30% development cost overrun to a six-month delay in the start and learned that the profit reduction due to a launch delay was ten times larger than from the cost overrun. While this doesn't say to overrun budgets, it does say that completing developments on time are essential.
6. Target Cost: Since the market sets the price, the design of the process to enable lowest cost is necessary. The great reduction in manufacturing cost is possible during the design of the new process.

2.2 Lean Thinking

The production preparation process (3P) derives its approach from Lean Thinking and develops Lean manufacturing capabilities. Taiichi Ohno, the founder of the TPS said, all we are doing is looking at the timeline, from the moment the customer gives us an order to the point when we collect cash. The easiest of all wastes and the hardest to correct is the waste of time removing the non-value added wastes. Ohno echoed Henry Ford who said, time waste differs from material because wasted time does not litter the floor like wasted material [10-11].

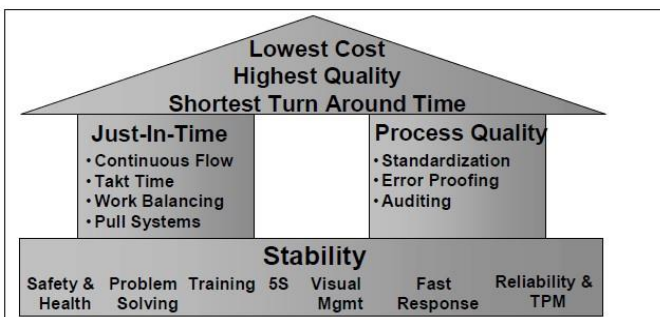


Figure 2 : The Toyota Production System House [7].

Figure 2, The Toyota Production System House, illustrates the major elements of the production system. One pillar of the house is Just-In-Time meaning the

right part at the right time, just when needed and of the desired quality and quantity. Just-In-Time is enabled through designing the production process for continuous flow, production rate to meet the customer's actual demand (takt time), balancing work, and allowing the downstream operations to signal when upstream production is needed. The other pillar is Process Quality meaning that only real output is passed to the next operation or customer [12-14]. Process Quality is enabled through standard work for production and maintenance, equipment designed to prevent errors, and checks on how people perform regular work and in-process quality audits. This production system aims to provide the lowest cost, high quality, and flexibility [15].

III. RESULTS AND DISCUSSION

3. Methods and Implementation Approach

This focuses on team-based workshop for creating and testing alternatives. The moonshine enables us rapidly to actualize our ideas of so named try-storming and cardboards engineering, is to mock up and simulate quick-and-dirty solutions. The figure 3 below shows the high measure of (3P). There are two paths, one for production and the other one for product, the process is highly integrated and includes feedback from product and process to design. The figure below shows more detailed to look. The moonshine events occur during the Production Preparation Process. These illustrate shows some ways that 3P differs from traditional design. The key steps in the 3P moonshine events are described below:

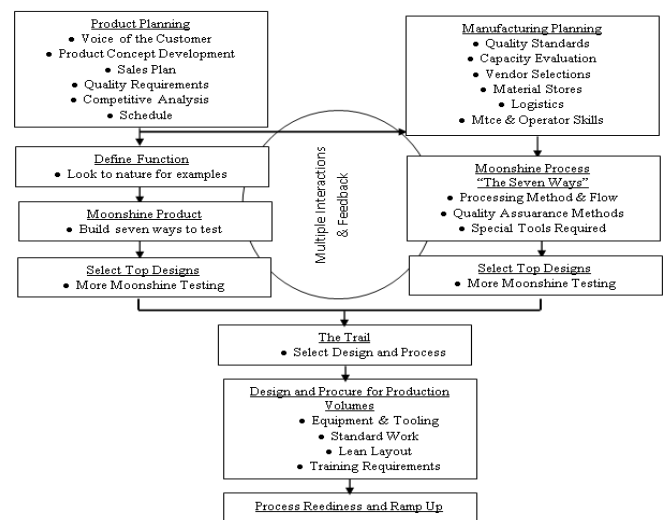


Figure 3: The High-Level Flow of 3P Process.

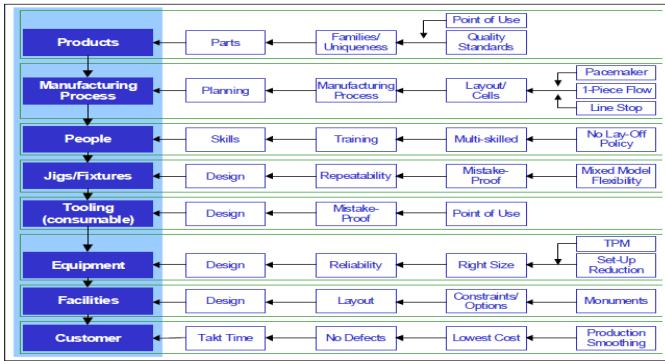


Figure 4: The Detailed Level of Production preparation process 3P [7].

1. Define Product or Process Design Objectives/Needs: The team looks for understanding the core customer needs that need to be satisfied. If a product prototype is available, the project team is divided into parts and raw materials to assess the function that each plays.
2. Diagramming: A fishbone diagram or another type of illustration is created to show the flow from raw material to finish goods. In this step, the plan team analyzes where work in process will happen and how information and content will join. The team looks for non-value-added activities.
3. Find and Analyze Examples in Nature: This means to consider how each process steps or product feature has a the same in the natural world, for instance, the movement of an animal. This action helps the plan team break out of existing paradigms, to look at the product and process in an entirely new way.
4. Sketch and Evaluation of the Process: Sub-teams are formed, and each of the sub-team members is considered to draw in a different format to fulfill the process in question. Each of the sketches is analyzed, and the best is selected along with any useful features from the plans that are not chosen for a mock-up.
5. Build, Present, and Select Process Prototypes: The team prototypes will examine the selected process, spending several days (if possible) working with different variations of the mock-up to ensure it will satisfy the criteria.
6. Hold Design Review: Once a concept is selected for additional refinement, it is presented to a larger group as part of the original product designers for feedback and determines the steps to implement the solution.

7. Develop Project Implementation Plan: This means if the project is selected to precede the team chooses an implementation project leader who helps to determine the schedule, process, resources requirements, and distribution of responsibilities for completion.

IV. CONCLUSION

This tool simulates the actual product, components and production line of a new product throughout its development cycle and design. In these levels of design and development, the simulation events contain development software and hardware then followed by production varieties. The application of 3P Process tool simulation can also be applied to non-product applications, for example, to develop a new or information infrastructure and upgraded service. In these cases, the simulations media may be different, e.g., live storyboards, the concept of operation scripts, role playing, pilots and process models. The goal is to show the lean concepts which can be adequately planned and managed with the use of concepts and lean tools in identifying any non-value added value including quality problems, constraints, productivity or performance issues and take action to repair these problems before implementation.

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