

ELIMINATION OF LOSSES USED LEAN MANUFACTURING TECHNIQUES AND KAIZEN PHILOSOPHY

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***Abstract:** Lean manufacturing is today one of the most successful production strategies for improving competitiveness. To achieve success, a healthy production system based on solid concepts and philosophies is also required. Thus, it has been decided to adopt and accelerate the Lean Manufacturing concept on every site. The Kaizen or "Continuous Improvement by Involving All" method is a teamwork methodology used to systematically solve problems and apply improvement solutions.*

Keywords: quality, LEAN manufacturing, KAIZEN philosophy

Introduction

After the Second World War, Japanese manufacturers, especially in the automotive industry, faced the problem of lack of materials, financial resources and human resources. Eiji Toyoda and Taiichi Ohno from Toyota Motor Company in Japan have been the pioneers of the production concept of the Toyota Production System, or what is known today in the United States as "Lean Manufacturing".

The basic idea behind the system is to eliminate losses (through Muda Hunting or Hunt for Loss). Muda is the name for everything that does not add value to the finished product from the client's perspective.

Lean is based on the philosophy, concepts and instruments of the Toyota Production System (TPS), but it all began in 1913 with Henry Ford and his line-up of the famous T model. Lean's main goal is to support manufacturers who want to improve their company processes to become more competitive on the market by implementing various Lean production tools and techniques. [1]

Following the rapid success of the manufacturing process in Japan, other companies and industries, especially in the United States, have taken on this remarkable system. The term "Lean" defined by Womack and Jones in 1994 is a system that uses less, in terms of all inputs and resources, to create the same outputs as those provided by a traditional mass production system, while contributing and increasing variety for the end customer. Lean means producing only what the customer needs, when needed, in quantities ordered by the customer and only with the minimum resources. More specifically, the manufacture of the products is done in a way that minimizes the time needed to deliver finished products, the amount of work required and the space required for storage, but everything done at the highest quality and usually at the lowest cost by eliminating those seven losses. [2]

Methods and tools used in Lean manufacturing to eliminate losses and improve processes

The basic methods are:

- Organization by 5S method,
- Visual Management,
- Standardization of production activity,
- Continuous Improvement - Continuous Improvement,
- Teamwork - (Team work, Workshop or Gemba kaizen).

Absolutely everything is possible to implement in all business activities, with low costs and immediate effects.

Following internal audits, Valeo 5000 and ISO-TS Certification, the Valeo Maintenance Department, has been downgraded by up to 10 points due to the large number of stops, micro stops, low production cycle cadence, or production line operation degraded way but also the poor organization of maintenance departments and not only from Valeo sites. The main causes identified were:

The level of rapid response to emerging issues is not sufficiently implemented and developed. Preventive maintenance is not sufficiently standardized, implemented or administered properly.

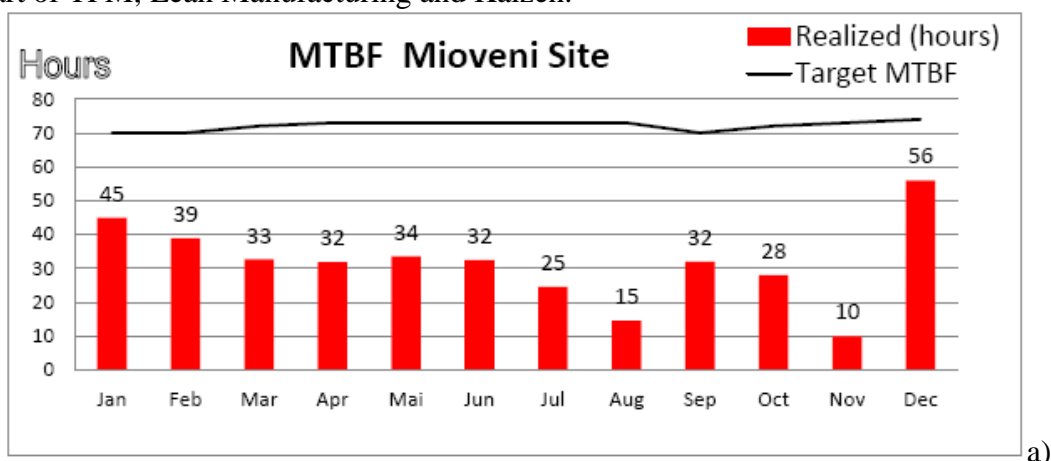
The root cause is not identified and eradicated, not even recurrent problems.

