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Kaizen philosophy a manner of continuous improvement of processes and products

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ABSTRACT

Purpose: of the paper aimed at motivating the legitimacy of implementation of kaizen system – the philosophy conducting to the continuous improvement of processes and products by the responsibility of all workers.
Design/methodology/approach: used for the research has embraced the estimation of kaizen ideas including: connection of the kaizen with the range of duty, employee's creativeness, practicality and efficiency of the idea, resources, deadlines in operations, involvement in accustoming the idea, possible success of idea, safety, quality, cost and time.
Findings: of research are as follows: kaizen idea should have positive influence on areas outside department of employee, surpass the level of ordinary scope of duties of employee, be characterised by high level of practicality, what means that employee has devoted a lot personal time and energy to achieve effective implementation and obtain the results exceeding desired ones; correct functioning of kaizen system should be confirmed by statistics of implementation.
Practical implications: can apply in case of any organisation which manages the quality by identification of the improvement area, selection of the key problem, definition of the cause of improvement, planning of the measurement, implementation of the improvement idea, analysis and comparison of the results and standardisation.
Originality/value: of the presented paper is being constituted by the procedure of the carried out estimation of kaizen ideas taking into account practicality and efficiency of the idea, direct influence of it on safety, quality, cost and time as well as creativity and personal involvement of employee, which can be used as an improvement tool in every organisation estimating every improving activity.
Keywords: Continuous improvement; Kaizen idea; Worker responsibility and commitment; Innovation

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1. Introduction

Continuous improvement of processes and products as well as the responsibility of all workers for quality are fundamental guidelines of TQM philosophy – the philosophy conducting to the increase of productivity without simultaneous decrease of quality and based on the Deming cycle. The cycle, characterising the repeatability of actions, is aimed at the achievement of farther improvements [1-4].

Those ideas had been formulated and published in United States of America, and than used in practice and improved in Japan; this is the place of origin of one the most popular methods of the quality improvement – kaizen [1,5-7].

Kaizen (jap. kai – do, change, zen – well) is a kind of thinking and management, it is a philosophy being used not only in management field but also in the everyday life in Japan. It means gradual and continuous progress, increase of value, intensification and improvement [5-9].

Kaizen needs attaching great value to the details and common sense to make work cleverer [5-7].

Usage of kaizen ideas and motivation of every worker at very stage of production make the chosen factory of General Motors Manufacturing Poland one of the most modern and the best managed among the biggest car concerns in the world.

2. Kaizen

The way of thinking named kaizen as well as ”Japanese style of quality management” became an object of interest of European and American industrialist, when Japanese economy had achieved success in 80-ies of the XX-th century. At this time, Japanese organisations were seen as a kind of ideal and their way to success were perceived as myths [5-7,10].

However, this system is far from ideality-it requires strain work in return for relatively low salaries and it doesn't guarantee the proper social conditions to the majority of employees. It also needs small-groups activities – informal, voluntary, inter company groups based on kaizen-minded and self-disciplined employees [5-7,10].

Two functions related to the executable work are distinguished in Japan [9]:

- maintenance of the existing condition relying on the operations related to complying with current standard of technology and management,
- improvement of the existing condition-kaizen, being the function playing the main role while the procedures and instructions are strictly implemented.

Application process of kaizen method basically consists of [5-8,11]:

- definition of the improvement area,
- analysis and selection of the key problem,
- identification of the cause of improvement,
- planning the remedial centre measures,
- implementation of the improving project,
- measuring, analysing and comparison of the results,
- standardisation.

Process of kaizen idea application is closed in PDCA cycle, where [5-7,11]:

- plan (P) refers to establishing the aim for improvement,
- do (D) is connected with implementing the plan,
- check (C) defines determining whether the implementation has brought the planned improvement,
- act (A) characterises standardising as the preventing recurrence of the original problem or setting goals for the new improvement.

Implementation of the particular improving projects in the range of kaizen passes in to three phases [5-8,11].

First period relies on realising by each employee the capability of the occurrence in the processes of different problems and swindling the habit of searching them. The most popular and the simplest method of problem identification are observing small incompatibilities in the results of work and than finding sources of incompatibilities. Objects of the improvement can be also actions and operations, which are not the source of visible incompatibilities [5-8,11].

Second phase includes the conceptualisation of the idea -the presentation of other, alternative solutions taking advantage of inapplicable methods or procedures, and then implementation of the new idea. Each employee, who improves course of his own work by accustoming new concept, has to observe its efficiency and if it is necessary – take the necessary correcting operations [6-8].

