

Deployment of Kaizen in the Framework of the Implementation of Lean Production in Passenger Transportation Company

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Abstract — Based on the analysis of the internal environment of the passenger company, factors that hinder the involvement of staff in the process of introducing lean production are highlighted. To neutralize these factors, “Kaizen implementation teams” have been created in accordance with the developed scheme for selecting employees into teams. Formation of kaizen teams requires a new structure to ensure the competence of company employees. For this purpose, three levels of personnel training have been developed depending on the target group. The kaizen-proposal system is one of the key points in the implementation of the kaizen technology in practice when introducing lean manufacturing. Kaizen-proposals are classified by categories and by the presence of economic effect. Responsibility for organizing work with kaizen ideas of employees and conducting kaizen blitz in a single unit is distributed. Criteria for evaluating the effectiveness at different stages of organizing work with kaizen-proposals have been developed. It is shown that the kaizen proposal supply system is aimed at involving staff in the ongoing improvement process.

Keywords — *lean manufacturing, Kaizen, kaizen proposals, kaizen blitz*

I. INTRODUCTION

The vast majority of successful companies in the world use the system of lean production, built on the basis of the best experience of leading companies, as a tool to improve the efficiency of production processes, [1]. In accordance with the concept of lean manufacturing, all activities of an enterprise can be classified into operations and processes that add value to the consumer, and operations and processes that do not add value. Therefore, anything that does not add value to the consumer is classified as a loss, and should be eliminated [2]. The advantage of lean manufacturing is the high level of organization of processes, which allows completely avoiding unnecessary costs and successfully compete in the conditions of the modern market. How to organize work in the company to use all the advantages of lean manufacturing? The basis of lean manufacturing is the kaizen methodology [3]. Kaizen is a constant commitment to excellence in everything, in all areas of activity and in all processes. The Kaizen approach implies an awareness of existing problems, a search for the slightest opportunity for improvement, a constant analysis of what has

been accomplished, a search for growth opportunities, and continuous learning [4].

For many companies, lean manufacturing is becoming a sign of industry leadership. The development of the kaizen system in the East-Siberian branch of the passenger JSC company “FPC” as a factor in the successful implementation of lean manufacturing is considered. It is necessary to develop the main activities in the framework of the introduction of kaizen system. The basis of the kaizen system consists of five key elements [5].

The first element is teamwork. All employees must work as a team to achieve a common goal and the desired improvement in work. Teamwork involves the constant exchange of information, mutual learning and the timely performance of their duties.

The second element is personal discipline. Kaizen demands that each employee improves their self-discipline in all areas of their activities.

The third element is the moral state. Regardless of whether the company succeeds in implementing the changes or not, staff should strive to maintain high morale. Top management should introduce into the practice of work various motivational tools, such as good working conditions, accounting for merit, a system of rewards and rewards.

The fourth element is holding a kaizen blitz. Kaizen-blitz involves training employees in the practice of lean manufacturing in the workplace, expanding their competencies, developing activities to achieve results with the help of lean manufacturing tools in the selected work area.

The fifth element is suggestions for improvement. It is necessary to give employees the opportunity to freely offer improvements regardless of their position.

II. FORMATION AND TRAINING OF KAIZEN-TEAMS. PREVENTING PERSONNEL RESISTANCE

Having collected and analyzed information about the internal environment of the unit, factors that hinder staff involvement in the process of introducing lean production were highlighted:

- prevalence of group resistance to change;
- prevalence of the passive form of resistance;
- pronounced hierarchy of the management system;
- conservatism of the industry;
- team cohesion (low turnover and the influence of the “culture of power”);
- lack of support for the transformation process by the personnel service.

To neutralize these factors, the first “kaizen team” was created - the implementation team, consisting of employees of JSC FPC with different status positions. The latter is important because the hierarchical structure of the company and the predominance of the “culture of power” leave their mark on the employees' perception of status, and the different status provides influence on the centers of power in various groups [6]. A group of workers can be influenced either by an authoritative worker or by a direct manager. The group of managers of the unit may be influenced by the higher management (it will not influence the agents of the implementation with the status of a worker, even a very authoritative one). The group of heads of departments can be influenced only by those who are of higher status.

