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Impelmentation of Kaizen Philosophy in Tractor Industry

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***Abstract*— Today the aim of the industrial sector or any sector is to improve the working condition in tandem with the increase in productivity, quality through simple implementations, incremental improvements and utilize the basic workforce to the top management in line with each other. This paper represents and gives us an incite to Kaizen philosophy in a reputated industry and its positive changes by implementations incorporated.**

Keywords — Productivity,quality,management,kaizen

I. INTRODUCTION

In today's scenario, it is quite tough relationship between the top authorities with the basic worker level is very crucial and hence the Kaizen technique is quite helpful in reinforcement of the relationship, since the success of the company comes up from the mixed efforts.

Kaizen is basically a continuous improvement involving managers, supervisor and operators in line with each other. This philosophy assumes, according Imai that ''our way of life – be it our working life, our social life or our home life – deserves to be constantly improved'' [2]. Kaizen is a Japanese philosophy for process improvement that can be traced to the meaning of the Japanese words 'Kai' and 'Zen', which translate roughly into 'to break apart and investigate' and 'to improve upon the existing situation'[3].

We must think of the fact that the way in which we fulfill even the daily tasks today is not the most efficient way to perform it. Therefore, we must continually look for new ways of achieving our objectives in the easy manner and of course at the lowest costs.

The Kaizen Institute defines Kaizen as a Japanese term for continuous improvement. It is a philosophy of never being satisfied with what was accomplished last week or last year [2]. Improvement begins with the admission that every organization has problems, which gives up opportunities for change. It largely depends on cross-functional teams that can be empowered to challenge the existing state of affairs.

Kaizen encompasses various techniques such as kanban, TPM, poka-yoke etc under one umbrella. The figure below shows the various processes depicting Kaizen, as an umbrella concept.

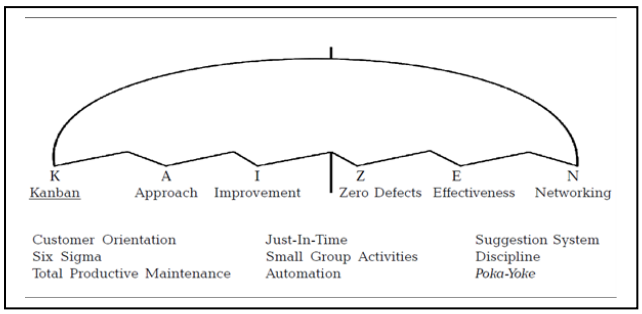

Fig. 1: Kaizen umbrella[2]

The premise of Kaizen workshop is to make people's jobs easier by taking them apart, studying them and making improvements. This is extended to everyone in the organization so everyone is a contributor.

II. METHODOLOGY OF KAIZEN

Kaizen that has to be implemented have a series of steps that are to be followed up for its consecutive execution. The methodology of kaizen implementation is also called Deming's PDCA cycle (Plan, Do, Check, and Act). The figure below gives various steps of implementing [19]:

Fig. 2: Methodology of Kaizen

Five steps that are implemented for a Kaizen Event are as follows:

Step 1: Selecting an area

You may have identified many high-priority Kaizen opportunities through value Stream Mapping. Some extra choice concepts you would possibly use for a primary Kaizen Event include the following:

- Select a neighborhood that features a comparatively sound method and a high probability of success. It's vital to succeed quickly within the initial Kaizen Event to make momentum for the following events.
- Select a neighborhood that may be sensible for visibly demonstrating improvement to the remainder of the organization.
- Select a neighborhood that's small and self-contained. For instance, you would possibly have a cell (or the chance to form a cell) that produces a whole product and isn't dependent on different processes within the organization.

Step 2: Choosing Team Members

A good size Kaizen team ranges from 6-12 members. Team members for a Kaizen Event ought to embrace the following:

- People from the chosen area (about 50%)
- Maintenance person.
- People from production management, warehouse, different manufacturing areas, quality control, design engineering, manufacturing engineering. This relies on the area on that you're centered.
- Customers, suppliers, consultants as required.

The person you choose as the event leader should have expertise and will not be from the actual area selected. The primary few Kaizen events should be professionally conducted for conducting so one should choose an advisor that has an expertise in conducting such events. Also, choose an advisor that states his intention to assist your organization become self-sustaining at conducting Kaizen Events.

Step 3: Getting ready the area

Specific provides can depend upon the realm during which your Kaizen Event is being done. In production areas, you will need hand tools, cardboard, tape measures, stopwatch, carts, safety instrumentation, cleanup provides, forklifts etc. If it's a non-production space like a design-for-manufacturability or data flow improvement event, you may not would like abundant of the instrumentation mentioned higher than.

Regardless of the area you've got selected, you may need flip charts, markers, dry erase board, and a room.

