Research on the Five-stage Method for Chinese Enterprises to Implement Lean Production

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Abstract: Since 1980s, more and more enterprises in Chinese Mainland have deployed lean production in consideration of its great success in other countries, but only a few of them became successful examples of lean production in Chinese Mainland. Although there are many reasons for the failure, the paper finds that the wrong doings of Chinese enterprises in implementing lean production is one of the main reasons; typically many of them want to build a Rome in a day. The paper proposes a five-stage method for Chinese enterprises to carry out lean production step by step including the tools configured for each stage. We hope the method will assist enterprises in Chinese mainland in deploying lean production successfully.

Key Words: Chinese enterprises, Lean Production, Five-stage Method, Tools Configuration

I. INTRODUCTION TO LEAN PRODUCTION

A. The Definition of Lean Production

Toyota Production System (TPS) was spread overseas to America and Europe in view of its great success in Japan. Many foreign researchers study it with enthusiasm, especially a research team initiated by Massachusetts Institute of Technology got significant achievement, and the members of the team professor James P. Womack and consultant Daniel T. Jones first put forward the term "Lean Production" or "Lean Manufacturing" after spent years analyzing the success of Japanese companies especially Toyota after World War II and summarizing their learning in a book called "Lean Thinking" published in 1989, and lean production (hereinafter to be referred as LP) began to spread all over the world from then on.

On one side, we can say that lean is a set of tools such as 5S, value stream mapping and total production maintenance assist in identifying and eliminating wastes continuously. As waste is eliminated, product quality improves while production time and costs are reduced. On the other side, the managerial aspect of lean is just as important as or even more important than production tools or methodologies. So we define lean production as a business environment where waste is identified continuously and eliminated passionately to realize zero waste and produce products without defects, which means the change of culture.

B. Lean Production in Chinese Mainland

First Automobile Works (FAW), a famous large-sized state-owned enterprise, dispatched a delegacy that had forty members to visit Toyota in Japan at the beginning of 1980s and learnt there for half a year; subsequently it first introduced Toyota Production System in China, and got some positive results. For example, the Chassis Branch of FAW reduced its work-in-process by 70% by deploying LP. Since then, more and more Chinese enterprises began to introduce LP, but few of them can implement LP as well as that in Toyota, even if a few of them have gotten certain effects, most of them haven't realized their original targets as expected, even FAW-Toyota don't think it has succeeded in LP.

II. THE WRONG THINKING AND DOING OF CHINESE ENTERPRISES IN DEPLOYING LEAN PRODUCTION

In order to find out the true reasons for the failure of LP in china, we have investigated in more than twenty enterprises that ever implemented LP for two years and find that there are various reasons for their failure, for example, some of them lack the basis to deploy LP such as industrial engineering and automation, but we also discovered some wrong thinking and doing commonly made in deploying LP as follows, which we believe are main obstacles for many enterprises that implement lean tools without sustained benefit and finally make lean production a flash in the organization.

A. Start at Tool Level without Combination with Business Strategy

Most enterprises start at the tool level, with no combination to business strategy and more seriously some employees don't know their business strategy at all including some leaders (see Figure. 1), not to speak of combining LP with it, which result that employees simply consider lean production as a set of tools such as 5S, total production maintenance, continuous flow manufacturing, setup reduction and error-proofing, if they failed in one tool, they thought it didn't suitable for them and pursue other new tools but neglect the philosophy of lean that can teach employees to develop good working habits and improve personal quality through continuous improvement. In fact, the later is much more important than the former and is actually essential for enterprises to deploy lean production successfully.

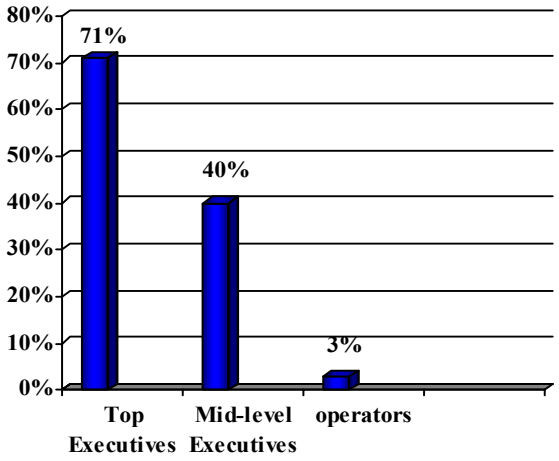

FIGURE 1. PERCENTAGE OF PEOPLE WHO UNDERSTAND THE BUSINESS STRATEGY

B. Hope to Build Rome in a Day

Many enterprises hope to build Rome in a day, once they can't get quick effect instantly after introducing lean production, they are suspicious of its prospect and give up. Rome can't be built in a day, the transformation of management model results from long-term aggregation of management basis and experiences. Toyota had even spent almost forty years to establish TPS, together with we began to research on management late on relatively weak foundation, so the aggregation process is absolutely necessary although we can shorten it by our efforts.