Maintenance teams are like firefighters, repair quickly, but without analyzing the problems in detail and without identifying a real cause of the problem - the root cause, not to mention the root causes of the adjacent ones.

Manufacturing operators have not at all acquired the sense of ownership of the equipment used.

The level of management focus on the Maintenance Department is insufficient.

Figure 1 (a), b) and c) shows the charts with the evolution of maintenance indicators before the start of TPM, Lean Manufacturing and Kaizen.



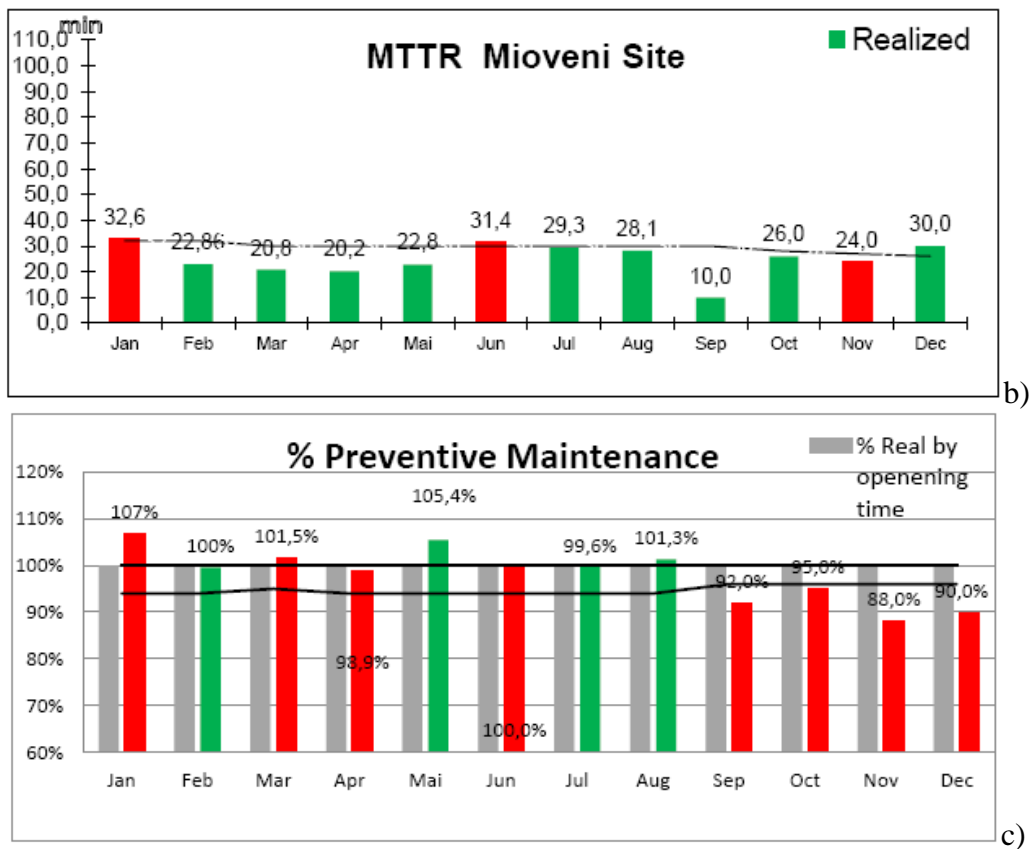


Figure 1. Pre-maintenance indicators.

Thus, targets for each site were set, improving the efficiency of each plant by implementing the TPM - Total Productive Maintenance concept and implicitly improving the maintenance work carried out on each site. These objectives are presented in Table 1.

Table 1 - The Target of the Group

Key Points	Objective
Logistics organization between Valeo Service and the production branches of the group	Service rate of 100%
Optimize asset transfer inside Valeo Group	
Organization and missions of centers of expertise	Creating a single expertise center per each specialization
Elimination of end-of-life risks of matter raw stocks	Reducing stocks by half raw material to avoid their depreciation
Improving the effectiveness of group sites: TPM & Maintenance	<4% of TRP for stops and micro stops
Reduce the time allocated for problems administratively by the production staff	<5% of the time assigned by the supervisors production lines for problems administrative.
Total labeling of the logistics area	No customer incidents due wrong labeling in the logistics area a materials and components

To achieve success, a healthy production system based on solid concepts and philosophies is also required. Thus, it has been decided to adopt and accelerate the Lean Manufacturing concept on every site.