Indicators for each employee on the way to kaizen implementation are [6-8]:

- giving up the conventionally established ideas,
- discontinuance of tactic of excuses, critical interpretation of schemes and practices,
- revising, how to make it, no – why it hadn't been done,
- immediate correction of the committed mistakes,
- taking advantage of wisdom, not – mindless spending the money,
- continuous searching the answer to the “why?” question.

The last period of kaizen implementation is application of the system of submitting a motions concerning the improvement of ideas. Form and procedure of submitting should be clearly defined. Assessment groups can be created on various levels of organisations. Each enterprise should be also obliged to elaborate clear and fair system of estimating the submitted motions [6-8].

The results of the submitted motions assessment are the basic criterion of employees' work estimation. Results are declared or published in order to enable the whole staff the full insight. Such an approach promotes creation for positive relation between employee and work, high culture and continuous improvement of the achieved results [6-8,12].

3. Kaizen and innovation

The basis of kaizen are constituted by 5s concept, defined by Japanese specialists as a set of good customs and manners, deriving from the traditional manner of behaviour in house and school. Determination „5S” dates from the Japanese words (Fig. 1) [8,13-15]:

- seiri-(selection); proper (suitable) preparation of a workplace, manner and instrument of work; with the elimination of everything useless,
- seito-order (systemic); tidiness in a workplace and preparation of every required tools in the manner enabling simple and quickly utilisation,
- seiso-clearness (cleaning); order in a workplace allowing on increase of safety of workplace, control of equipment and responsibility for the means of production,

- seiketsu-consolidation (standardisation); reminding employees about their duties in the aspect of care of used tools and equipment and about keeping the workplace order,
- shitsuke-discipline (self-discipline); adaptation of employees to the principles accepted by the organisation, independent elimination of bad custom, training.

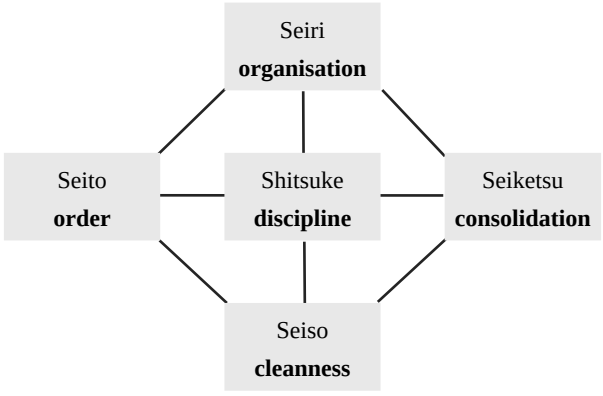

Fig. 1. 5S structure [8]

Proper implementation of 5s principles allows for application of kaizen concept – continuous improving performed by all the employees involved in the process of change and including the whole organisation [8,9,14].

That is why kaizen is unequal to the classic western manner of improvement in the fundamental respect – it creates the process by taking advantage of human factor. Classic western approach is based mainly on the innovative operations being characterised by necessity of executing considerable investment in newest the instruments and technologies and involving the specialist. Such operations lead to considerable and variable changes. Unfortunately, most often, these changes most often are not the subject of standardisation [5-8,11].

The comparison of basic features of kaizen and innovation has been presented in the Table 1 [16].

In spite of so many differences, the proper combination between kaizen method and operations of the innovative character gives the biggest effects and benefits. Innovations allow following the newest trends and modern technologies, kaizen guarantees the continuity competences and essential standardisation [5-8,11].

4. Techniques connected with kaizen

There are no strictly defined principles and instruments, which must be used by management and employee, in order to achieve benefits and control the processes of continuous improvement. However, several definitions and techniques are connected with kaizen [6,7,13,14,17].

These are [6,7,13,14,17]:

- technique 5 Why – basic for kaizen and at the same time the simplest organising technique simultaneously, captivated in motto “when you find a problem, ask why five times”; it ask so many times as you will find the deepest reason of problem,
- practice 5s – system of practice ordering the workplace and increasing involvement of employee in the improvement process,
- 7 kind of productive loss (Muda) – everything, which does not bring value added; according to the basic classification of the productive loss one can differentiate losses resulting from: excessive inventories, over-production, waiting for next operation (raw materials, employee), transport, inappropriate way of processing, unnecessary unergonomic motion, internal and external incompatibilities,
- 7 instruments of the quality control – practical methods of registration and analyses of data; the most popular are: check list, Pareto diagram, reasons and results diagram (so called Ishikawa diagram), histogram, scheme, punctual diagram, check card most often with x-R diagram,
- Andon – signal used to show the place in the process requiring additional attention; signal is given by the employee the defect has been noticed by,
- Chaku-chaku (load-load line) – organisation of the productive nest in such a manner, in order to operator dealt only with setting-up parts to machines; throwing out processed part is realised automatically (hanedashi),
- Gemba, Gembutsu, Genjitsu – basic for kaizen principle of objectivism; solving the problems, everyone should be concentrated on the workplace, where the problem appears in which (gemba), on the real object (gembutsu) and on the facts (genjitsu); three of this notion are sangenshugi – ”three reality”,
- Jidoka (autonomation) – control process held, one of the basic solution improving assurance of the quality production; defects of the processed part are automatically found by the machine, which immediately stops its working mode,
- Kaikaku – radical improvement or reform; the most often in area of business processes,
- Nagara – balancing of work concerning only one operator, not a group; the most popular solution is parallel executing incoherent tasks by one operator; nagara has the similar meaning to the word “meanwhile”,
- PDCA cycle – cycle of continuous improvement; plan - do - check - act,
- Poka-Yoke (error proof) – system of means eliminating defects being the results of inaccuracy; poka-yoke solutions find application in stable processes and enable to drop of frequency of defects for six sigma level,
- Sensei – guardian, instructor, mentor, very often from outside the organisation, in assisting employee to practice kaizen,
- Shoujin ka – productive line with elastic ration of labour force; solution applicable in situations, when the priority is full utilisation of infrastructure.

5. Own research

The research has been conducted in General Motors Manufacturing Poland in Gliwice. The realised processes of continuous improvement find the reflection in all aspects of activities of Gliwice factory; the main purpose of the factory is continuous improvement of both products and productive

processes not only in the meaning of quality, but also in the environmental and occupational safety aspects.

Taking advantage of kaizen system allows correcting workplaces and processes, it tends to eliminate the potential loss by involvement of all employees in the development of Factory; also by reporting the personal kaizen idea.

5.1. Registration and estimation of kaizen case

Kaizen idea can be reported by each employee both managers and productive one. However, there are some certain limitations – the idea reported by managers can't be the subject of awards system, and kaizen ideas reported by employees like: administrators, analysts, specialists, engineers, leaders of the groups, coordinators, can not concern the range of their normal duty. Decision concerning the acceptance of reported idea belongs to the direct rearrange.

Each kaizen idea should be submitted on specially standardised forms and should cover feature that:

- allows for potential improvement of the current workplace or process,
- indicates practical manner of its realisation,
- can be successfully introduced to usage,
- is consistent with the occupational health and safety rules.

Estimation of chosen kaizen case includes:

- description of chosen area /workplace /process,
- reporting kaizen idea taking into consideration:
  - title of the idea,
  - description of the idea,
  - description of the loss eliminated by the proposed kaizen idea,
  - member group,
  - assessment of the risk connected with the implementation of the idea,
- estimation of the kaizen idea in the following areas (Table 2):
  - connection of the kaizen in the range of duty,
  - employee's creativeness,
  - practicality and efficiency of the idea,
  - resources needed,
  - deadlines and in operations essential in realisation,
  - involvement in accustoming the idea,
  - possible success of the idea,
  - safety, quality, cost and time connected with the idea.

All of the areas are subject of the estimation. Each area is included to category of weight.

Estimation of each area is reflected by product of amount of points in this area and weight of this area.

5.2. Estimation of chosen kaizen ideas

Elimination of useless movement – liquidation of LTV key

Description of situation: on one of the productive lines three models of cars are assembled: Zafira, Astra III sedan and Astra II Classic, in all mentioned models of cars the same assembly action is executed – twisting by LTV key (Fig. 2). Twisting moment for Zafira and Astra III models is 4 Nm, but moment for Astra Classic is 5,5 twisting Nm, LTV keys of various twisting moments are used.

Table 1.
The comparison of basic features of kaizen and innovation [16]

innovation	kaizen
creativity	ability to adaptation
individualism	team work
orientation towards the specialists	orientation towards person having no specialised qualifications
attaching great value to the general matters	attaching great value to the details
orientation towards techniques	orientation towards human
information directed to the chosen persons	free-for-all information, generalised
orientation to the individual section	interdepartmental orientation
searching for the new technology	basing on the existing technologies
limited feedback	strong feedback
short-time effect	long-time effect
participation of several chosen „leaders"	participation of every worker
adaptation to the fast growth rate economy	adaptation to the slow growth rate economy
big investment needed	small investment needed
results in the aspect of profit as the estimation criterion	processing estimation criterion