Considering the high dynamics of the external environment and the personnel's resistance to changes in the company, it was determined that the number of such “primary implementation specialists” is about two people per fifty employees.

It is necessary that the kaizen team has a number of personal and professional qualities that contribute to the task. Their competency profile includes such requirements as developed communication skills, leadership skills, flexibility, the desire for self-development, social adaptability and diligence, possession of authority in their team [7].

The scheme for the selection of employees in the group “Kaizen-team implementation”:

1. According to the results of the expert assessment (sociological survey), those who enjoy great prestige in the department (professionals who are able to solve complex non-standard problems and enjoy the trust of the team) are selected.

2. Consideration of experience, age, experience and differences in status - so that the group turns out to be heterogeneous.

3. Selection of employees of the department and the company as a whole, most relevant to the competence profile of the “Kaizen-team implementation”. Motivation (whether they want to participate, how they relate to changes in the company) was also considered.

For lean manufacturing, the involvement of staff in active work to improve efficiency is more important than for any other system [8].

After the formation of kaizen teams, they should be trained and involved in the implementation process in the company.

The Kaizen Team Training Plan for the Conductor Reserve Division:

1. Meeting with the head of the carriage depot. It is motivational in nature, provides information “first-hand”, which reduces the distortion of the essence of the goals and objectives of the implementation. At the meeting, the powers and duties of the “kaizen team” are indicated both on their own positions and in the company as a whole.

2. Training of “key figures” by specialists of the quality sector with necessary and sufficient knowledge of lean manufacturing (seminars, trainings).

3. Training in basic self-study skills for employees of the reserve staff.

4. Involvement in the implementation process. The members of the “kaizen team” of the reserve training department continue to work at their workplaces, perform their functional duties, but are involved in the implementation of changes at all stages. They can act as consultants, mentors, participate in planning meetings, popularize and promote changes in the team, etc. The plan of activities for them is the quality sector in the opinion of their CEO.

5. Members of the “kaizen team” also carry out an interim control of the implementation process, conducting interviews with employees directly on the ground, identifying the causes of resistance. The data of these observations go directly to the quality sector so that the heads of the divisions of the reserve training could not correct them.

After personnel training and as the kaizen system develops, it is planned to form other types of kaizen teams in the reserve department, such as:

- Permanent teams - these teams work every day. The teams include specialists (workers, employees) who perform work in the field.
- Problem Solving Teams — formed to find solutions to a specific problem at work. The team consists of members from several permanent teams. The total number of participants in such a team is, as a rule, from six to eight people. After making a decision, the team disbanded.
- Cross-functional teams - formed to evaluate existing processes of the organization and search for opportunities for their improvement. The teams include ordinary specialists and managers from various departments.
- Solution implementation teams — formed to implement the developed process improvements. These teams consist of members of permanent teams, teams to solve problems.
- Small groups - formed for the development, implementation and application of specific or new processes. The teams include low-level specialists (workers, performers) and heads of divisions from permanent teams and teams to solve the problems encountered.

The work of teams (with the exception of permanent) is carried out during kaizen sessions. The duration of kaizen sessions is from 2 to 5 days. Each session is aimed at solving a specific task. The organization of work within the kaizen session is based on the principle of the PDCA continuous improvement cycle (plan, do, check, implement) [9].

III. CONDUCTING PERSONNEL TRAINING

Formation of kaizen teams requires a new structure of competence of the company's employees. To create it, there is a movement in two key areas: staff training and the practical implementation of the knowledge gained [10].

One of the key stages in the implementation of lean manufacturing is competent and well-organized training.

Three levels of staff training have been developed depending on the target group:

The first level is the Working School of Lean Manufacturing.

The target group for this level is all employees of the reserve department. Teaching the theory of lean manufacturing and its tools, a description of the activities is undertaken and the role of employees in their implementation is assessed.

