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THE „5S” STRATEGY FOR CONTINUOUS IMPROVEMENT OF THE MANUFACTURING PROCESSES IN AUTOCAR EXHAUST

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Abstract. *The paper presents a continuous improvement strategy, process-oriented and aiming to improve manufacturing at AUTOCAR EXHAUST. The „5S” rules have immediate and significant effects on the sequence of activities in the work post, thus influencing the performance of processes in the analyzed company.*

Keywords: quality management, continuous improvement, exhaust, AUTOCARS.

1. Strategies for continuous improvement

The continuous improvement strategy is based on a series of methods, techniques and instruments, like PEVA action plans, quality circles, „fireman” groups, suggestions systems, Kanban, total productive maintenance, „3S” and „5S” methods, which are presented in the following:

a. PEVA action plans. Deming has underlined the importance of the standing collaboration between research – design, production, detachment in the process of quality improvement process, in the form a graphical representation, the „Deming’s circle” (Kaizen, 1991). This suggests that for improving quality, the enterprise should permanently advance along the circuit „plan – execute – verify - act”.

The „participative management” received different denominations, in different cultures: „the big brothers group”, „the big sisters group”, „the quality circle”, „ZERO DEFECTS movement”, „no mistake movement”, „the level upgrading movement”, „the voluntary management group”, „intelligence mini-reservoir”, „the suggestion group”, „the total productive maintenance circle”, „the safety group”, „the involvement in workshop movement”, „the productivity committee”, „the management by objectives group (MBO)”, „the group of workshop discussions” etc. (Olaru, 1999).

b. System of suggestions. The simplest instrument of the continuous improvement strategy is collecting individual suggestions from organizational stakeholders. The rule of this system, similar to the principle of brainstorming, is that managers must, in the first stage, accept every improvement at the workplace, irrespective of its economical efficiency. This involves the precise delimitation of the workplace, for which it is recommended to mark the production halls with numbered squares (Olaru, 1999).

c. Just – In – Time. Just – in – Time (JIT) method represents, at its origin, a coordination method of the production processes through which it is ensured the manufacture and delivery of parts (subassemblies) in due time, as set by the incoming orders from the previous work post, in the chain of activities. In other words, only the

precise number of parts needed at a certain moment is inputted in the process (Pruteanu et al., 2000).

d. The „5S” system of rules. This mnemonic denomination comes from a sequence of activities leading to performance: SEIRI, SEITON, SEISO, SEIKETSU, SHITSUKE (in Japanese). Their English translation is tidiness, orderliness, cleanliness, standardization, discipline, or, for the sake of preserving the acronym, sort, set, shine, standardize and sustain. Sometimes, the „5S” are separated in „3S” and „2S”.

e. Total productive maintenance. The Total Productive Maintenance is a technique used within the strategy of continuous improvement, in order to increase the lifetime of equipments, with the participation of all workers, not only of the maintenance team. In order to apply this method, each worker has to be trained in respect to the equipment he is going to work with (Olaru, 1999).

f. The zero defects method. This method is based on the philosophy of „all must be well done from the first time, and each and every time”. This principle refers to the „error free” course of all processes and activities in the enterprise, as a premise for the execution of products which conform to the requirements (Pruteanu et al., 2000).

h. Fireman groups. The intervention of „fireman groups” implies the existence of specially designated people in the organization, who intervene when serious errors intervene in the course of achieving the pre-set quality objectives. These groups are meant to quickly eliminate major deficiencies and insure the normal course of the quality continuous improvement process. (Olaru, 1999).

2. The „5S” system of rules

The „5S” system of rules represents an improvement process-oriented strategy, which is based on minor improvements of the processes involved in the manufacture of autocars exhaust.

Within the continuous improvement framework, companies may use either the „5S” or the „3S” system of rules. The „3S” system of rules is based on:

SEIRI: elimination of everything which is not useful in the workplace: residues, blanks, unused tools and equipment, scraps, superseded documents;

SEITON: order, storage, labelling of useful objects that were kept after SEIRI so that they can be easily found and manipulated when needed;

SEISO: insuring the cleanness of the entire production area (squared and marked). While cleaning their equipment, executants often discover defects that the specialised maintenance teams missed. When equipments are clean, the incipient defects are observed and easier remedied, thus increasing the utilization factor of the machines.