You will conjointly get to gather the maximum amount baseline data regarding the area as possible: i.e. the client needs, layouts or drawings, flow charts, etc. If you've done your value stream mapping up-front, abundant of this could be at your fingertips. Have all of this accessible for the team on the primary day of the event.

Step 4: Final day – performing of the Event Itself

For a five-day Kaizen event, the event payoff as follows:

Day 1: Lean coaching with stress on a specific tool (5S, DFM, SMED, etc.)

Day 2: Complete Training; this might embrace teambuilding exercises. Document current state

Day 3: Brainstorming; plan selection (future state); Future state formulation

Day 4: Implementation of Future State (implement the maximum amount as possible); Develop action set up for things that can't be enforced throughout event.

Day 5: Complete Implementation; Final return and celebration.

Step 5: Follow Up

There should be a follow up to the action set up developed throughout the event. Sometimes, the advisor can try this as a part of the project. Regular conferences ought to be held till action items have been completed. The remaining action things ought to be visibly denote within the space till they need been completed.

III. ELEMENTS CONSTITUTING KAIZEN

There are basically two most important aspects that are to be kept in mind while implementing the kaizen these are improvement, and continuity. Lacking of any element wouldn't be considered as a Kaizen.

Basic message of the Kaizen philosophy is that not even a single day should go by in an industry without some type of improvement being established in some process in the company. Kaizen is more importantly not one man job whereas it is everyone's job; it requires sophisticated problem-solving expertise as well as professional and engineering knowledge and involves people from different departments working together in teams to solve problems, as shown in *Figure 3*

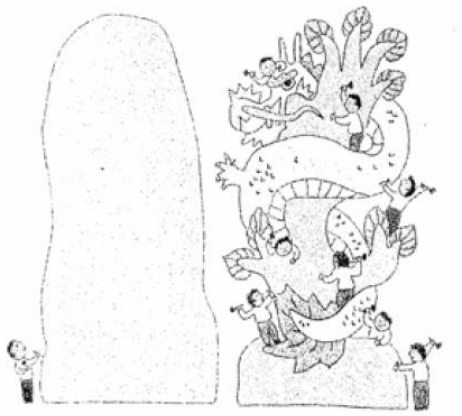

Fig. 3: Kaizen Philosophy [17]

According to M. Imai guru in these management philosophies and practices there are basically three pillars of kaizen:

1. Housekeeping
2. Waste management
3. Standardization.

A. *Houskeeping*

It is basically managing the workplace , known as Gemba in Japanese for improvement purpose. Imai introduced the word as the real place to perform the process and add value to it and pass it on to the next process.

For housekeeping the tool that is being used up is the 5S methodology. These 5S is being derived for clean and manageable surroundings and work areas. Various 5S are as follows:

TABLE 1: Represents 7 waste in Kaizen

5S	Description
Seiri	Sorting out the unnecessary components and elimination of what is not necessary.
Seiton	Straightening is the best way of what must be kept and eliminating the pointless searching.
Seiso	Shining means that everything should be clean enough to shine in a clean environment abnormality can be detected easily and it gives us a pleasing appearance too.
Seiketsu	Standardizing best practice in the work area, maintain orderliness . check for cleanliness routinely.
Shitsuke	Sustain i.e. to keep in order, perform regular audits, training and discipline, The audit is based on a very precise questionnaire, which assesses the previous 4S, and which leads, if successful - to the site being certified.

By practicing 5S cleanliness, sanitary, safe environment for working is maintained it basically removes the kind of waste search as searching from the various materials the proper set that is to be used, reducing fatigue to the operator increasing their efficiency, freeing up the space and most important making viable environment for the workers to work.

B. *Waste Elimination*

Waste basically means muda in Japanese. The resources of the process either people or machine, either add value to the process or they do not add value. The resources that do not add value to the system are known as muda in Japan. There are most important seven types of waste in kaizen that has to be looked upon given up in the table below:

TABLE 2: Represents 7 waste in Kaizen

Waste	Description
Overproduction	Producing more than the production schedule
Inventory	Too much material ahead of process hide problems
Defects	Material and labor are wasted; capacity is lost at bottleneck
Motion	Walk to get parts because of the space taken by high WIP
Processing	Protecting parts to transport to another process
Waiting	Poor balance of time; operator attention time
Transportation	Long moves; re-stacking, pick and put up down

C. *Standardization*

Standards are set by management; however they need to be ready for modification once the setting changes. Firms are able to do dramatic improvement as reviewing the standards sporadically, grouping and analyzing knowledge on defects, and inspiring groups to conduct problem-solving activities. Once the standards are in situ and are being followed then if there are deviations, the employees recognize that there's a tangle.

V. PROCESS APPROACH AND COST BENEFIT: CASE STUDY

A particular problem is being selected up from the company in which the improvement is to be made. Production line in Eicher tractors consist of various other section where a complete set of Kaizen events can be implemented. Kaizen Events are addressing a particular issue over a period of time this being a small improvements helps to get hold over the extensive preplanning and large scale innovation.

