Abstract: Kaizen is a Japanese word which is today used as an international mark for quality management. Composed by two words, “kai” which means “change” and “zen” which means “good”, kaizen translates into “continuous improvement” which describes a simple philosophy on how to improve the quality of a product or a process, by taking small steps each day to obtain the desired improvements.

Key words: kaizen, continuous improvement, quality management.

1. INTRODUCTION

Kaizen is a word that describes a Japanese philosophy, a way of life, yet since Masaaki Imai wrote “Gemba Kaizen: A Commonsense, Low-Cost Approach to Management” the term “kaizen” has become a reference in the quality management.

The great aspect on this type of quality management is that it brings considerable benefits with a minimum cost. That’s because the main strategy is to take simple tasks from the process and improve them each day, instead of investing a large amount of capital in research and innovation.

Improving the process means less losses which leads towards the final goal of kaizen: “zero losses”.

2. KAIZEN AND THE QUALITY MANAGEMENT

Although price and time delivery are also important for a business, quality must be the main target and concern of every contractor.

According to ISO 9000:2000, quality is defined as “the degree to which a set of inherent characteristics fulfills requirements”.

In order to achieve kaizen, there are certain concepts that need to be applied:

- Kaizen and management;
- Process vs. Results;
- PDCA (Plan/Do/Check/Act) and SDCA (Standardize/Do/Check/Act);
- Quality first;
- Decisions on the basis of the data;
- The following process is the client.

In the context of kaizen, the management has two responsibilities: maintenance and improvement.

The maintenance refers to taking the proper measure to ensure that the actual standards are met, while the improvement refers to always looking for better, more efficient ways, to increase the quality of the process/product.

Kaizen aims to improve the process and to do that, we need data to compare, to see where and how can the improvement be made.

These two cycles, PDCA and SDCA, relate to maintenance and improvement. The maintenance can be done by taking the four steps that PDCA propose: plan, do, check and act (fig. 1).

Once the cycle is completed, the next step is to standardize the new results.

Fig. 1. PDCA cycle

The new results need to be measured exactly so we can take the proper action to improve the process.

Kaizen is a philosophy that relies on human resource. Each product needs a series of processes to be completed (fig. 2) and that’s why we need to consider that the next process is the client so that each workplace receives the piece for the next transformation, flawless.

Fig. 2 Process scheme

The main kaizen systems that are applied in the context of kaizen are the following:

- Total Quality Management;
- Just In Time;
- Total Production Management;
- Policy Management;
- The suggestions system;
- Small groups’ activities.

Each of these systems has its well defined role in achieving the main purpose of kaizen: the continuous improvement and eliminating muda.
MUDA is the Japanese word used to describe any waste, loss or any activity that does not bring value to the final product. That’s why in kaizen, eliminating muda is one the main targets.

MUDA can be divided in several categories such as (fig. 3):
- muda of overproduction;
- muda of inventory;
- muda of repairs;
- muda of movement;
- muda of waiting;
- muda of transport;
- muda of processing.

The 5S are:
- SEIRI (sorting) - differentiation of the things in gemb as necessary or unnecessary and the elimination of those that are useless;
- SEITON (ordering) - refers to the order to be made to the articles as they are validated as necessary after SEIRI;
- SEISO (cleaning) – refers to removal of the sources of filth and dirt;
- SEIKETSU (ranking) – refers to planning of the three listed above;
- SHITSUKE (standardization) – refers to self-discipline through standardization of the four S from upstream.

The progress that they achieved after the measures they was measured by an audit and the results were a statement for implementing kaizen in every process:
- the response time to market was narrowed from 21 days to only 8;
- the production line was shortened from 90 to 30 meters;
- inventory at the line reduced from 2-3 weeks to only 4-8 ours.

For those at Electrolux, the kaizen strategy has proved to be the best solution. They continued to apply the kaizen strategy and extended from the food department to all the departments.

4. THE KAIZEN SOLUTION FOR A PROCESSING SHAFT

For processing a shaft (fig. 4), in terms of dimensions, tolerances and prescribed conditions, it will take more processing to reach the size and shape that we desire.

That why there will be needed more processes and phases of processing to reach the final shape and dimension. Each process involves a prescribed tolerance and at the same time the possibility of the occurrence of errors.
The first phase, the debiting, assumes of course, processing on a circular saw (or any other compatible kind of saw) where processing errors may occur.

The turning is another, and very important phase in which may appear faults and errors, caused by the human factor, the calibration of the machine tool, the condition and the parameters of the process, etc.

4.1 Kaizen solutions

S.1. Muda elimination

In this case calculations can be made, which can show whether certain changes in this steps can be so we can shorten the production line, the number of operations required and by default, to reduce the costs.

A solution could be for the production line to change the form from a linear one to one in the form of U, square, circular, etc, thus obtaining not only a reduction of the space but also a flexibility of the process.

Through the use of such an arrangement in the manufacture cell (fig. 5), it will decrease the muda of movement, as each post is only intended for certain processes. Muda of transport is also reduced because the transport is now done automatically via conveyor belts and industrial robots.

Muda of waiting and muda of inventory are also removed because in this way, each semifinished is automatically sent in the next post when the latter is ready for following operation.

S2. Process optimization and recalculation of parameters of work

Another solution may be optimizing process in such a way that through the use of tougher knives (fig. 6) and recalculation of the process parameters we may be able to reduce the number of passes necessary for the turning.

If for example, the turning requires three passes, we may take into account the use of loggerheads with tougher blades of carbide, the use of a lathe with a mechanism that is able to resist to a higher force and increasing the speed of process.

Tool parameters, the depth of turning, the advance, the knife material, the speed of turning and the material of the processed piece are very important and only a rigorous computing and the use of implements of better quality can lead to reduce the time of processing.

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S3. Preventive maintenance and reduction of time in which the machine doesn’t work

The time machine fault diagnosis and repair is a time “dead” that brings no value. That’s why it’s necessary to eliminate this time by taking a policy of preventive maintenance which has proved better solution than to fix the problem.

From the kaizen perspective this can be solved through the method of 5S which I have mentioned it previously.

S4. Reducing the space

In general, companies use four times more space than necessary, made up in ten times longer and use twice as many people than they need.

That’s why a redesign of the working area and / or simplify the necessary processes would result in a reduction of the working area (fig. 7).

S5. Reducing the total time of production

A business involves many resources and one of the most important is the time.
The production time starts when the command is sent to suppliers and it ends when the manufacturer receives money from customers.

The life cycle of a product may be divided as follows (fig. 8):
- phase of research and innovation;
- launch / placing on the market;
- increase;
- maturity;
- saturation;
- decline and disappearance from the market.

A shorter time of production means a rationalization of resources, flexibility and low cost.

A very good tool for rationalization of time is the Gantt chart that provides a better overview on all the activities necessary for the conduct of the production process (fig. 9).

A Gantt chart is a type of bar chart, developed by Henry Gantt, that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project.

5. CONCLUSIONS

This material should serve as a basis for understanding the main elements of kaizen. Kaizen is a set of concepts and tools intended for improving the quality of processes and products. Its main purpose is to eliminate waste and to bring improvement step-by-step daily, in order to achieve a higher quality.

In contrast with the west management, kaizen values the human resources and involves all the people in this process. It's a process that takes time but promises higher standards every day.

REFERENCES


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