These „3S” are considered basic, compulsory. The „5S” system of rules has been developed at the beginning of the 80’s by Takasi Osaka for creating an environment of „total quality” and adds two more categories of activities:

SEIKETSU: Establishing a series of clear rules for the maintenance of a perfect hygiene and of an agreeable environment at the workplace;

SHITSUKE: The close following of work procedures, continuous learning and self-discipline (Olaru, 1999).

The learning process allows the execution personnel:

- to do correctly the sorting, order and cleaning operations;
- to permanently apply them.

The administrative and technological discipline changes the work mentality of each employee. The advantages of implementing and maintaining the „5S” system of rules are as follows:

- increase of the work productivity;
- decrease of the production costs;
- improvement of the individual activities quality;
- increase of the workplace safety;
- increase of the clients level of satisfaction;
- proving that the Quality Management System creates the framework for continuous improvement;
- workers become more organized;
- stress is eliminated.

As disadvantages of implementing the „5S” quality improvement system we may mention:

- relatively long periods of implementation;
- along implementation decreases in work productivity may occur.

The application of the „5S” system of rules leads to the accomplishment of the following objectives:

- orientation towards clients;
- increase in the efficiency and effectiveness of the processes;
- cost reduction;
- concentration on the processes that add value and total elimination of those which don't;
- continuous improvement of human resources;
- diminishing of resistance to change.

2.1. Ordering tools needed for the manufacture of exhaust systems with the help of „5S” system of rules

„A place for everything – each thing in its place” is one of the basic rules in the implementation of the „5S” system. The „5S” system of rules is based on order and discipline within all departments involved in the manufacturing of exhaust systems.

This strategy's success lies in following the sequence of activities SEIRI, SEITON, SEISO, SEIKETSU, SHITSUKE. To insure the implementation success of the quality improvement programme „5S”, the teams accomplishing the desired results will be rewarded, but for delays or non-fulfilment of stages no sanctions are applied.

The production process of exhaust systems, with inputs and outputs, is presented in **Figure 1**:

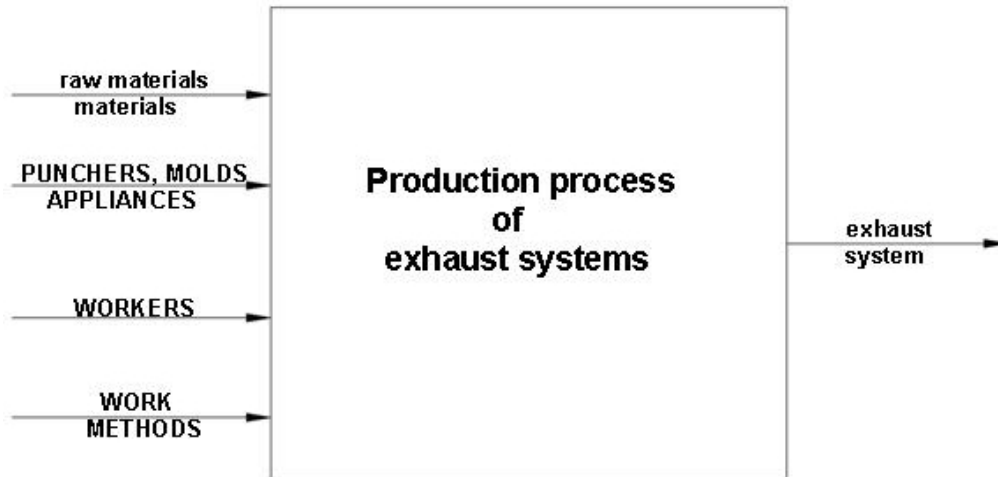


Figure 1. Inputs and outputs of exhaust systems production process

2.2. Model for applying the „5S” system for ordering the tools needed for the auto car exhaust manufacture

For the production of exhaust systems, one uses, as presented in Figure 1, raw materials, materials, punchers, moulds, appliances, execution documentation and workers, foremen, engineers.

