

# APPLICATION OF MODERN QMS – KAIZEN MANAGEMENT SYSTEM

HELENA CIERNA, ERIKA SUJOVA

Technical University in Zvolen; Faculty of Environmental and Manufacturing Technology; Department of Manufacturing Technology and Quality Management, Zvolen, Slovak Republic

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e-mail : [helena.cierna@tuzvo.sk](mailto:helena.cierna@tuzvo.sk), [erika.sujova@tuzvo.sk](mailto:erika.sujova@tuzvo.sk)

Experience shows that with the exception of international manufacturing organizations operating in Slovakia and some national manufacturers, new trends, methods and information regarding quality management are rejected. Our goal is, with the help of the Kaizen method, to use acquired information from practice and available theoretical resources and to suggest approaches that can lead to a more flexible organization and improve results while utilizing the same resources. In this article we present an important contribution to management of change as a result of implementation of the Kaizen method in an organization. For better comparison, we analyze three manufacturing organizations operating in Slovakia. The Kaizen method is presented as a tool, with which we can solve a specific problem, achieve positive changes in all processes, on all organizational levels, in all organizations and with all employees of an organization.

## KEYWORDS

The Kaizen method, modern quality management systems, application

## 1 INTRODUCTION

The Kaizen method is not a commonly used management tool in Slovakia. This opinion stems from the fact that there are no experts in Slovakia who dedicate their work to applying the Kaizen method in practice. One can therefore assume that this is also tied to traditional thinking of companies' managements and their effort to implement changes to already established practices. Our experience shows that with the exception of international manufacturing organizations that operate in Slovakia and some national manufacturers, new trends, methods and information about quality management are rejected. The reasons for this rejection by managements of organization are similar: insufficient financial resources, not enough time to apply new methods, refusal from owners, doubt about contributions and doubt about successful real life application of the method. This fact reminded us that we need a real life example of application of the Kaizen method. This study, for comparison, analyses three manufacturing organizations. In two, the Kaizen method was successfully applied and bring expected results. In the third organization, we are using the Kaizen method to solve a specific problem, tied up finances. Through structured discussions with

employees from different levels we have an idea about perception and suggestions about how to solve an internal problem. In the conclusion we offer suggestions for improvement for analyzed organization while utilizing tools and methods of the Kaizen concept. Our suggestions can also be applied by other organization as case studies. Our goal is to show and to enforce suggested processes for problem resolution by applying the Kaizen method in manufacturing organizations. Additionally, we wanted to offer an overview of current trends and new methods used in management, their implementation and contributions that their implementation brings. We present the Kaizen method as a tool, which can resolve not only a specific problem, but can also achieve positive changes in other process, organizational level, departments, and employees.

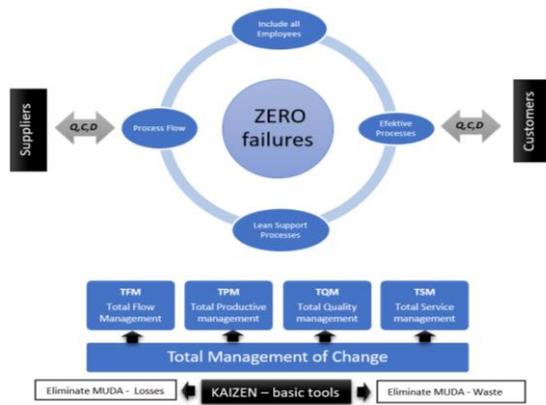
We can state that every organization that wants to be successful in a market needs to implement innovation and some modern strategies, which support growth, competitiveness, profit, and maximum market value of an organization [Nenadal 2015]. It is proven that successful companies could predict changes and could react to them in time, while they were still manageable. Masaaki Imai [Masaaki 2007] came with the idea that in the case of the Kaizen strategy it is a strategy that can face challenges of the new millennium.

## 2 MODERN QUALITY MANAGEMENT SYSTEMS

Experience and expertise of manufacturing organizations show the need for continuous improvement of systems, especially quality processes.