C. Indiscriminately Imitate and Copy Practices of Others

During investigation, we found some enterprises thought they would get desirable effect by applying lean methods such as Kanban, standardized work and just in time (JIT), but the fact is not so simple, so they believed that lean production is only suitable for advanced countries with modern equipments such as USA and Japan and not fit for the situation in China. Lean is the close combination of management philosophy and methods, so we can't succeed by imitating and copying practices of others indiscriminately, it must be combined with local culture.

III. FIVE-STAGE METHOD FOR CHINESE ENTERPRSIES TO DEPLOY LEAN PRODUCTION

According to the detailed investigation performed, we propose a five-stage method for Chinese enterprises to deploy LP step by step, prevent them from take stopgap measures and assist them to make steady progress.

A. The Meaning of Five-stage Method

Just as its name implies, five-stage method means an enterprise deploys LP by five stages including comprehensive survey phase, stability phase, continuous flow phase, standardized work phase and pull production phase. The object of putting forward the method is to solve the problems in operational level as mentioned above, and exert a subtle influence on management concept and work habits in the long term.

B. Five Stages

Stage 1: Make a Comprehensive Survey

In this phase, we should make a comprehensive survey on the situation of our enterprise including our business environment, develop strategic plan for lean deployment, choose a production line to implement LP, determine implementation time, performance measures we want to improve on this product-line and the resources we are willing to put into this change.

Stage 2: Stability Phase

In this phase, our objective is to increase corporate image and employees' morale by improving the environment of worksite as well as office area and establish stable workplace that has the ability of providing high quality products and performing consistent production.

Stage 3: Continuous Flow Phase

In this phase, our objective is to realize continuous flow manufacturing (namely, processes flow smoothly through all operations without stopping) and consequently to eliminate wastes such as inventory and waiting to improve production efficiency.

Stage 4: Standardized Work Phase

In this phase, our objective is to realize standardized activity and reduce the changeability of production process, and hereby to improve corporate image and employees' morale further.

Stage 5: Pull Production Phase

In this phase, material is replenished by upstream process at right place, right time and in right quantity, and we really can manufacture products according to customers' demand.

C. Tools Configuration and Sponsor for Each Stage

We configure lean tools for each stage for Chinese enterprises to implement lean production step by step and realize their objectives. In order to make sure the tools for each stage can be performed efficiently and professionally we also suggest sponsors for lean tools with sufficient organizational power or influence to initiate resource commitment and reinforce the change at all levels, authorize, legitimize and demonstrate ownership for the change, help remove hurdles, achieve effective vertical communication and present the needs to the management for approval (see Table Ⅰ).

- Value stream mapping can create a high-level look at total efficiency by visually showing three flows - material flow, product flow and information flow, which helps us understand where we are (current state map), the problems we confront with, where we want to go (future state map), and map a route to get there (see Figure 2, the bursts in the figure signify the points need improvement).

TABLE Ⅰ TOOLS CONFIGURATION AND SPONSOR FOR EACH STAGE

Stage	Tools	Sponsor
Stage 1: Make a comprehensive survey	Value stream mapping	Plant manager
Stage 2: Stability phase	5S Error proofing	HR manager Quality manager
Stage 3: Continuous flow phase	Setup reduction Total production maintenance Continuous flow manufacturing	Mfg. Eng. manager Maintenance manager Production manager
Stage 4: Standardized work phase	Standard work	Production manager
Stage 5: Pull production phase	Pull system (Production Kanban) Pull system (Supplier Kanban)	Production control manager Purchasing manager