Within the „Exhausts” department of SC TESS CONEX SA IAȘI approx. 100 exhaust systems per month are produced. For each exhaust system there is a preparation process, consisting of punchers and moulds. Due to the fact that some exhaust lines have common elements (only the product code differs), the ordering and the standardization of punchers, moulds and appliances are enforced. Ordering and standardization are enforced due to the following elements:

- a. when production processes for each exhaust system are planned, these can be carried out immediately with „zero searching times”;
- b. periodical cleaning of punchers and/or moulds often allows the discovery of some defects that those in charge with the maintenance miss;
- c. the traceability of products is assured.

To improve the quality of the exhaust systems that equip the auto cars the mentality and approach must be changed. The ordering and standardization of punchers and moulds that are necessary for the fabrication of exhaust systems may be regarded as a project. Such a project is presented in Table 1. The evaluation of the project, in Table 1, is made step by step, based on the visible progress. The application of the „5S” system of rules is the first step towards continuous quality improvement or, in other words, towards the ordering of activities and discovery of nonconformities, incongruities within processes or between processes.

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The application of the „5S” system in parallel to JIT – KANBAN concept and the suggestion system may lead to the automatic control of the exhaust systems production processes, as through the successive application of the above mentioned concepts, workers gain experience and a degree of technological knowledge that allow them seize malfunctionings and defects.

Table 1

Questionnaire for the evaluation of the „5S” system of rules

Activity category	Questions	Score	Available
SEIRI sorting	1. Are there only the necessary tools on shelves?	5	5
	2. Are the storage places and when necessary the going direction clearly evidenced?	5	5
	3. Are the signs and labels logical and systematic?	3	3
	4. On the workplace are there only validated tooling?	5	5
	Total 1S	18	18
SEITON ordering	1. Does storage take place correctly, in the delimited areas?	5	5
	2. Are shelves kept in order in the storage places?	6	7
	3. Are tooling placed in their place after use?	6	7
	4. Is order kept within the storage spaces?	2	3
	5. Is systematization and quick search of tooling insured?	9	10
Total 2S	28	32	
SEISO cleanness	1. Are tooling safely used?	7	8
	2. Are there trash, materials/non-conform parts within the tooling storage areas?	4	5
	3. Is the storage area clean?	6	7
	4. Are the tooling cleaned of contaminants?	2	3
	5. Are the tooling awaiting distribution cleaned?	6	7
Total 3S	25	30	
SEIKETSU discipline	1. Are the rules for placing and manipulating SDVs posted in the right places?	3	3
	2. Are workers disciplined? (are there rules deviations)	6	7
	3. Identification plates, name plates, badges and work clothes are clean and adequate?	2	3
	4. Are the instructions during installation and fabrication observed?	6	7
Total 4S	17	20	

SHITSUKE systematization	1. Are the results of the 5S visible?	6	0-7
	2. Do you wish to make the workplace aesthetic?	3	0-3
	3. Are all people included in training programmes?	4	0-5
	4. Are the coordinators and quality norms established?	4	0-5
Total 5S		17	20

Total score „5S”:

105	120
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Evaluation: The tooling ordering and standardization project has achieved its final objective regarding the tooling ordering and standardization.

3. Conclusions

The efficient implementation of the „5S” strategy leads to a subsequent improvement of the exhaust’s quality.

The improvement of auto car exhausts quality, using the „5S” system of rules, is accomplished at the initiative of the inferior levels of the organization (workers, setters, operators, foremen) coordinated and helped by the superior management (section managers, department managers) when they encounter implementation difficulties. In other words, the system of rules represents „the foundation stone in the changing of the mentality at all organization’s levels”.

The implementation of the „5S“system of rules leads to the following effects regarding the improvement of the auto car exhaust quality:

- Visible results within a short period of time (2-3 weeks);
- Workers get used to order and discipline;
- Labelling draws attention to change that is about to occur, and first steps towards it can be taken;
- Reduction of physical effort, less accidents during the production process;
- Increase of the workers’ professional training, better organization of activities;

All these rules lead to an increase in competitiveness that every business should pursue.

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