### 2.1 Kaizen – Basic Definition Of The Strategy

The Kaizen strategy can be defined based on terms used by several authors. However, Masaaki Imai, the founder of this strategy defines it the most appropriately. The basis of the term is very simple and clear: Kaizen means to improve and to perfect. Lecturers from the Kaizen Institute Czech and Slovak Republics refer to it as a process of change. In this study, we will also treat the Kaizen strategy as a process of change. The Kaizen strategy in itself encompasses other techniques and tools that are necessary for successful application of the strategy in an organization [Markulik 2016]. By combining all techniques and tools, we create a wholesome system - the Kaizen Management System - KMS. It is a system for longterm growth of an organization. It has four basic pillars: TFM – Total Flow Management, TPM – Total Productive Maintenance, TQM – Total Quality Management, TSM – Total Service Management, and it is tied to TCM – Total Change Management with its different thinking. The main goal of KMS is perpetual improvement from suppliers of materials and subcontracts to fulfilling client's expectations [Nenadal 2015]. The main tools are: involvement of all employees and use of their creativity, setting of all processes, zero tolerance of all mistakes and defects, effective use of equipment and technology, use of lean production systems and QCD – Quality Q, Cost C, Delivery D (Fig. 1).



**Figure 1.** Kaizen Management System (Source: created by author of the article)

The foundation for creating a wholesome system is creating awareness of waste (muda) and basic tools - Kaizen Foundations. It is primarily the 5S method, standardization, problem solving story and use of visual management [Bauer 2012].

### 3 ANALYSIS OF SITUATIONS IN PRIVATE ORGANIZATIONS

The paper is focusing on the comparison of three organizations, two of which have implemented KAIZEN method. In another - the third organization they have not established it and we have assigned areas where they can apply the Kaizen method. Through methods, tools and processes we want to point out to remedy the problem of high costs of excessive input's stocks. As a result of applying Kaizen method we assume to reduce storage input's costs and design a new system of ordering and delivering. The problem we decided to solve by creating an effective Kaizen team.

By applying an appropriate application of this method an organization can become a more flexible company and achieve better results while utilizing the same resources. Another goal will be to show contributions of application of the Kaizen method in manufacturing and management processes of an organization.

For the purpose of this study, we have selected the following organizations: ZOS Zvolen, Inc. and Nematik Slovakia, L.t.d., Ladomerska Vieska, as organizations where the Kaizen method was applied and used. The third private organization is a pulp and paper manufacturer from central Slovakia, where the Kaizen method is not used to manage processes or to improve quality.

#### 3.1 Introduction Of ZOS Zvolen

ZOS Zvolen, Inc. is one of the most modern organization in Slovakia whose focus is repair of train locomotives. Repair of train vehicles has in this company more than a 140 year old tradition. In 2008, the company joined the ZOS Trnava Group. The company categorizes its area of expertise into repair of train vehicles, which encompasses a wide range of motor locomotives and motor vehicles, passenger trains according to client's needs and train undercarriages. The company's vision is to become a leading central European company in repair and

modernization of train cars, production of locomotives and additional equipment. They wish to create under the brand of ZOS Zvolen, Inc. a renown, lively and productive organization with qualified employees, progressing repair, assembly and manufacturing potential and specialized mechanical technology [ZOS 2014].

#### 3.1.1 Analysis Of Critical Processes In Zos Zvolen

Through observation of the organization and analysis of process in ZOS Zvolen, Inc., we have determined critical processes. Costs for quality in manufacturing are not individually evaluated. Only costs for no-quality are analyzed and evaluated. The goal of the Kaizen method in an organization is to determine critical factors of costs of quality.

#### 3.1.2 Cost Of No- Quality

Costs for no-quality are analyzed by a body called Management Systems, and it is also analyzed by individual business such as (LOKO and SV). Costs for no-quality are divided into the following:

- costs for internal defects (internal mistakes)
- costs for supplied defects (internal mistakes of others)
- returns to the company (external mistakes).

Analyses show that defects together with low quality work result in losses in manufacturing and affect economic results negatively. A company with the help of Management Systems regularly performs, once a month, analysis of costs for no-quality. The analysis consists of returned defects as well as statistics of reasons based on individual manufacturing changes.

ZOS Zvolen, Inc. categorizes defects the following way:

1. based on where it occurred
  - a. internal – determined by the organization
  - b. external – determined by suppliers, outside of the organization
2. based on nature of the cause
  - a. their own – defects caused by employee and individual operations of the organization and defects caused by suppliers, which cannot be returned
  - b. cause by others – defects caused by suppliers, which cannot be returned
3. based on level of damage, whether it can be repaired
  - a. repairable – these are costs for defects that can be only calculated after the repair, which was not foreseen by the technological process, if the repair is technically and economically feasible. An organization considers a repair to be economically advantageous, if the cost of the repair does not exceed the cost of manufacturing a new product
  - b. not repairable – products not suitable for the intended use and their repair is technologically impossible or economically not feasible [ZOS 2014].

