PRODUCT MANAGEMENT AUDIT

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Abstract: Product audit is the method which aims at evaluating the efficiency of preventive and corrective actions implemented to improve a product-specific manufacturing process. Efficiency is measured by comparing the results obtained from testing the final product against product specification. Product auditing method is a specific method developed by the major car manufacturers. The effectiveness of this method is revealed in the quality of products delivered and in the optimization of manufacturing processes. The applicability of this concept can be extended, in the author's opinion, in all productive organizations in the machinery industry with large or small series production. Selecting the type of corrective or preventive actions based on the evolution in trends of the results obtained from product auditing represents the value added obtained from this process. The audit is essentially a product control key for the activities of a productive organization .

JEL classification: M10, M42

Key words : Audit, Audit criteria, Audit evidence, Audited, Audited organization., Auditor

1. INTRODUCTION

The main purpose of quality audit is to assess the corrective actions required to eliminate deficiencies, actions to improve enterprise quality system, the efficiency of its processes and the quality of products and services offered.

By consulting relevant literature, we may identify the following audit types, ranked by the extent and limits of an audit: system audit and process audit.

The research documentation has been done considering two standards, namely: the requirement imposed by ISO 9001: 2008 on the activities of non-conformities to prevent occurrence (Chapter 8.5.3); the second research hypothesis is based on the requirements of standard 19011: 2003 where methodology and types of audits are defined.

In any such document the concept of product audit is not met. Instead, the concept of auditing products is common among large car manufacturers.

Product audits are tools used in mass production processes, in order to keep control of such manufacturing processes. Depending on the production plan of the organizations, product audits are performed regularly, their results being recorded. Statistical interpretation of results leads to an analysis of trends as compared to the targets set in advance.

By analyzing the trends of the results obtained, the organization decides what types of actions need to be implemented in order to control of the manufacturing process for the respective product. Depending on the strategy and policy of athe

productive organization, relevant targets are identified for the final quality of processed product.

In order to keep the manufacturing process under control, it is organized according to several types of inspections: self-control, inspection monitoring, 100% inspection, final product inspection, product inspection before delivery. All these inspection types run at a frequency required by the particular type of inspection/monitoring. Therefore, monitoring inspection may have a frequency of 10% - 50% of total products manufactured on a workstation per shift, 100% inspection means that 100% of products in a workstation is inspected, as well as the final inspection.

In all these types of inspection based on risk analysis index as calculated in the designing phase, parameters are identified which should be kept under control all along the manufacturing process. Depending on the resulting degree of criticality, the type of inspection is selected.

As such, for a high degree of risk associated to a particular parameter, self-checking needs to be performed by the production operator and, on the other hand, 100% inspection of production and operation processes must be performed by the inspector. A average degree of risk requires a monitoring inspection conducted by the process inspector.

In this context the novelty of the "product auditing" concept is that it represents a control key for the entire manufacturing process because it identifies both design problems, technology issues, problems, and deficiencies in personnel training system quality control of manufacturing process.

2.THEORETICAL CONSIDERATIONS CONCERNING THE METHOD OF PRODUCT AUDIT

Documentation of present research resulted from studying this process at car manufacturers facilities of Renault, Citroen and in factories specialized in rolling stock wagons Astra Arad, Meva Drobeta Turnu Severin and Romvag Caracal.

To better monitor the manufacturing process based on existing production type in a productive organization, product audit is planned on a daily basis for large series, or at regular intervals, weekly, fortnightly or monthly for organizations producing small series.

In terms of structure, the audit team may vary according to the existing production type. Therefore, for large series productions such as car and spare parts industry, have assigned product audit teams which select samples of the daily production for auditing. For small series production organizations such as the rolling stock industry, manufacturers of bogies, wagons, product audit is conducted by a joint team formed by the company representatives from designing, technical, quality and production designing so that the team will select samples from a weekly or monthly production.

The first step in the audit relates to verification of product documentation as compared to the reference. "Product documentation" refers to product execution drawings found at the manufacturing lines, technologies, work instructions and control. "Reference documentation" refers to documentation approved and homologated by the customer or by certification bodies.