Second level - Lean Production School [11].

The target group includes key employees of the department, heads of departments, management.

A greater amount of theoretical knowledge is given than in the "working school", a description of the plan of events held, and its possible adjustment to the proposals of the school participants. The third level is the Institute for Lean Production.

The target group includes top management, employees of the quality sector, and attracted specialists (depending on the scale).

Development of measures for implementation, analysis of the experience of independently introduced methods and examples of implementation of lean production methods by other structural divisions of JSC FPK, analysis of the experience of other organizations.

IV. IMPLEMENTATION OF THE KAIZEN PROPOSAL SYSTEM

The kaizen-proposals system is one of the key points in the implementation of the kaizen technology in practice when introducing lean manufacturing.

One of the first stages of implementing lean manufacturing technology is the creation of a kaizen-proposals program.

Kaizen is an activity with the participation of all employees of the enterprise, which consists in the continuous implementation of positive changes (improvements) in a short time and without attracting large investments [12]. Thus, a kaizen proposal is an employee idea aimed at improving current processes. The kaizen proposal system is aimed at engaging staff in a continuous improvement process. The number of proposals made by employees is considered as an important

criterion in evaluating the performance of the divisions and the company as a whole.

Ideas can be submitted by all employees of the company with the focus on improving processes in the main and auxiliary production. All submitted kaizen proposals are classified. The classification of kaizen-proposals by categories and by the presence of economic effect is used. By category, kaizen proposals are classified according to the area in which they are intended to be improved:

- increased labor productivity;
- improving occupational safety;
- reducing production costs and saving resources;
- improving the efficiency of the equipment;
- improving workplace organization and working conditions;
- improving the quality of work, products and services.

According to the economic effect:

- with an economic effect;
- without economic effect.

The developed classification is not final and can be modified and supplemented.

An employee is responsible for the organization of work with kaizen ideas of employees in a single subdivision of his head, whose main responsibilities are the overall management (planning and allocation of resources, performance of leadership functions), consideration, implementation of proposals for production. The head does not bear direct financial responsibility; however, as part of the overall assessment of his work by superiors, the indicator of Kaizen efficiency is monitored, revealing the ability to make good use of the company's internal reserves to achieve the targets [13].

The very fact of allocating on him the relevant duties implements the principle of leadership in the company.

Quality experts directly work with kaizen proposals. They carry out:

collection, registration and transfer of proposals to the authorities; entering information into the database; kaizen outfits; assistance to employees (mostly workers) in the proper design and presentation of ideas; preparation of measures for the introduction of kaizen proposals; control of the payment of premiums for them; informing the management and staff of the unit about changes in the production system; analysis of work with kaizen-proposals in the division.

Methodological work is carried out by the quality department. This work includes:

preparation of regulations, instructions, standards governing the operation of the system; the creation of training programs and training courses; analysis of the functioning of the implemented elements and their improvement; determination of system performance indicators; control, including checking the work of all participants in the kaizen system for compliance

with the requirements of the “Procedure for submission, review and implementation of kaizen proposals”.

The introduction of kaizen-proposals (the service may be small, but it is assumed that it will be formed from high-level specialists) is engaged in introducing new ideas in the enterprise, together with the department of reserve guides.

The activity on the development and implementation of proposals includes several stages [14]:

- initiation and execution of kaizen proposals;
- consideration of kaizen proposals;
- encouragement of participants;
- introduction of kaizen proposals.

A. *Initiation and execution of kaizen proposals*

The author draws up his idea of improving the production process in writing on a special Kaizen-proposal form. The narrative should contain the essence of the problem, the proposed solution and the expected effect. Use of schemes, sketches, a photo is welcomed.

The form is transferred to the quality manager, or placed in a specially installed “box for collecting kaizen-proposals”. An employee on the same day registers the idea in a special “Register of kaizen-proposals” and indicates that she belongs to one of the six categories, after which she returns the detachable part of the form to the author, which confirms that this person introduced the proposal and can track it. “Fate”.