#### 3.1.3 Cost Of Quality

A control department of an organization manages all costs relating to quality. This is performed on analytical accounts in accounting class 5 – Costs. Costs for quality are at ZOS Zvolen, Inc. divided into two groups. These

are costs for prevention and costs for evaluation. The amount of total costs dedicated to quality in an organization is quite high. According to available sources, in 2013 these costs accounted for 30% of total costs of the organization.

### **3.1.4 Use Of The Kaizen System In Zos Zvolen**

The organization was advised to implement the Kaizen system by using a tools, methods, and Kaizen teams. A Kaizen team is based on the premise that people who work in such a structure achieve better results than individuals in a group. One priority is to create a more efficient and more effective organization that operates based on the concept of teams. In ZOS Zvolen, Inc. follows the following steps when creating a KAIZEN team:

1. select a problem or a process suitable for improvement or elimination
2. define demands on members of the Kaizen team
3. determine a Kaizen team
4. train Kaizen team
5. Kaizen team completes their work.

Members of a Kaizen team at ZOS Zvolen, Inc. strive to achieve continuous approach while utilizing all tools (methodological guides, techniques, standards, statistical data, etc.) to solve given problems in departments they are responsible for. Members of the Kaizen team utilize the continuous approach to not only determine and analyze total costs on quality and no-quality, but also to find causes for their occurrence, they suggest counter strategies to eliminate them and to decrease their occurrence. Results of their work are presented to the company's management, which suggests measures and approves steps. Accordingly, the Kaizen team implements a new standard or a process to lower total costs, if the suggested processes are adhered to in all departments.

### **3.1.5 Results And Advantages Of Implementation Of The Kaizen Method In An Organization**

After successful implementation of the Kaizen method with the help of the Kaizen team, team members submitted to the organization's management processes and measures, which will decrease the risk of incorrect estimation and analysis of total costs on quality and no-quality. The result is implementation of monitoring of costs through the use of management information systems. By implementing the Kaizen method in an organization, the organization is able to better estimate and accurately analyze total costs of quality and no-quality, while in detail structuring costs for all departments of the organization. The Kaizen team also uncovered a problem with monitoring environmental costs. Until now, these areas were only monitored as part of total costs. It was not possible. The team suggested and accepted a system to include these costs in individual categories. In addition, improvement of the process for evaluation of quality entries from external suppliers was also implemented. Management approved a new process for quality control of materials from external suppliers. Within one year, this process helped find higher number of defects, which were immediately

returned to the supplier. The result is a 12% decrease of costs on external defects.

## **3.2 Introduction Of Nemak Slovakia**

Nemak Slovakia L.t.d., Ladomerska Vieska is a division of an international company Nemak, with headquarters in Mexico, established in 1979 in Monterrey. As a main manufacturer of high-tech aluminum components it focuses on manufacturing of cylinder heads and engine blocks, which are part of transmissions for the automotive industry. Nemak Slovakia is an established company with more than fifteen years of operation in Slovakia. From 2007, the company has been operating under the name Nemak Slovakia. The company's clients comprise of car manufacturers. Their biggest client is Kia Motors Slovakia, followed by the Volkswagen Group. Nemak is a world leader among suppliers who are not owned by car manufacturers and currently supplies globally to all known car brands [Nemak 2015].

### **3.2.1 Quality Management Tools At Nemak Slovakia**

Nemak Slovakia uses the Lean Management philosophy in its management. The philosophy is based on the Just In Time system. To achieve this philosophy, organizations utilize several tools and methods of quality management as well as improvement, such as: Benchmarking, the 5 S Method, Visual Management, Cellular Manufacturing, FMEAS, Total Productive Maintenance, Kaizen, Kanban, the PokaYoke System, and others [Nemak 2015].

### **3.2.2 Use Of The Kaizen Method**

Nemak Slovakia has been applying the Kaizen method since 2009. It applies the Kaizen methods in many areas within the organizations. The most frequently it is used in the following areas: quality, productivity, OHS (occupational health and safety) and costs.