Implementation 1st: Bracket for testing at PDI unit

In Eicher tractor the PDI unit is of the importance as the end testing before the field test is done here. Once it passes through the PDI unit the field testing is performed and the tractor is dispatched up to the dealers.

Problem occurring is metal to metal contact of the drawbar to that of the bracket. As both being of metals the various problem arising due to the same are:

1. Scratch marks over the drawbar.
2. Paint peeling off while the static loading testing
3. Direct metal to metal contact of the surfaces

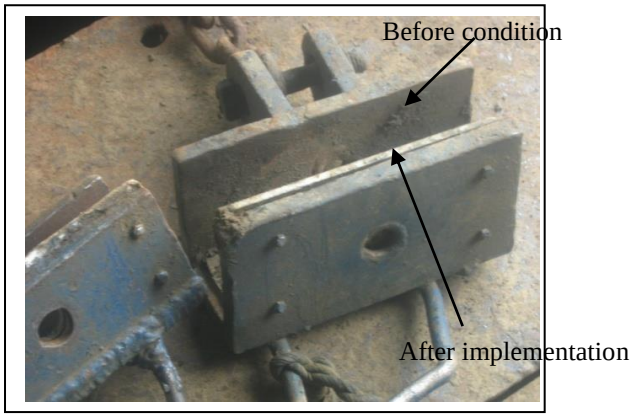

Fig. 4: Depicting the Bracket Before and After Implementing

of the bracket the problems aroused were counteracted and the after the implementation the benefits that were to the company were as follows:

1. Complete removal of scratches.
2. Elimination of paint pill off at PDI.
3. Nylon sheet provided to avoid direct contact.
4. 100% rework eliminated
5. 100%quality improvement
6. Cost benefit in long run

Cost Analysis

Cost Analysis is performed on the application of the nylon sheet provided over the 6' x6'x 8mm various cost incurred on the implementation on nylon sheet and the total monetary profit to the company is described below:

- Labor cost = Rs 100
- Total cost incurred in implementing (including the labor cost) = Rs 352
- Paint cost or reworking cost per tractor =Rs .75/tractor
- Tractor requiring reworking = 50/day
- Total reworking cost = .75*50 = Rs 37.5/day
- Total reworking cost per annum = Rs 11250
- Cost saved by the company per year = Rs 11250-352 = Rs 10898

Implementation 2nd: CTF Sleeve Gasket Missing

Case transmission front transmits power from transmission to the front axle. Here the CTF is being assembled and the pressing operation is done, in between various auxiliary parts are being used.

The gasket is being used up to seal the unit i.e. no leakage can take place. The CTF and the Guide Sleeve is being pressed together and in between gasket is being kept before pressing and tightening. Problem that aroused is that the during the operation the gasket one of the part used for sealing is missed by the operators. As the work is in continuation at the point this small detail is not visible until the assembly goes out for the testing side.

Solution applied is the new system with sensors helps to interlock the gasket pick up with that of the pressing operation i.e. until and unless the gasket is being picked up the pressing of the unit does not take place. This helps in overcoming the missing of gasket and hence the leakage afterwards can be overcome.

Fig. 5 : No Arrangement of Sensor Used (Before Implementation)

Fig. 6: Showing the Various Arrangement for Sensor and Interlocking

Benefit after implementation are as follows :

1. Gasket pick-up confirmation provided.
2. Guide sleeve pressing in CTF housing operation is interlocked with gasket pick-up sensor.
3. If operator not pick the gasket next pressing cycle not work.
4. No leakages in the housing due to gasket miss.

4.2.1. Cost Analysis

- Proximity sensor cost = Rs 1235/piece
- No of sensors used = 4
- Total cost of sensors used = Rs 4940
- PLC cost = Rs 17250
- Labor cost = Rs 250

- Implementation cost = Rs 425
- Total cost while implementing the setup
  = Rs 940+17250+250+425
  = Rs 22865
- Number of complaints received per year = 150
- Servicing cost by the company = Rs 280/tractor
- Total cost during service per year = Rs 42000
- Total cost saved by the firm per year = Rs42000-22865= Rs 17135

VI. CONCLUSIONS

Kaizen principle has being implemented gives us the following benefits towards the organization:

1. Low cost investment leading to less amount of maintenance and giving benefit to the company in monetary as well as improvement for the employees.
2. Increasing knowledge of employees and decrease in there fatigue.
3. Increase in effectiveness and reduction in downtime for the process.
4. Kaizen philosophy can be used in any field from manufacturing to commerce etc. The techniques have being successfully implemented in many industries and it creates an excellence by the help of suggestion schemes given by the various people.
5. It includes the contribution from top level to that at the basic operator level.
6. Cost saved on implementation 1=Rs 10898 , Cost saved on implementation 2= Rs 17135

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