KAIZEN™ philosophy - an integral part of the ERIM tool

As mentioned above, much of the ERIM concept is based on the Lean Manufacturing culture and implicitly the Kaizen concept.

The Kaizen or "Continuous Improvement by Involving All" method is a teamwork methodology used to systematically solve problems and apply improvement solutions. It is assumed that no process can ever be declared perfect, but can always be improved. Kaizen in practice means that all team members in all parts of the organization are constantly looking for ways to improve operations, and employees at every level of the company are undergoing this improvement process [4].

Advanced methods such as Total Productive Maintenance (TPM), the Just In Time (JIT) system with the introduction of PULL Systems and Kanban cards require a step-by-step approach, but especially with a well-trained staff.

Regardless of the evolution of a company, any manager wants to improve the efficiency of the team and also the results to be better every day. However, problems arise when there are no budgets for team or project development or to support the implementation of success ideas. However, there are many powerful management styles that solve budget problems, and one of the best known and appreciated is Kaizen, a method that has also begun to be used by businesspeople in Romania.

To be effective, the Kaizen method is not one that is implemented once at a certain time, but it is a daily activity. The most important rules of the method include making changes, monitoring results and adjusting them. All these, with the help of small experiments that are quickly and effortlessly adapted. [2]

The concept rejects static periods in which companies do not go through changes and support innovation in any shape and size at any point or level. The problem many companies face is the fact that innovation is a strong but very short duration, so very high costs can occur, the changes being spectacular, directly proportional to the assumed risks that come with the changes.

The Kaizen concept requires practical approaches, small changes, but often also a continuous process that will have medium to long-term results. Thus, the costs will be reduced as well as the risks, and if the changes do not prove to be successful, managers can return to their old solutions without additional costs.

KAIZEN™ - continuous improvement, based on the following solid principles:

- Improvement is not done once at a time, but is a daily, continuous process.
- Change is not major, but work on the pieces.
- It has a minimalist side: you do not work for the sake of work, but identify, reduce and eliminate "MUDA" in translation: everything that does not add value.
- Encourages experimentation. Make changes, observe the results and modify as appropriate.
- Problems are received with open arms, these being growth opportunities. You really want to find, report and solve problems.
- Correct processes lead to good results.

- Identifies the company's current situation.
- Talk with data, conduct facts.
- Act to identify and correct the root causes of problems.
- He works like a team.
- KAIZEN™ is everyone's attention.

Post-implementation findings

Following the approach and implementation of the TPM, 5S and KAIZEN concepts, the evolution of indicators, especially those of maintenance, was an upward and positive one. Implementation activity has been seriously treated at all levels of management and execution, and the results have not been delayed in a relatively short time.

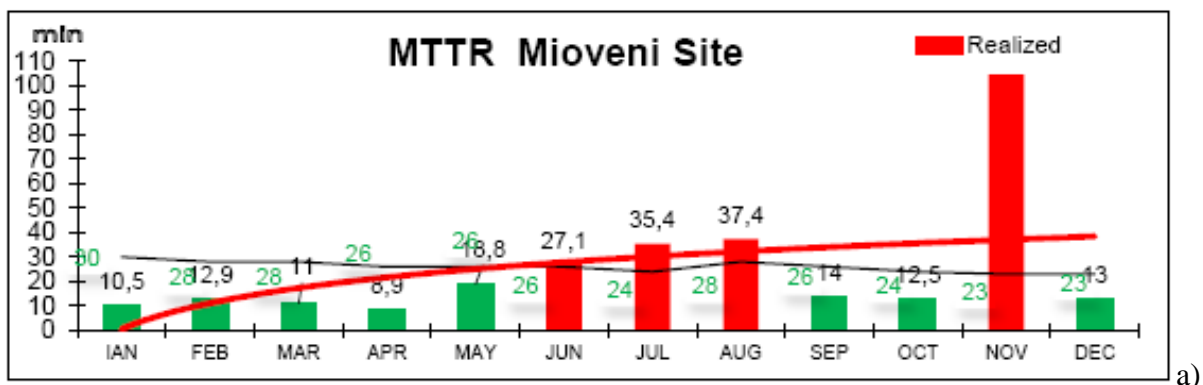
Thus, a number of losses have been identified and eradicated in the Maintenance Department, such as:

- Excessive stocks of spare parts for some equipment.
- Lack of spare parts for a number of equipment.
- Lost time in preventive, but mostly corrective maintenance activities, due to the lack of a 5S standard and a reaction standard.
- Corrective interventions performed quickly and without analyzing the real cause of the defect, which attracts the recurrence of the untreated problems.
- Non-up-to-date preventive maintenance instructions, which entails a chaotic activity from both maintenance and maintenance engineers for Level 1 and Level 2 maintenance.

