

# Research on the Process Management System of Manufacturing Enterprises Based on Lean Production

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**Abstract:** Against the backdrop of rapid global economic development and increasingly fierce market competition, manufacturing enterprises are confronted with multiple challenges such as sluggish improvement in production efficiency, high operating costs, and continuously rising quality requirements. Lean production, as an advanced management concept oriented towards eliminating waste, continuous improvement, and customer value, has become an important path for manufacturing enterprises to achieve transformation and upgrading. Based on the lean production ideology, this paper systematically explores the construction path of the process management system in manufacturing enterprises and takes a certain manufacturing enterprise as an example to analyze its specific practices in promoting lean production. The research proposes that through four key links: process diagnosis and analysis, lean solution design and implementation, process standardization and solidification, and performance evaluation and continuous improvement, process optimization and management system integration can be effectively achieved. Practice shows that this system has significantly shortened the product cycle, improved the qualification rate and production capacity, providing theoretical and practical support for enterprises to enhance market competitiveness and achieve sustainable development.

**Keywords:** Lean Production; Process Management; Manufacturing Industry; Process Optimization; Continuous Follow-up

## 1. Introduction

The world today is undergoing profound changes unseen in a century. The global economic landscape is undergoing a deep

adjustment, and a new round of technological revolution and industrial transformation is in full swing. Against this backdrop, manufacturing, as the mainstay of the national economy and the foundation of a nation, its development level directly affects a country's overall competitiveness. However, in the face of increasingly fierce global market competition, continuously rising factor costs, and customers' strict demands for personalized, high-quality and fast-delivered products, the traditional manufacturing enterprises' extensive management model characterized by large-scale production and high inventory has become unsustainable. Many enterprises are trapped in the predicament of encountering bottlenecks in improving production efficiency, persistently high operating costs, and being unable to effectively control quality fluctuations. Therefore, seeking a new management paradigm that can systematically enhance operational efficiency, eliminate waste, and quickly respond to market changes has become an urgent need and strategic choice for China's manufacturing industry to achieve high-quality development and move towards the medium-high end of the global value chain.

The lean production concept, as the essence of the Toyota Production System originated from the Toyota Motor Corporation in Japan[1], has been proven through decades of global manufacturing practice and theoretical refinement to be an effective philosophy and methodology system for addressing the aforementioned challenges. It transcends the scope of a single production technology and becomes a complete management ideology centered on eliminating all non-value-adding waste (Muda) to the greatest extent, driven by continuous improvement (Kaizen), and aiming at maximizing the value defined by customers as the ultimate goal. Through a series of tools and methods such as Just-In-Time (JIT) production, Jidoka (automation), Value Stream Mapping

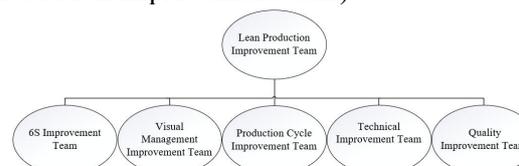
(VSM), and standardized operations[2], it strives to build an efficient, agile, low-consumption, and high-quality production system. However, although the tools and methods of lean production have been well-known and introduced by many enterprises, its successful implementation and the consolidation of long-term benefits are not easy. Many enterprises' lean practices often remain at the level of isolated tool application and local improvement, falling into the trap of "campaign-style" promotion, failing to integrate lean thinking into the enterprise's DNA, resulting in the inability to solidify improvement results and even the recurrence of previous problems. The fundamental reason lies in the lack of a systematic process management system that matches the lean ideology as the top-level design and implementation carrier, which leads to fragmented and short-term lean improvement activities and the inability to form a long-term mechanism and cultural atmosphere of continuous optimization.