To increase staff involvement in the process of improving production, visual information on kaizen proposals is updated on a brigade board or at the information booth of the unit on a monthly basis. The information includes two blocks: one is devoted to the dynamics and structure of kaizen-proposals, on the other - in the section “Best kaizen” - there is a material about outstanding proposals, a description of the idea with illustrations “before” and “after” implementation is given. At the information stand for the convenience of staff attached blank forms.

A proposal containing a calculation of the economic effect can also be viewed as an rationalization or cost-cutting measure. In this case, in accordance with the established procedures, other documents are drawn up (for example, this may be an “Application for rationalization proposal”, “A proposal for inclusion in the “Comprehensive plan for cost reduction””), and the employee receives a one-time additional remuneration.

B. *Reviewing Kaizen Proposals and Encouraging Members*

In order to make a decision on the prospects of the submitted ideas, a committee on introducing kaizen proposals is created by a written order of the head of the department. The composition of the committee is determined by the relevant regulatory documentation and approved by top management. Committee meetings are held at the initiative of the employee responsible for reviewing and collecting kaizen proposals as they accumulate. Following the meeting, a protocol is drawn up

in which all decisions taken on the agenda are recorded. It is conducted to control the implementation of decisions.

At the committee meeting, the registered proposals, issues related to the implementation of the decisions of previous meetings are reviewed, and the list of employees who have contributed to the implementation of the proposals is discussed and approved. This list is compiled monthly by an employee of the quality department and submitted for discussion at the commission meeting.

As a result, for each of the submitted proposals, one of three decisions is made: reject (indicating the reason); recognize promising; recognize conditionally promising (if the proposal requires clarification or additional coordination).

All information about accepted kaizen proposals for implementation is registered in a single database of proposals. This is done by a quality department employee until a predetermined date of the current month. At the same time, he submits to the department for improving the production system a decorated kaizen outfit for workers whose ideas were considered promising based on the minutes of meetings over the past month. The document confirming the formation of kaizen attire is kept in the quality department all year. This is necessary to control employee remuneration for proposals approved by management. On the basis of the documents submitted on the formation of kaizen orders, the head of the department draws up an “Order on the bonuses of the company's employees” on a monthly basis.

C. *Introduction of kaizen proposals*

The employee of the quality department draws up a schedule for the implementation of promising proposals, taking into account the importance and possibility of their implementation. Priority is given to ideas that do not require investment. The schedule is reviewed and approved at the next meeting of the committee. If the proposal cannot be implemented by the employees of the department (it is necessary to manufacture or upgrade special organizational equipment or perform certain operations), then the corresponding application is submitted to the kaizen-proposals implementation service, which has all the resources to implement the improvements. The term for introducing the proposal is not more than two months from the date of approval of the schedule, but its duration is approved by an official order of the top management.

Evaluation of the activities of participants in the kaizen-proposals system is carried out on the basis of the calculation of a number of indicators. Its purpose is to reward the initiators and determine the effectiveness of the system. The indicators “Kaizen Level” and “Kaizen Efficiency” are calculated [15]. In order to encourage the submission of kaizen proposals, remuneration is due to authorship and to facilitation of the introduction of proposals.

To promote and accelerate the effective implementation of kaizen in the department, events and information materials are being developed. Stands “Lean Production”, “Our Kaizen”, “Our Success”, “Lean Employees” are periodically drawn up.

V. CONDUCTING KAIZEN BLITZ IN THE DEPARTMENT

Kaizen-blitz is a group work method that aims to quickly eliminate an existing problem, including the elimination of losses in processes and operations. An element that distinguishes kaizen blitz from other improvement measures is the immediate implementation of improvements.

A kaizen blitz is conducted in the reserve department of conductors as follows:

1. An area is selected, the changes in which have the greatest positive effect on the employees of the unit. A specific problem is being formulated in this area. It is not necessary to cover several problems at once, it is better to hold several kaizen blitzes.

After the end of kaizen blitz, the proposed solutions to the task are subject to rapid implementation.