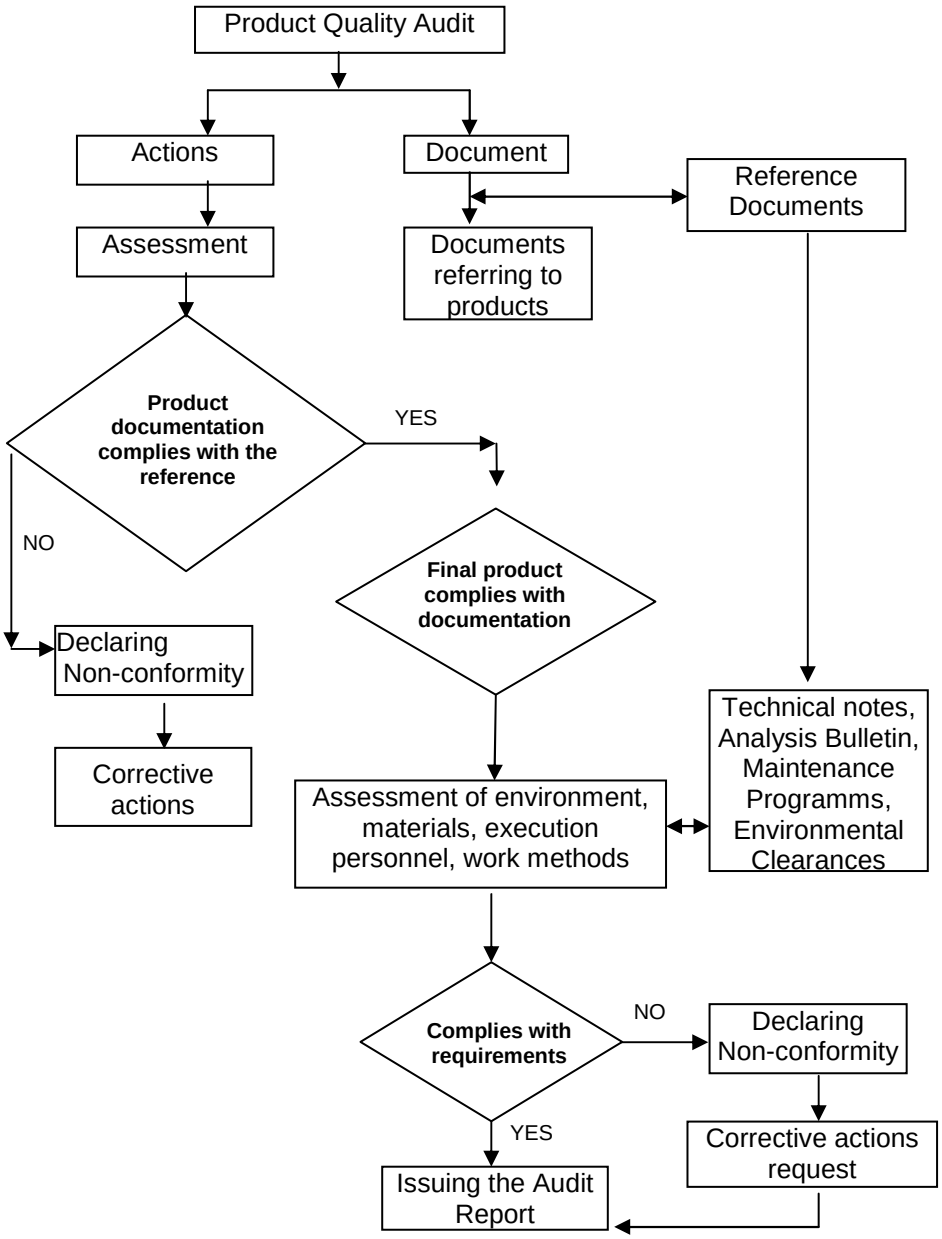

Figure 1 - Product audit Flowchart [1]

The second stage refers to the verification of product as compared to product documentation. Any non-conformity found in these two stages is declared and registered. Non-conformities are classified into three categories:

[1]http://www.scritube.com/management/AUDITUL-ŞI-CERTIFICAREA-CALITA63822.php

Critical non-conformity (Nc) – where the levels of risk refers to impairing the product function, compromising the brand and generate complaints, this type of non-compliance is assigned a score of 100 penalty points.