The organizations that implemented rules are supposed to adhere to the following for specific situations:

- announce application of the Kaizen method in advance as solution for a problem that occurs, information about inclusion in a Kaizen team has to be received at least one week in advance to ensure that a member has sufficient time to familiarize his/her self with the topic
- ensure that a member of a Kaizen team is working only on tasks and goals that stem from application of the Kaizen method
- select members of a Kaizen team from among employees who are not directly affected by the problem
- possibility to clearly define downtime and time required for short repairs within the application process of the Kaizen method
- quick and effective transfer of materials necessary for application of changes, which are the goal of a Kaizen team
- goals and tasks set to solve a problem are fully accomplished
- after application of the Kaizen method, implemented changes, new processes, and advantages are explained to the rest of the employees.

### 3.2.3 Application Of The Kaizen Method For Solving A Specific Problem

Specific application of the Kaizen method in a corporation is used mainly when critical situations arise in manufacturing processes. It is used mainly to eliminate defects and products that do not meet client's requirements. In such situations an organization incurs not only financial losses, but also faces the risk that it will not be able to fulfill the client's order. The mentioned conditions form a foundation for application of the Kaizen method where the most frequently applied tools is creation of a Kaizen team. Nemak Slovakia used the Kaizen method to improve and implement a system for cooling of manufacturing equipment. The goal is to better fulfill client's requirements specified in project documentation, so that an organization is able to manufacture the required number of products without any technical problems with the manufacturing equipment. A specific process appropriate for improvement was suggested by employees from the manufacturing department. The reason for improvement was the fact that some products did not meet the client's requirements and did not fall in line with the product documentation. This process resulted not only in financial losses to the organization, but also created a risk that order for a client will not be fulfilled on time and in the required quality. As a result, management of the organization decided to solve this problem which could damage the company's reputation.

To ensure accurate preparation, we use a so called Flow Chart. It defines processes of preparation. It determines individual processes, determines order of individual processes and schematically portrays a model of preparation from its conception until its end.

Specific application of the method can be summarized into several steps:

1. Define members of the Kaizen team - depending on a situation, a team has usually between 5-7 members; selected is a so called moderator who is responsible for following the Kaizen process, for defining goals, for fulfillment of tasks and for presentation of results
2. The Kaizen process - determining the time frame of Kaizen, e.g. 4 business days. The moderator informs members of the Kaizen team about problems at hand and also explains the Kaizen method - philosophy of lean organization, individual quality management tools, waste, improvements, etc. The next step will be to define goals and adjust a Kaizen plan based on analyses. Many techniques such as brainstorming, diagrams of causes and consequences (see Pic. ), definition of improvement of the pilot project are used for these analyses. As part of the pilot project, we define necessary materials. Application of the Kaizen method as part of the pilot project takes place on a specifically determined day. Access to required material, access to the site and possibly shut down of equipment need to be ensured. Members of the team implement changes, which they have set as part of their goals. The final step of the Kaizen process is presentation of achieved goals and explanation of changes to other employees.

	RESPONSIBILITIES	PROCESS	DESCRIPTION
PREPARATION OF APPLICATION OF THE KAIZEN METHOD	Sponsors, moderators, heads of departments	Start ↓ Definition of goals of Kaizen with the help of the SMART method	2 weeks before application of Kaizen
	Sponsors, moderators, quality officer, heads of affected departments	↓ Definition of member of the Kaizen team	Depending on goals for application of Kaizen <ul style="list-style-type: none"> <li>• Operators</li> <li>• Foreman</li> <li>• Quality officer</li> <li>• Mechanic</li> <li>• Maintenance staff</li> <li>• The exact list of names for moderator</li> </ul>
	Moderator	↓ Creation of invitation and supporting documents (room, analyses, training materials, tools, etc.)	Preparation based on a list of names and focus of Kaizen
		↓ Distribution of notes to members of the Kaizen team	
	Sponsors	↓ The End	Activities to take place latest 3 days before Kaizen begins

Figure 2. Flow Chart of Preparation of Kaizen [Nemak 2015]