Based on this, this research focuses on building a systematic manufacturing enterprise process management system based on the lean production concept. This research holds that embedding the core principles and methodologies of lean production systematically into the end-to-end process management cycle of an enterprise is the key to achieving a transformation from "technique" to "philosophy" in lean production. This paper will first explain the intrinsic compatibility of lean production and process management in terms of value orientation and systems thinking, and argue for the necessity of a process management system as an organizational and institutional guarantee for the implementation of lean thinking. On this basis, this research will propose a closed-loop management model covering four stages: "process diagnosis and value stream analysis, lean solution design and implementation, process standardization and organizational solidification, performance evaluation and continuous improvement". This model emphasizes a macroscopic value stream perspective to comprehensively examine process bottlenecks and waste sources, and through the combined application of lean tools, carry out targeted optimization. The best practices after optimization will be solidified through standards, systems, and culture, and ultimately drive a new round of improvement cycles through a

scientific performance indicator system. To verify the feasibility and effectiveness of this theoretical framework, this paper will select a typical manufacturing enterprise with deep accumulation and successful practice in lean management as a case study, and deeply analyze how it integrates lean tools with the management system, and the specific paths, key measures, and achievements of systematically promoting the construction of the process management system. Through the in-depth decoding of this case, the aim is to distill universal implementation strategies and management insights, providing a reference solution with both theoretical height and practical guidance significance for the systematic and in-depth promotion of lean management by the vast majority of manufacturing enterprises in China, to achieve cost reduction, efficiency improvement, and competitive leap.

### 1.1 Lean Production

Lean production is a management concept originated from the Toyota Production System. This concept was developed by a group of international experts and scholars led by a professor from the Massachusetts Institute of Technology through in-depth research, summary and refinement of the Toyota production model[3]. In lean production, the "lean" represents precision and accuracy, and the "benefit" refers to efficiency. This production mode runs through the entire life cycle of product production, aiming to eliminate waste, optimize resource utilization, and improve efficiency and quality. This concept has been rapidly promoted globally, and its core principles include customer orientation, value stream analysis, flow and pull, continuous improvement, and respect for employees, which together form an efficient and flexible production management system (see Figure 1. for the organizational structure of the lean production improvement team).



**Figure 1. Lean Production Improvement Team Organizational Chart**

Customer first is the cornerstone, emphasizing market demand orientation to ensure products meet customer expectations. Value stream

analysis helps enterprises accurately identify and eliminate ineffective links in production, optimizing resource allocation. The flow and pull mechanism promotes the balance between production continuity and demand-driven, reducing inventory build-up and enhancing response speed. Continuous improvement encourages enterprises to constantly explore optimization space and maintain competitiveness; while respecting employees stimulates team potential and builds a harmonious working atmosphere. In enterprise process management, lean production is of profound significance. It significantly improves production efficiency and quality, reduces waste and costs through process optimization, and responds quickly to changes in market demand, enhancing market competitiveness.

### **1.2 The Intrinsic Link between Lean Production and Process Management**

A key point of lean production lies in eliminating waste by determining the correct and standardized processes. Therefore, optimizing or even reengineering processes is essential to achieving lean production. Lean production holds that any process, whether in manufacturing, marketing, or product development, can only create value by transforming the physical or informational aspects of products, services, and activities into what customers need[4]. The correct and standardized process is to eliminate the non-value-adding links in the process and fix them in a standardized form. Through lean production, enterprises can effectively improve their processes, solidify the results of process reengineering through standardization, and guide the daily operations of the enterprise. At the same time, establish a process-oriented organizational structure, use standardized management and work standards as tools to empower employees, cultivate employees, and make them understand and identify with the enterprise's philosophy, thereby creating value for the enterprise. Therefore, one of the keys to achieving lean production is the continuous optimization of production processes and the solidification of process standards. Process management is a management method and means that focuses on constructing excellent business processes through standardization and continuously improving organizational performance through process optimization. The two complement each other and support each

other. Lean production and process optimization or reengineering play a very important role in improving all aspects of enterprise basic management.

## **2. Research on Process Management System Based on Lean Production Thought**

### **2.1 Analysis of the Current Situation of Process Management in Manufacturing Enterprises**

Under the macro background of global economic integration and accelerated technological iteration, manufacturing enterprises generally face multiple challenges such as highly dynamic market environment, sluggish improvement in production efficiency, persistently high operating costs, and significant fluctuations in product quality. The traditional rigid production model characterized by scale and standardization is difficult to respond agilely to the rapid changes in market demand, thereby restricting the continuous improvement of the core competitiveness of enterprises. Against this backdrop, Lean Production, as an advanced management philosophy, oriented towards customer value, focuses on eliminating non-value-added activities in the process, promoting continuous improvement, and advocating full participation, providing important theoretical support and practical paths for manufacturing enterprises to achieve process management innovation[5].