2. An analysis of the problem in a particular process. A map of the current state of the value stream in the process [16] is built.

3. The method of brainstorming proposals is developed to eliminate losses or implement improvements. A map of the future state of the value stream is under construction.

4. Develop an action plan and activities to achieve a future state.

5. The immediate implementation of activities. If it is impossible to immediately implement, then the kaizen blitz is divided into two parts. The date of the second part is set no later than two weeks after the first part. If deviations occur in the parameters to achieve the future state of the process or inconsistencies, corrective actions are carried out in it [17].

6. Developed the necessary documentation for the standardization of the new process.

7. The results of the kaizen blitz are communicated to senior management.

Measures to improve the production or organizational process are conducted by a pre-prepared kaizen team, which includes a leader, a branch manager, a personnel department officer, a coordinator and an expert on lean manufacturing.

The leader leads the team, coordinates the actions of the participants, supports them during the search for solutions, and promotes the implementation of a creative approach in the implementation of the program. A good leader should have a basic knowledge in the field of lean manufacturing, and be impartial about the decisions of team members. The role of a leader is given to a specialist who perfectly knows the tools and methods of lean manufacturing. The head of the department decides to conduct a kaizen blitz. He chooses the intervention zones and determines the tasks the team will work on, the coordinator says, invites outside experts (if necessary), provides the necessary support for the implementation of the activities developed by the kaizen team. A staff member participates in the selection of team members, keeps records of employees trained in lean manufacturing tools, and provides support in preparing and conducting training events. The coordinator provides communication between company management and

members of the kaizen team. It is recommended that one of the heads of the departments should carry out coordination. A lean manufacturing expert participates in the planning and preparation of blitz-kaizen, conducts the necessary training for members of the kaizen team, and proposes his ideas when developing and implementing improvement measures. He must have experience in implementing blitz-kaizen, and be knowledgeable in the use of lean manufacturing approaches and tools in order to build a quality process for implementing improvements.

For lean manufacturing, the involvement of staff in active work to increase efficiency is more important than for any other system. Organized work with kaizen proposals allows an enterprise to engage staff in a continuous improvement process and improve the performance of processes and the enterprise as a whole [18].

VI. CONCLUSION

The key to success of any modern enterprise is continuous improvement of the quality of services provided, which directly affects the efficiency and effectiveness of activities. This is especially true for large companies, such as JSC "FPC". The complexity of the implementation of lean production in the framework of the conductor reserve activity is related to the fact that the concept of lean manufacturing is primarily focused on production processes. In the production process, it is much easier to assess the main indicators of the process - such as scrap, time costs, losses, material costs and other indicators affecting the immediate value of the product. In the provision of services, such as the organization of passenger transportation, this is more difficult to do, but the first steps have been taken by the kaizen teams. In lean manufacturing, the most important thing is people and management's ability to build a system of continuous involvement and motivation of staff. The implementation of such activities as the kaizen-proposals system, kaizen-sessions allows JSC FPC to solve problems arising in production processes without the involvement of third-party specialists and with minimal costs.

Kaizen-proposals system allows the company to continuously improve its performance. This results from the fact that nobody knows the workplace better than the worker does. Only he can comprehensively describe all the problems arising in the course of his duties. It is much easier for an employee than for a manager to see what improvements his workplace, department or some of the stages of his activity may be subjected to. Often, kaizen proposals require minimal investment and effort, but they bring tangible economic effect.

Training in the field of lean manufacturing, and in particular kaizen methods, allows you to increase the staff's commitment to your enterprise, management will be able to more successfully solve problems related to the achievement of quality goals, maintain the required level of competitiveness. Conducting events such as "Lean Production School of Work" and "Lean Production School" allows you to maintain and distribute among employees the basic principles of lean production, to promote new approaches designed to support organizational strategy. As a result of introducing the kaizen system, the process of improving the quality level of the

company becomes continuous and, as a result, the level of customer satisfaction will increase. There is no limit to perfection. It is necessary to strive to be better every day, to strive to make the consumer happy.

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