Major Nonconformity (NP), where the degree of risk refers to minimizing the possibility of actual usage of product and generates complaints. This type of non-compliance is assigned a score of 50 penalty points.

Minor nonconformity, where the degree of risk is not to reduce the likelihood of use but the likelihood of leading to complaints is high; non-compliances of this type are assigned a score of penalty 10 points.

The sum of these penalizing points highlights the difference between the quality of product as compared to a product made in compliance with reference documents. The processes that have generated these nonconformities are classified according to score penalty points.

Figure 2 presents such a classification of processes that are generating non-compliances, according to penalty score assigned at the end of the audit conducted in a bogie.

In quadrant 1 of Fig. 2, the result of penalty point total score obtained at the end of a product audit is shown in columns. The analysis of the trends of these monthly results is made by comparison to the objectives indicated by TARGET, or by comparing one month to the other.

In quadrant 2 in Figure 2 the penalty points score assigned to each process generating nonconformities is represented in columns. Analysis of trends is performed by comparison to the results of a previous period. These previous results are represented by broken line.

In quadrant 3 in Figure No. 2, the penalty points score attributed to each particular special process that generates nonconformities is represented by columns.

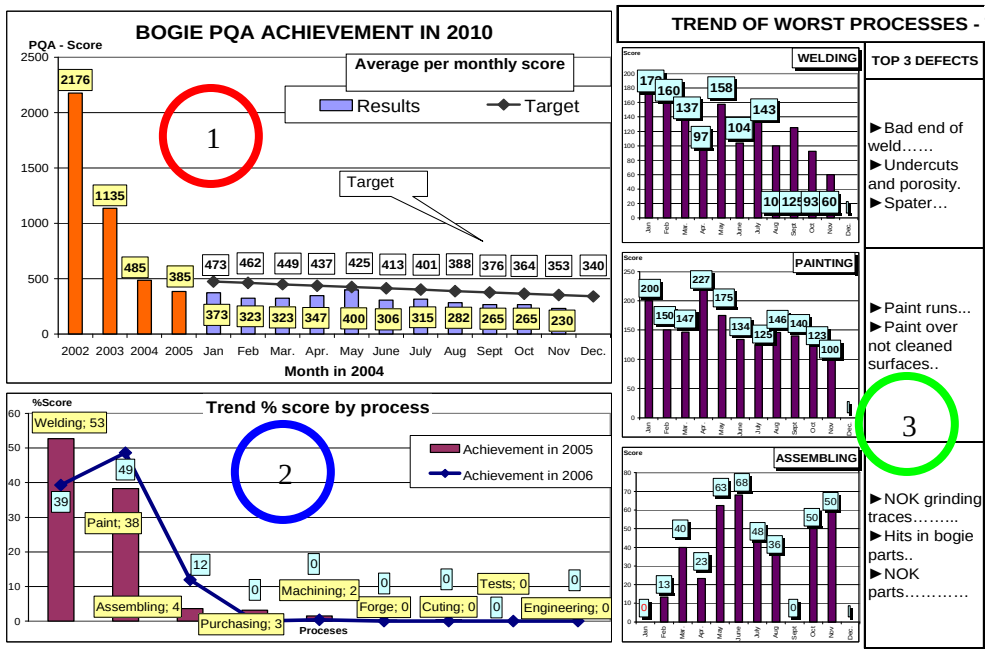

Figure No. 2 – Trend of con-conformities analysis

The third stage concerns the analysis of non-compliance and establishing corrective and preventive actions.

Analysis of non-compliance is based on several concepts that may apply as a unit or in tandem, such as: the 5 why? ; Cause-Effect Diagram (Ishikawa); 4M + E - Man (human), Machine (equipment), Method (work and control technology), Material (material) + Environment (environment).