At present, the process management model of manufacturing enterprises still has several structural limitations, mainly manifested in the lagging response to market changes, the imbalance between production efficiency and cost control, and the lack of flexibility in organizational operation mechanisms. The traditional management model relies heavily on scale effects and cost control, but it is insufficient in quickly identifying and responding to emerging market trends, which often puts enterprises in a passive position in the dynamic competitive environment. In addition, the redundancy and complexity of production processes, as well as the poor information flow across departments, further exacerbate cost pressure and efficiency bottlenecks, making it difficult for enterprises to build sustainable competitive advantages in the increasingly fierce market competition.

With the wide application of lean production

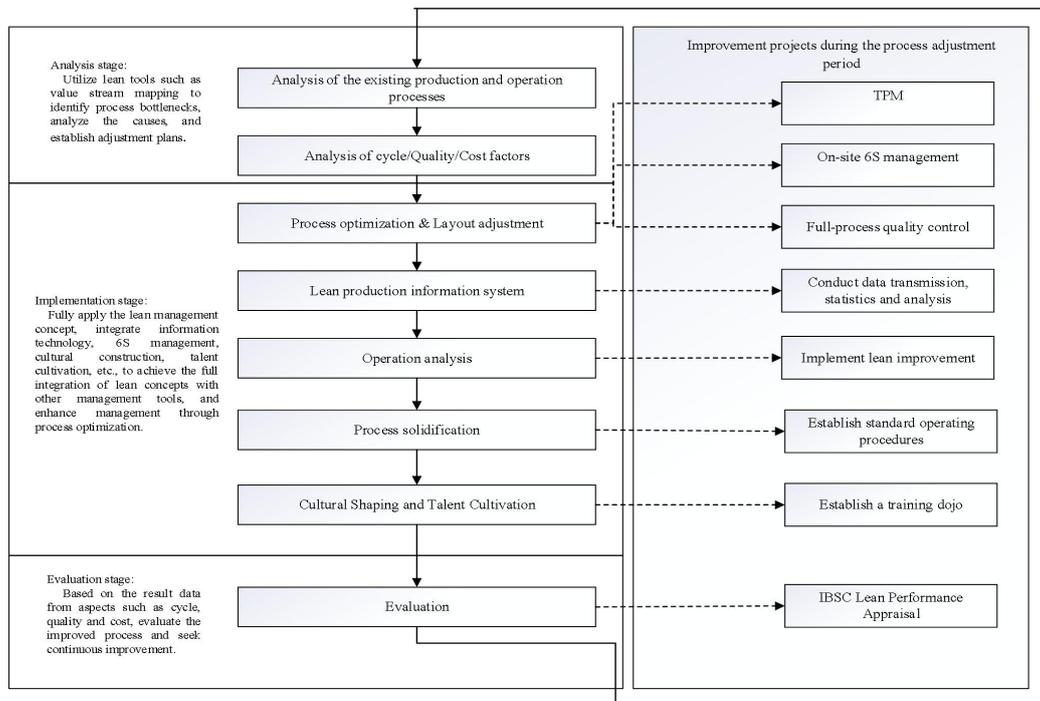
concepts in the manufacturing industry, its implementation effectiveness has been verified through practice. By systematically optimizing production processes, strengthening cross-functional collaboration, establishing a continuous improvement mechanism, and encouraging innovative behaviors, enterprises can not only effectively enhance operational efficiency and product consistency quality but also strengthen overall market adaptability and competitive barriers. However, the implementation process of lean production also faces many challenges, including insufficient understanding of management concepts, limited investment in supporting resources, and the difficulty in breaking organizational inertia. Therefore, manufacturing enterprises need to promote the in-depth implementation and effective execution of lean production concepts by strengthening the dissemination of concepts and systematic training, formulating scientific and feasible implementation roadmaps, and providing adequate organizational and resource guarantees.