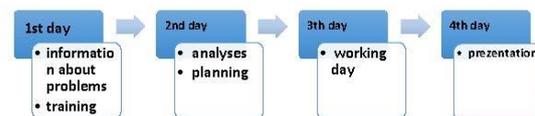


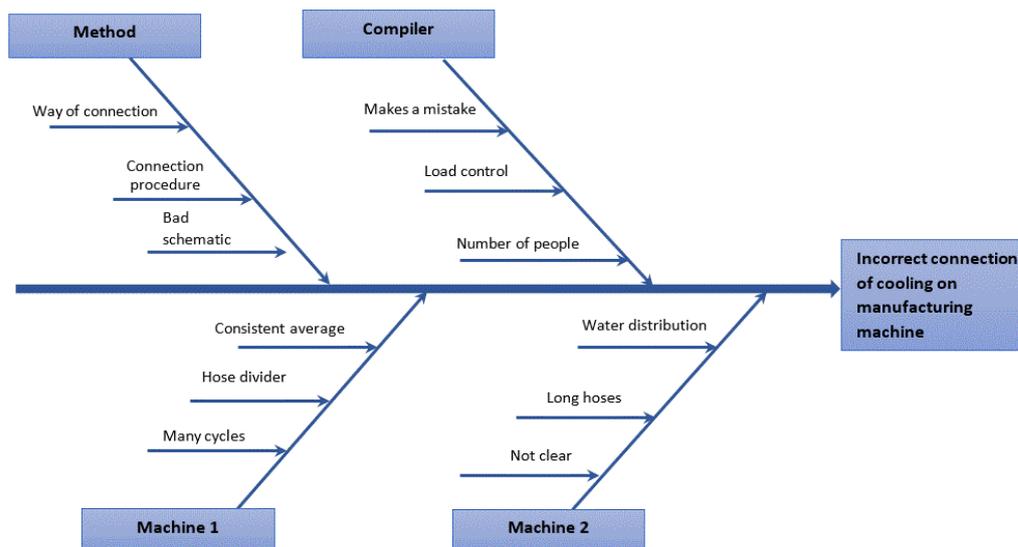
Figure 3. Process of application of the Kaizen [Nemak 2015]

3. Execution of open tasks – after a few days, management of affected departments meet with the moderator. The goal of these meetings is to prepare execution of open tasks and to determine deadlines for their resolution. At the meetings, the tasks are approved while all present have to confirm that they understand tasks that were assigned to them.
4. Follow up on execution of tasks – each task assigned to a Kaizen team is discussed with responsible and management personnel who will execute it. Completion of tasks is regularly checked during short meeting where an update of individual tasks is presented and their contribution is evaluated.
5. Evaluation and application of the Kaizen Method – approximately three months after the Kaizen team started its work, a team moderator calls a meeting with the person who assigned the team and with the manager of the affected department. Together they evaluate the state of open tasks. The moderator informs the participants about

improvements that execution of the tasks contributed. After completion of all short-term and long-term open tasks, another meeting is called to evaluate all tasks. Completion of goals is noted in the minute book of resolved tasks by application of the Kaizen method.

organization that combines manufacturing and business operations in several countries. A more than a hundred year old history of the organization serves as a premise that the organization has vast experiences in manufacturing of pulp and paper products. In the organisation Kaizen method is not applied.

Figure 4: Ishikawa diagram [Nemak 2015]



### 3.2.4 Results And Advantages Of Application Of The Kaizen Method In An Organization

Application of the Kaizen method at Nemak Slovakia resulted in resolution of long-term problems with incorrect marking and connection of manufacturing equipment. The Kaizen team suggested implementation of a new system of connecting cooling of manufacturing equipment. The Kaizen team and management agreed to implement new color coded marking of cooling hoses and tubes leading to specific manufacturing equipment. They appointed individuals responsible marking of feeding hoses and tubes. The new system of connection set a new standard for this process. The standard, among other things, includes synchronization and clarification of technical and connecting material for affected equipment. This is for specific synchronization of flows, synchronization of connecting material, hoses, and tubes. This way during an unexpected breakdown the organization can avoid losses and downtime caused by different parameters of technical and connecting materials.

Nemak Slovakia has been using the Kaizen method as a very active tool to improve efficiency of the organization and to eliminate critical situations.