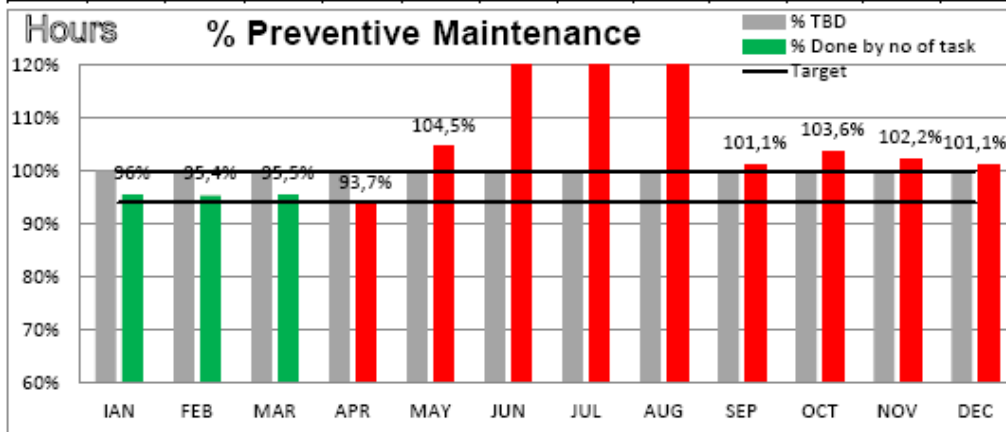
All these have been eliminated or in some cases minimized by the measures adopted in the TPM and Kazien implementation.

Evolution of maintenance indicators from the start of the TPM - ERIM yard until the end of the first year.

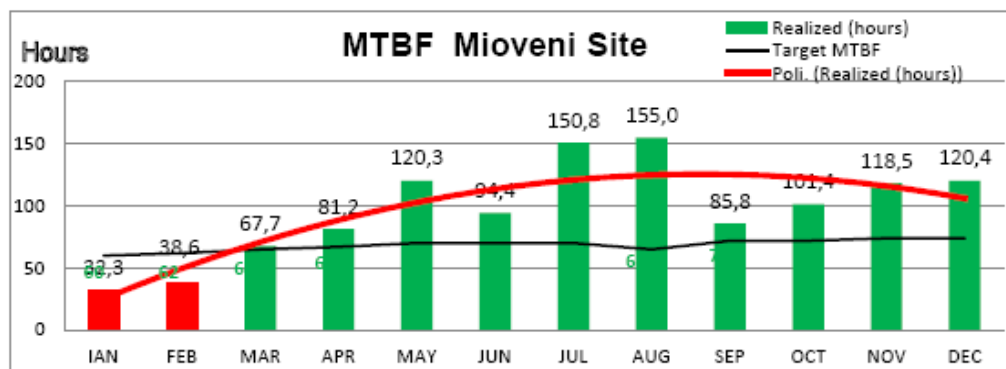
Figure 2 shows the evolution of the indicators.



Real vs. Plan	IAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Task-un planif	257	209	99	208	208	220	208	420	188	220	230	270
Task-un realiz	246	199	95	195	217	308	420	520	190	228	235	273



b)



c)

Figure 2. Evolution of MTTR and MTBF indicators.

Final conclusion

The implementation of a production system based on the Kaizen philosophy, the Lean Manufacturing concept, the adoption of the TPM system and, above all, the pursuit of the maintenance and improvement of the actions implemented in the Valeo Mioveni site, resulted in the improvement of the intervention times for defects, the drastic reduction of their number, reducing the recurrence of the same defect several times on the same machine.

All this was reflected in the evolution of the maintenance indicators presented above, both before the start of Lean actions and after.

Following one of KAIZEN's estimates - "Free on Continuous Improvement" - it can be said that the result of the actions was beyond expectations.

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