### 2.2 Basic Conception

When lean production is elevated to the level of philosophy and culture, it will naturally become a platform that governs all management tools

and forms a management system. By integrating it with the core of management - the process, and solidifying it through the process, a management system that can do the right things and do things right can be formed. This will surely lead to a significant improvement in the management level of the enterprise[6]. Therefore, YH Company, based on its own management status and production characteristics, focuses on the establishment of a quasi-assembly line production organization model. Starting from meeting the actual needs of the last workstations in the production process, with the goal of optimizing the production process, guided by lean thinking, and using the design and optimization of production operation processes as the means, it drives the thorough transformation of the production organization model and production organization process through the adjustment of production operation processes. Thus, a full-system and full-process management system that can continuously optimize the production process is established, thereby exerting the comprehensive effect of management, achieving the effective integration of management methods and overall optimization.

### 2.3 System Construction



**Figure 2. Schematic Diagram of Process Management System Construction Based on Lean Thinking**

#### 2.3.1 Process Diagnosis and Analysis

The establishment of a system begins with a

comprehensive review and in-depth diagnosis of the current state (see Figure 2. Schematic

Diagram of Process Management System Construction Based on Lean Thinking). The core task of this stage is to use lean tools such as value stream mapping to conduct an end-to-end systematic depiction and analysis of the existing production and operation processes. Value stream mapping can visualize material and information flows, precisely revealing value-added and non-value-added activities (i.e., waste) throughout the entire process from raw materials to finished products[7]. Through this analysis, it is possible to accurately identify process bottlenecks that restrict overall efficiency, such as excessive waiting times, overstocked work-in-progress inventory, unnecessary material handling, or imbalances between processes. On this basis, it is necessary to further explore the root causes of the bottlenecks rather than merely focusing on surface phenomena. At the same time, key performance indicators of the process, especially cycle time (delivery speed), quality pass rate, and cost structure, need to be quantitatively analyzed to clearly understand the performance level and problem points in terms of cycle, quality, and cost (QCD) of the current state. The exact output of this stage is to establish a clear, data-based direction for adjustment and improvement, laying a solid empirical foundation for subsequent precise interventions. The entire analysis process emphasizes objective data and on-site observations to ensure an accurate and profound understanding of the current situation.

### 2.3.2 Lean Program Design and Implementation

After identifying the problem points and improvement directions, the system enters the program design and implementation stage. This stage is crucial for transforming lean concepts and methodologies into concrete actions. The implementation content is a multi-dimensional and systematic improvement set. At the hardware and on-site level, Total Productive Maintenance (TPM) is promoted to ensure equipment overall efficiency, and on-site 6S management centered on sorting, straightening, sweeping, cleaning, discipline, and safety is implemented to create an orderly and efficient working environment[8]. A comprehensive quality control system covering source quality control and error-proofing mechanisms is also established to pursue zero defects. At the process optimization level, specific process optimization and layout adjustments are made based on the conclusions of the analysis stage, such as

introducing unitized production or optimizing material flow to reduce handling and waiting. Moreover, the implementation of lean improvements cannot be separated from data support, so an effective data transmission, statistics, and analysis mechanism must be established to ensure that improvement activities are based on facts rather than experience. Additionally, this stage also initiates the construction of supporting systems, such as establishing training dojos for systematic skills training and beginning to introduce lean production information systems to enhance information flow and decision-making efficiency. All these improvement projects are not carried out in isolation but are coordinated and advanced under a unified lean strategy framework, jointly contributing to the enhancement of process efficiency.

### 2.3.3 Process Standardization and Solidification

If the achievements of lean improvement cannot be consolidated, it is very likely to regress to the state before improvement. Therefore, standardizing and solidifying the verified effective improvement measures is the core link to ensure long-term benefits. The primary task at this stage is to establish and improve the standard operating procedures, document and visualize the best practices, so that operations have rules to follow, reduce variations, and provide a benchmark for subsequent continuous improvement. Combined with cultural shaping and talent cultivation, through platforms such as training dojos, ensure that all relevant employees can understand and master the new standard processes. At the same time, to guide and motivate the correct behavior, it is necessary to establish a corresponding lean performance evaluation system (as shown in the TBC lean performance evaluation in the figure 2.), link the key performance indicators of the process with the evaluation of teams and individuals, thereby solidifying the improvement behavior[9]. The solidification of the process also depends on the transformation of organizational culture, that is, shaping a lean culture of continuous improvement, respect for employees, and transparency of problems, making improvement the conscious action of every employee. Through the three-pronged approach of standardization, performance evaluation, and cultural shaping, the improvement results are "locked" in the daily operations of the organization, forming a stable and predictable

operation mode.