### 3.3 Introduction Of A Manufacturing Organization In The Pulp And Paper Industry

A manufacturing organization operating in central Slovakia is among leaders in pulp and paper production in central and eastern Europe. It is an international

### 3.3.1 Determining A Specific Problem And Its Solution Within The Organization

A result of a discussion is discovery of a problem, which is excessive amount of stored materials, input into the manufacturing process. It was discovered that the problem lies in the fact that procurement and planning of manufacture are two very different centres, which cause excess inventory of inputs. A structured discussion revealed that another such problem is excessive manufacturing of final products. We analyzed internal sources and found that costs for excess inventory of inputs cause:

- costs for storage facilities (energy, cleaning, snow removal, security)
- maintenance costs (repairs and renovation of storage facilities)
- costs for technology (air technology, dehumidifiers, sewer, water, electrical and other connections)
- costs for internal transport (crane, transportation vehicles including repairs and check ups)
- costs for fire protection (electronic fire alarms, team of fire fighters)
- costs for environmental protection (regular check ups of building materials that they are not seeping in the grounds, repairs of insulation to prevent leaking of chemicals)
- costs for employees (salaries, taxes, OHS).

The size of individual storage facilities is between 135 to 270 m<sup>2</sup>. The organization currently uses 6 storage

facilities, which are used to store inputs for manufacturing. For storage of such inputs, the organization in 2011 renovated older production facilities to build two warehouses. We realized that at that time this was a temporary solution to a problem that has not been until now resolved. On average inventory is kept considerably long, between 1 to 3 months (from storage to delivery to manufacturing) [Industry World 2015, Research Institute 2014].

### **3.3.2 Application Of The Kaizen Method In The Organization**

The goal was to apply the Kaizen method in a specific organization. With the help of methods, tools and processes we suggest to solve the problem of high costs for storage of excess input inventory. As a result of application of the Kaizen method, we expect decrease of costs for storage of input inventory and suggest a new system of procurement and delivery of these. By suggesting such a system, the inventory department will function more dynamically to requirements from manufacturing. We decided to solve the problem in the organization by creating an effective Kaizen team. Creation of this team is actually a result of an out of sync system of procurement and planning. It also affects organization's management, since we created a system that is based on a team concept. By creating a Kaizen team, we aim to achieve a situation where people working within this team achieve better results than they would as individuals.

For effective creation of a Kaizen team, we set up six steps in the following order:

1. Select an appropriate process or problem that needs to be improved.
2. Define requirements for knowledge and experience for members of the Kaizen team.
3. Determine and create a Kaizen team.  
Select members of a Kaizen team according to the following specifications:  
Member no. 1 – procurement – specialist in procurement of material inputs for manufacturing.  
Member no. 2 – logistics – an employee responsible for internal and external transportation within the organization.  
Member no. 3 – planning of manufacturing – specialist for manufacturing processes. Determines time plans and schedules of manufacturing processes  
Member no. 4 – warehouse employee – employee from logistics who is responsible for storage facilities.  
Member no. 5 – economics – specialist for economic process in the organization. Monitors and analyses costs, is aware of investments, can forecast and plan finances and in his/her work uses management informations systems.
4. Training of the Kaizen team  
Education and development are one main condition for preparedness of the team to solve problems, which they are tasked to face. Members of the team need to learn a number of methods and techniques, which they have not previously used in their work. We prefer that training of a Kaizen team in an organization be performed by a specialist from an

external provider specializing in Kaizen. This person will be informed in advance about problems and processes that the organization needs to resolve and improve.

5. Work of the Kaizen team  
Work of the Kaizen team was set for five business days.
  1. day – introduction to Kaizen and training. The day ends with open discussion about presented materials.
  2. day – Kaizen training continues
  3. day – Analysis
  4. day – Data collection and suggestion of measures and improvements
  5. day – Presentation and drafting of standards  
Team members present their work to the organization's management. Management can have reservations about presented results, which the Kaizen team will need to address, potentially include in suggested measures. After approval of suggested processes to eliminate the problem and to improve processes by management, the Kaizen team will draft internal directives, which will serve as standards for planning processes in manufacturing, material procurement for manufacturing.
6. Completion of work of the Kaizen team  
Usually the work of the Kaizen team ends with a presentation of achieved results, as described in the process above. Experience shows that information discussion with management during the presentation was beneficial. It is appropriate that results from the Kaizen team are also publicly presented to other employees of the organization. A company bulletin, mass email with presentation are appropriate forms of communication of this information. An organization should not forget to award members of the Kaizen team if they achieved good results and achieved goals. Such award is a good way to motivate other employees to suggest ways to save and to improve efficiency in the organization.