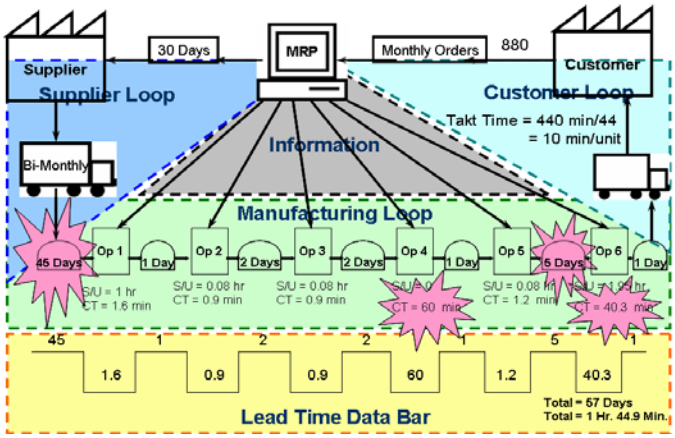

FIGURE 2. EXAMPLE OF CURRENT STATE MAP

- 5S is the basis for lean production and the foundation for a disciplined approach to the work site including 5 steps to shape up workplace: Sort (seiri), straighten (seito), shine (Seiso), standardize (seiketsu) and sustain (shitsuke), which is the basis for TPM.
- Error proofing is a systematic approach for anticipating and detecting potential defects and preventing them from occurring to achieve zero defect products.
- Setup reduction is a set of activities to prepare for the next part of a project that improves equipment availability and total capacity.
- Total production maintenance (TPM) is a methodology which ensures rapid and continuous improvement in manufacturing by eliminating equipment breakdown losses, speed losses and losses due to poor project quality.
- Continuous flow manufacturing is defined as a mode of production, in which movement of material from value-added process to value-added process without transport time or storage in buffers that depends on the interactions of men, machines, material and methods to shorten production time and realize continuous improvement.
- Standardized work is the optimum combination of operators, machines and materials to ensure that a task is completed the same way every time with minimum waste.
- Pull system make what customers need when it is needed in the quantity needed.

IV. ESSENTIAL ELEMENTS FOR CHINESE ENTERPRISES TO DEPLOY LEAN PRODUCTION SUCCESSFULLY

The five-stage method we propose for Chinese enterprises to deploy lean production just provide a step-by-step way; whether it can succeed or not depends on if we can change our extensive operation culture to lean. We suggest essential elements for Chinese enterprises to form a lean environment and culture, which are essential for Chinese enterprises to deploy lean production successfully according to the method we propose.

A. Visible Support and Involvement from Management in Different Level

Chinese people like to follow their leaders, so management in different level should provide complete, real and visible support for lean production. Firstly, top management commitment is necessary for sustaining the program. This could be done in different ways such as visiting lean production areas, conduct LP audits, present awards for significant achievement and other ways to get involved on a regular basis. Secondly, the involvement from management in different level is also important for deploying LP because they can set good examples with their own conduct for employees.

B. All-staff Involvement and Change in Work Habits

All-staff involvement is critical for an enterprise to successfully implement lean production. Moreover, employees' work habits will influence their behavior and behavior determines success or failure, so we must change employees' work habits to comply with lean standards: employees should conduct "continuous improvement" events, document results in one-point lessons and complete daily check to engage in lean production passionately, which help build pride.

C. Thinking Lean and Combining with Chinese Culture

Thinking lean means we should keep firmly in our mind that we only do those things that create or add value, for which customer is willing to pay and all other activities are waste. Moreover, when deploying lean production, we should break traditional concepts, overcome misunderstanding and combine it with the situation and culture in China, because Chinese is unique in the world different from Japanese and Americans in characteristics and working environments. For example, Chinese are extremely clever, but some times they play petty tricks on their work, which disobey standardized working procedure.

D. Record and Report Lean Production Activities for Knowledge Management

We should learn from past success and failure, when implementing lean production program, take 'before' and 'after' photos, document the results using standard form to create a summary report, submit the summary report to the team leader of lean production committee, publicize and review it by internal media to find out possible best practices for knowledge management to share and begin sustaining lean production in another area of same plant or other plants.

E. Long-term commitment to lean production for continuous improvements

Lean production can not accomplish in one action, it is an endless journey, so start by doing it as a long-term commitment and not as a task to realize continuous improvements. We should implement LP in accordance with famous PDCA cycle, which will make lean as a culture and a way of life.

V. CONCLUSION

Lean production will benefit an enterprise greatly if it is implemented correctly, especially in the current situation of financial crisis. The paper suggests a practical method for Chinese enterprises to implement LP tools gradually and systematically, in another word, it provides a procedure for enterprises to follow up for their success in LP. The authors hope to help enterprises in Chinese Mainland implement LP by the five-stage method we propose and establish lean culture where lean is a learned habit via the proposals in the paper, but changing previous habits and establishing a culture are both long-term assignments that need the efforts of all employees, so the road to realize lean is still long and we have a long way to go.

REFERENCES

[1] Womack, James P., Jones, Daniel T., and Roos, Daniel, The Machine That Changed the World, 1991.

[2] "Automotive News calls Toyota world No 1 car maker". Reuters.com. Retrieved on 19 April, 2008.

[3] Andrew Scotchmer, lean production Kaizen in 90 Minutes, Management Books 2000 Ltd, Gloucestershire , England, Feb. 2008

[4] Li Qingyuan, Efficient Instrument for Improving Production Management: lean production and TPM, Peking University Press, Peking, PRC, June 2003 (in Chinese)

[5] Li Jingyuan, Worksite Management Practices in Modern Enterprises, China Economics Publishing House, Peking, PRC, 2004 (in Chinese)

[6] Imai, Masaaki, Kaizen: The Key to Japan's Competitive Success, McGraw-Hill/Irwin, Nov. 1986.

[7] Chen Lixia, Meng Bo, How to Make 5S as a Culture in Chinese Enterprises, ICIII08, 163-166, 2008.