#### 2.3.4 Performance Evaluation and Continuous Improvement

The ultimate goal of the process management system is to achieve outstanding operation, which is essentially an endless pursuit. The evaluation stage constitutes the feedback mechanism of the lean management closed loop[10]. At this stage, it is necessary to systematically collect the result data of the improved process in terms of cycle, quality, cost, etc., and compare it with the baseline data of the analysis stage. Statistical methods should be used to objectively evaluate the actual effectiveness of the improvement measures. The purpose of the evaluation is not only to confirm the achievements but also to identify new gaps and improvement opportunities. This means that even if the current process has reached the expected goals, it should be based on higher standards to seek further optimization space. The new bottlenecks or problems discovered in this stage will be used as the input for the next PDCA cycle, restarting the improvement cycle from "analysis". Therefore, the entire system is not a one-time project but a continuous improvement engine that spirals upward, ensuring that the organization can constantly adapt to internal and external changes and maintain the competitiveness of the process in dynamic competition.

### 3. Conclusion and Effects

This research, through systematic theoretical construction and empirical case analysis, demonstrates the feasibility and effectiveness of a process management system based on lean production ideology for manufacturing enterprises to achieve systematic performance improvement. This system is not merely a simple superposition of lean tools and management processes, but rather, it is centered on the core philosophy of "eliminating waste and creating value". It constructs a dynamic, self-improving management framework through four stages: "process diagnosis and analysis - lean solution design and implementation - process standardization and solidification - performance evaluation and continuous improvement". Its practical value lies in successfully elevating lean production from a series of discrete improvement tools to a systematized and process-oriented management system that runs through the entire enterprise operation. This

system is based on the actual foundation of production units. While establishing a lean production organizational model systematically, it effectively integrates other advanced management tools and methods such as value stream analysis, standardized operations, and total productive maintenance (TPM), making "continuous improvement" (Kaizen) no longer remain at the conceptual level, but rather be concretized and normalized through the continuous optimization of processes. This, in turn, effectively drives the coordinated and fundamental transformation of production organizations and the overall management system. Therefore, the core contribution of the system constructed in this research lies in breaking through the common local improvement model in traditional management practices that focuses on "points" (such as individual processes) or "lines" (such as single production lines), achieving a global optimization from strategic goals to execution, from individual departments to the entire system's linkage, and forming a dynamic cycle mechanism that enables various management methods to organically permeate and work in synergy.

As an integrated management solution, the effectiveness of this system has been fully verified through empirical applications. Taking the practical data of a case enterprise as an example, after implementing this system, the average repair cycle of its products was significantly shortened by nearly 20%, which directly reflects the substantial improvement in process flow efficiency and the effective compression of non-value-added time; the product qualification rate increased by 8 percentage points, demonstrating the substantial enhancement of process stability and quality control capabilities; more importantly, production capacity increased by 34%, comprehensively reflecting the overall optimization of key elements such as equipment utilization, personnel efficiency, and production rhythm. These quantifiable achievements not only visually guarantee the delivery cycle and quality reliability of products but also bring direct economic benefits and competitive advantages to the enterprise. The internal mechanism of action lies in that this system, through the standardization and solidification of processes, transforms occasional, experience-dependent excellent practices into stable and

replicable organizational capabilities; at the same time, through performance evaluation and continuous improvement links, it establishes a long-term self-optimization mechanism, enabling the enterprise to continuously adapt to internal and external changes and continuously explore new potential for efficiency.

In conclusion, the process management system based on lean thinking is essentially a virtuous cycle system with process optimization as its core engine, effectively integrating various management tools, stimulating organizational vitality, and driving continuous performance improvement. It successfully compensates for the inherent deficiencies of traditional single management methods in terms of systematicness and integration, providing enterprises with a feasible path from extensive management to lean operation. Future research can further explore the adaptive adjustments of this system in different industries and manufacturing enterprises of different scales, as well as its new development models after deep integration with intelligent technologies such as industrial internet and big data analysis, thereby continuously enriching the theoretical and practical connotations of lean management.

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