## **4 SUGGESTIONS AND RECOMMENDATIONS FOR APPLICATION OF THE KAIZEN METHOD**

A decision to apply Kaizen has to come from a need to optimize processes in an organization, to eliminate problems, to have effective manufacturing, to decrease costs, to achieve better competitive advantage, and better market position. Improvement and perfection of processes with the use of the Kaizen method is gradual and often not visible, while its effects are noticeable long-term. We suggest that managements of organization be patient when expecting results. We suggest to instead of strictly evaluating based on results, praise effort for improvement [Alavi 2016]. Application of the Kaizen method in an organization can be successful only if the organization's management and its employee are open to change. Unsuccessful improvement efforts lead to fear of change, of risk and of results. We recommend overcoming these fears by analyzing case studies

about results of improvements, which other organizations have achieved.

#### **4.1 Suggestions For Application Of The Kaizen Method At Zos Zvolen**

ZOS Zvolen, Inc. applied the Kaizen method through Kaizen teams. A Kaizen team was created also to create a more productive and efficient organization that operated based on the concept of teams. The result of the Kaizen work were processes and measures to lower the risk of incorrect estimate and analysis of costs on quality and non-quality. Implemented was consistent system to monitor costs with the help of management information systems. It improved estimation and provided more accurate analysis of total costs for quality and non-quality in the form of detailed classification of costs for all departments of the organization. The Kaizen team also uncovered a problem of monitoring environmental costs. Recommended and accepted was a system of inclusion of such costs in specific categories. It also suggested improvement of process of evaluation of quality of inputs from external suppliers. These deficiencies formed the biggest portion of costs for non-quality. We recommend to ZOS Zvolen, Inc. to focus on the Kaizen concept focusing on teams. Kaizen in team work, as long-term approach presents groups, groups that control quality and other group activities while utilizing tools and methods of quality to solve problems. Long-term approach means that a full PDCA cycle will continuously take place, which is also applied in an organization. Activities of quality control teams and other small teams are limited to problems that affect individual departments. Activities of the Kaizen concept lead to better morale because everybody is learning to immediately solve problems. We recommend that the organization appoint one employee from the department of quality to work with groups, quality control teams. This employee would complete a specialized seminar about quality control. In the organization he/she would also fill in the position of instructor to quality control teams. For ZOS Zvolen, Inc. we recommend that teams perform their activities during their working hours. If necessary, they can also perform their activities during overtime. It is necessary to consider a form of award in case that they reach results. We presume that suggested recommendations and measures will bring the organization improvements in the form of higher quality of supplied materials, quality of processes, increased quality of employees and relationships amongst them, quality of products and satisfied customers.

#### **4.2 Recommendations For Application Of The Kaizen Method At Nemak Slovakia**

Nemak Slovakia, L.t.d. has had several experiences with using the Kaizen concept in the organization's activities. Also in this case, the organization made

use of effective problem solving of a Kaizen team. The results of their work were implemented in manufacturing processes of the organization. The problem at hand in this organization was lack of system for connecting cooling manufacturing equipment. Some products did not meet the client's requirements and did not follow project documentation. In this process, the organization incurred not only financial losses, but also faced a risk that delivery for the client might not be on time might not meet required quality. To solve this problem, the organization also used a Kaizen team, as it helps to effectively eliminate problems and leads to improvement. The Kaizen team suggested improvements in terms of connecting a new system for cooling manufacturing equipment. The Kaizen team and management agreed to implement new color coded marking of intake hoses and tubes. The new system of connection was set as a new standard for this process. A standard, among other things, incorporates compilation and clarification of technical and connecting materials for affected manufacturing equipment. It is a specific compilation of flows, compilation of the connecting material, of hoses, and tubes. This way, if an unexpected malfunction occurs, it will prevent losses and downtime cause by different parameters of the technical and connecting materials. As a result of the achieved results, we can state that the Kaizen team was solving problems dealing directly with manufacturing equipment and tools in the manufacturing process. Our recommendation for employees of the quality department is to implement their activities into Total Productive Maintenance as another effective tool of the Kaizen concept. This tool can be defined as absolute productive maintenance related to machine and equipment maintenance. The reason for application of this tool from the Kaizen concept, is the fact that Nemak Slovakia, L.t.d. is a manufacturing organization and analysis of the organization revealed problems relating to technological equipment and machines.