The analysis of trends is always taking into account two parameters, namely: the objective and the outcome, or the current result against the result from a previous period to the one analyzed.

Corrective measures will be triggered if, after a steady trend of the last three months, the reviewed month shows a deviation both from the target and from the positive evolution of the three previous months. In this situation, management should institute corrective measures plan. If the evolutions of previous months are positive and achieved the targets, but the reviewed month, although achieving target is negative as compared to the previous months, the operational management shall have to implement the prevention actions plan. The results of this analysis are input for the following types of audits that the organization will need to develop: the process and the system audit.

3. RESEARCH HYPOTHESES

The first research hypothesis is based on studying the performance of companies that implemented the product audit as compared with the period before implementation of the audit. The second assumption underlying our study concerns the analysis of the benefits provided by the organizations in our study. We shall carry out our research on the group of wagons factories that are part of the International Railway Systems, a market leader in Europe.

4. SURVEY RESULTS

Table 1 shows the evolution of product audit results in Astra wagon manufacturer in Arad. Analyzing the results obtained in a period of nine years, we see a positive trend in the results of the product audit. This mirrors the fact that, in terms of product quality, Astra has improved the quality of its product, all along the nine years, with more than 80%. By comparing data obtained from Astra cars with data obtained from Drobeta Turnu Severin and Romvag Meva Caracal, we noted that since the implementation of product audit, the quality of the product increased in a period is four years with more than 50%.

Name	*Average of product audit results*									*Improvement*
	2002	2003	2004	2005	2006	2007	2008	2009	2010	
ASTRA	1936	1502	1362	930	795	411	341	283	236	**88 %**
MEVA						780	605	451	323	**59%**
ROMVAG						1120	613	501	501	**55%**

Table no. 1 – Trend of product quality

The benefit of the product audit is reflected primarily by identifying product nonconformities and, at the other end, by identifying the workstation in the manufacturing process that generated the respective nonconformity.

After identifying the generating source of nonconformities, implementing preventive and corrective actions and follow-ups will reduce or eliminate these nonconformities which, in turn, leads to an optimization of the manufacturing process and consequently to a reduction in costs.

Table 2 shows the evolution of the average number of defects per wagon in the three plants analyzed.

Name	***Defects average number per wagon***									***Improvement***
	2002	2003	2004	2005	2006	2007	2008	2009	2010	
ASTRA	30	28	26.6	21,9	12,6	15	15,2	16,8	13	**57 %**
MEVA						28	22	15	14	**50%**
ROMVAG						30	24	17	16	**47%**

Table no. 2 – Trend of Defects average number per wagon

Positive influences of the product quality improvement are also reflected in manufacturing costs. Average defects per wagon identified in the manufacturing process before implementing audit techniques was more than 30 defects per car. A reduction of up to 50% per unit in the number of defects is revealed over a period of at least four years. This reflects the reduction of human resources and financial resources allocated to this process.

The influence of the process audit id defining for the operational management of productive organizations structured on a small or large series production. Product audit is an important key to control the quality management system, demonstrating that its application / implementation, keeping under control a production process is far more efficient.

5. CONCLUSIONS

Product audit is a specific audit method suitable to the manufacturing processes in machinery industry which, integrated within the quality strategy and policies of an organization, is a key manufacturing process control and quality inspection in that process.

The identification of deficiencies occurring in an organization processes is made by means of quantification of product deficiencies (product audit) and, after analyzing the causes of their appearance, they are assigned to the processes that generated the deficiency / defect.

The beneficiaries of the audit results are the processes within the respective Quality Management System as implemented in an organization.

The analysis method of the results generated by a process audit are based on the analysis of the ongoing trends, which simplifies the management's decision-making options regarding the type of corrective or preventive actions that should be implemented.

Audit work should be seen as an inspection done by the client but using organization's staff.

This concept is part of preventive activities that a production organization has to develop in order to ensure the quality of its products.

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