Table 2.
Sheet of kaizen idea estimation

	Area of estimation	result	weight	points
1	Relationship between the idea and the work – how coherent is the idea with normal range of duty of employee		1.0	… /10
	The idea has positive influence on the process/work executable by 1 operator on one position	1		
	The idea has positive influence on the other processes/operations in the range of 1 team	2		
	The idea has positive influence on the other processes in the range of group	4		
	The idea has positive influence on the areas in the range of department of employee	7		
	The idea has positive influence on the areas outside department of employee	10		
2	Creativity – how much does kaizen idea illustrate creativity of employee		1.0	… /10
	Identical idea – the idea has been already reported by the other (or the same) employee in past on the other position in the range of group	1		
	Basic kaizen idea – limited level of creativity – the idea has been contributed in the runtime of ordinary duty	5		
	Good level of creativity – kaizen surpasses the level of ordinary scope of duties of employee	10		
3	Practical development of kaizen – in what degree has employee thought about kaizen idea – practicality and efficiency		1.0	… /10
	Kaizen idea has not been developed outside very basic range	0		
	Employee has spend some time trying to implement the idea	1		
	Employee has developed the idea and devoted some personal time on discussion with others/ good practical apprehension of situation and consequences	5		
	Employee has developed the idea on very good level, very high level of practicality	10		
4	Plan of implementation – in what degree has employee considered needed resources, operations and deadlines wanted for implementation of kaizen idea		1.0	… /5
	Lack of rethinking of the problem of kaizen implementation	0		
	Rethinking of the problem of kaizen implementation with the basic plan and consideration	1		
	Good rethinking of the problem of kaizen implementation with the detailed plan	5		
5	Introduction of kaizen idea – in what degree has employee been personally involved in implementation of the idea		1.5	… /15
	Lack of involvement in the implementation process	0		
	Small involvement – employee has been taken part in operations, has not played the most important role	1		
	Good level of involvement – employee has played important role	5		
	High level of involvement – employee has devoted a lot personal time and energy to achieve effective implementation	10		
6	Kaizen result – has been kaizen idea introduction ended with progress		1.5	… /15
	Failure of the idea – lack of concrete benefit subsequent with implementation of the idea/none of purposes has been achieved	0		
	Partial obtainment of the required result	1		
	Complete obtainment of the required result	5		
	Obtainment of the result above desired ones	10		
7	Direct influence of kaizen idea on safety, quality, cost, time		1.5	… /12
	The idea effects 1 of the mentioned elements	2		
	The idea effects 2 of the mentioned elements	4		
	The idea effects 3 of the mentioned elements	6		
	The idea effects all of the mentioned elements	8		
	In total			… /77

Fig. 2. Photo of LTV key application

Kazein idea: twist all three models with moment of nominal value 5 Nm, eliminate one of the keys from the position and save about 3 seconds on each tact.

Kaizen idea estimation:

1. The idea has positive influence on the other processes/operations in the range of 1 team – 2/1/2 (10)
2. Good level of creativity – kaizen surpasses the level of ordinary scope of duties of employee – 10/1/10 (10)
3. Employee has developed the idea on very good level, very high level of practicality – 10/1/10 (10)
4. Good rethinking of the problem of kaizen implementation with the detailed plan – 5/1/5 (5)
5. High level of involvement; employee has devoted a lot of personal time and energy to achieve effective implementation – 10/1,5/15 (15)
6. Complete obtainment of the required result – 5/1,5/7,5 (15)
7. The idea effects 2 of the mentioned elements – 4/1,5/6 (12)

In total: 55,5/77.

Improvement of safety, improvement of process, elimination of useless movement and expectations – unit air pillow tester

Description of situation: test of unit air pillow requires the following actions: unassembling the unit, conducting the reliability tests, secondary assembling the parts, verification of correctness of the functioning and parameters using diagnostic equipment tech2 (Fig. 3); process demands multiple repetitions because of different type of tests.

Kaizen idea: make a tester – electronic circuit compatible with all the circuits connected with the system of air pillows in Astra Classic model, shorten procedure to: stocking parts from the magazine, conducting the tests; probations, connection of the unit, tester and equipment tech2, and verification of the correctness of functioning and parameters.

Kaizen idea estimation:

1. The idea has positive influence on the areas in the range of department of employee – 7/1/2 (10)
2. Good level of creativity – kaizen surpasses the level of ordinary scope of duties of employee – 10/1/10 (10)
3. Employee has developed the idea on very good level, very high level of practicality – 10/1/10 (10)
4. Good rethinking of the problem of kaizen implementation with the detailed plan – 5/1/5 (5)
5. High level of involvement; employee has devoted a lot personal time and energy to achieve effective implementation – 10/1,5/15 (15)
6. Complete obtainment of the required result – 5/1,5/7,5 (15)
7. The idea effects all of the mentioned elements – 6/1,5/12 (18)

In total: 65,5/77.