#### **4.3 Recommendations And Measures To Eliminate Problems And Improve Processes In The Paper And Pulp Organization**

With the help of the Kaizen team, we have solved a problem of high cost of storage of inventory of materials for manufacturing. By lowering costs of storage of these input materials we optimize all related processes. Due to effective work of the team, we discovered several MUDA – incorrect processes, which negatively affect the organization. From the analysis we can define basic kinds of MUDA, which need to be eliminated: inventory, transport, over production and unnecessary activities.

From the results of the analysis we can define three main causes for increased costs of storage of input materials:

1. Economic reasons – supplier motivates an organization to purchase higher volume of material by offering bulk discounts.

2. Due to the process of ordering and planning in manufacturing - as we have described in previous sections, we do not consider ordering of material inputs in an organization as effective.
3. Due to internal logistics – amount of inventory in the warehouse tied in costs for internal transport, which account for the highest portion of costs for storage of material inputs. We determined that overloaded warehouses make manipulation harder and longer. Often some groups of materials need to be moved around. The result of the Kaizen team’s work is that department of internal logistics is the most overburdened department in the entire process.

We suggest implementing a Just In Time system as an ideal tool for eliminating a problem. With the help of this system, we can eliminate main causes of the problem that occurred. The system is based on the principle that individual levels or productions receive the exact number of required units at a given time.

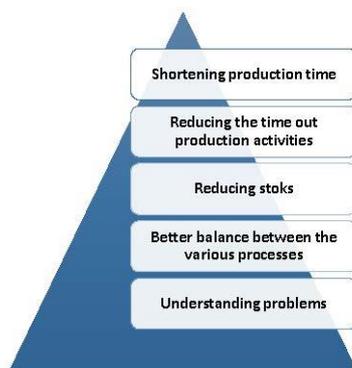


Figure 5 Advantage of the Just In Time concept (Source: created by author of this article)

Based on data from received and analyzed information, during the work of a Kaizen team we suggest to focus on eliminating above mentioned causes for costs:

- *Eliminate economic causes* – we recommend to inform suppliers about organization’s request to follow a process of delivery based on the Just In Time system.
- *We suggest that suppliers visit manufacturing operations and storage facilities of an organization.* An organization needs to provide the suppliers sufficient time to streamline their processes according to the organization’s requirements.
- *Implement a system of internal procurement within the department of inventory.* An order will include a specific number of material and time of delivery. Saved finances from internal logistics can be used according to the organization’s need to innovate. As final suggestion, we recommend for organizations to standardize achieved results with the help of appropriate forms such as via internal bulletin, which will update new processes. Only if processes that take place in the near future are performed in accordance with the new standard can we say that an improvement

occurred. We suggest that shortly after implementing the new standard management of the organization oversee strict adherence to his standard. One value of application of the Kaizen method in an organization is the fact that it forces management of an organization to determine when were existing standards last evaluated. We recommend that management of an organization evaluate, at set intervals, existing standards and tries to improve them. We achieved the following results with suggested measures of the Kaizen method (Figure 6).



Figure 6 Results of KAIZEN application

## CONCLUSION

In conclusion we would like to suggest to organizations to dedicate attention to problems. Problems need to be understood as “opportunities for improvement.” Where there are no problems there are no “opportunities for improvement.” A problem in an organization can be anything that causes problems to employees at various level, to people in other processes or to the end customer. Experience has shown that a person that creates a problem is not directly affected by this problem. We recommend that the individual not pass the problem onto another process. Specific recommendations for the analyzed companies are located the chapter 4.

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#### **CONTACTS:**

Assoc. Prof. MSc. Helena Cierna, PhD.  
Technical University in Zvolen, FEVT  
Department of Manufacturing Technology and Quality Management  
Studentska 26, 960 53 Zvolen, Slovak Republic  
Tel. +421 5026 860  
e-mail: [helena.cierna@tuzvo.sk](mailto:helena.cierna@tuzvo.sk)

MSc. Erika Sujova, PhD.  
Technical University in Zvolen, FEVT  
Department of Manufacturing Technology and Quality Management  
Studentska 26, 960 53 Zvolen, Slovak Republic  
Tel. +421 5026 877  
e-mail: [erika.sujova@tuzvo.sk](mailto:erika.sujova@tuzvo.sk)