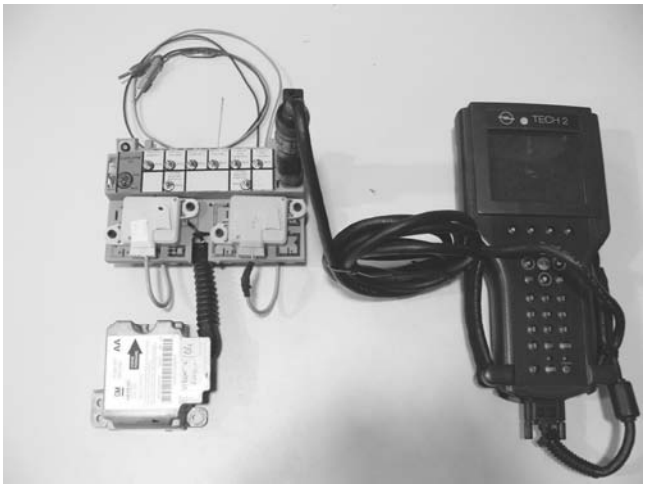

Fig. 3. Photo of tester of air pillow unit connected with the diagnostic equipment tech2 for Astra Classic model

Improvement of quality, of process, elimination of useless movement, reduction of cost-ressure of threshold OPC

Description of situation: for underlining sport character of the vehicle the additional thresholds and spoilers are assembled. Process of installation of the threshold proceeds through their sticking to the vehicle's under-carriage. In the time of glue drying pressure is required. Thresholds are stocked and afterwards secured by special adhesive tape in several places, in order to assure good adhesion of the threshold to the vehicle.

Kaizen idea: eliminate application of the adhesive tapes, design and implement to production instrument supporting and pressuring threshold (Fig. 4).

Kaizen idea estimation:

1.The idea has positive influence on the areas in the range of department of employee – 7/1/7 (10)
2. Good level of creativity – kaizen surpasses the level of ordinary scope of duties of employee – 10/1/10 (10)
3. Employee has developed the idea on very good level, very high level of practicality – 10/1/10 (10)
4. Good rethinking of the problem of kaizen implementation with the detailed plan – 5/1/5 (5)
5. High level of involvement; employee has devoted a lot personal time and energy to achieve effective implementation
6. Obtaining of the result above the desired ones – 10/1,5/15 (15)
7. The idea effects 3 of the mentioned elements – 6/1,5/12 (16)

In total: 74/77.

Fig. 4. Picture of handle pressuring threshold OPC

6. Conclusions

Kaizen – continuous improvement by the small steps – should be realised due to each employee's involvement. Kaizen improvements should proceed without any additional investment or through small investments.

Good kaizen idea should: have positive influence on areas outside the maternal department of employee, affect the level of ordinary duty of employee, be characterised by the high level of practicality. It means that employee has devoted a lot personal time and energy, to achieve effective implementation, and obtain the results exceeding desired ones.

Correct functioning of the system is confirmed by the statistics lead by the coordinators of kaizen system. The number of ideas, which has been approved as well as the number of the ideas being implemented in the chosen factory of General Motors Manufacturing Poland are presented on Fig. 5.

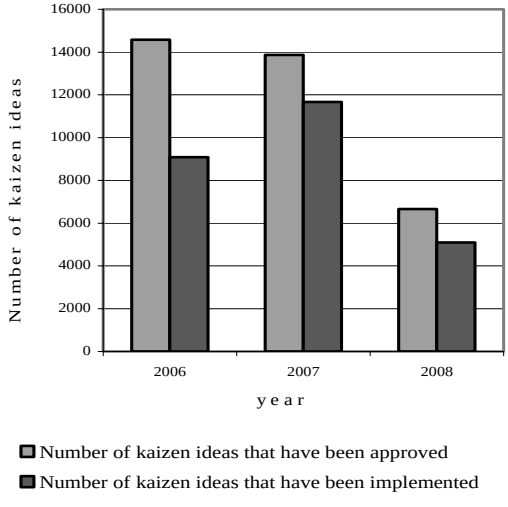

Fig. 5. Specification of the amount of approved and implemented kaizen ideas in the recent years

In the Factory of General Motors Manufacturing Poland during the recent years the number of reported kaizen ideas have fluctuated about 14000 per year; it surpasses about keel of thousand the purposes accepted by the leading management. Such a big number of ideas and high percent of implementability confirms the correct functioning of kaizen system, the proper manner of awarding and high involvement of employee in improvement of the personal workplace as well as the whole productive process.

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