

Maintenance Function Audit According to ISO 9001/2008 Standart Case Study TSS (Arcelor-Mittal) Annaba-Algeria

Audit de la fonction maintenance selon la norme ISO 9001/2008 Etude de cas TSS(Arcelor-Mittal)Annaba-Algérie

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ملخص

تعد تلبية حاجيات العملاء في خصائص وجودة المنتج أهم مشكلة يواجهها تسويق الإنتاج الصناعي، ومن أجل ضمان منتج ذو جودة عالية ، توجب على المؤسسات الصناعية وضع نظام جودة صارم للمؤسسة يلبى متطلبات السوق، إرضاء العملاء وإعطائهم الثقة اللازمة حتى تكون هذه المؤسسة معتمدة وفقا للمعايير الدولية.

من خلال هذا العمل، قمنا بدراسة حالة لمؤسسة الحديد والصلب وحدة TSS (آرسيلور-ميتال)، حيث كان الهدف هو دراسة مدى تطابق نظام الصيانة المنتهج داخل المؤسسة للمعيار الدولي إيزو 2008/9001 في إطار نظام تسيير الجودة، وكذلك إقتراح حلول لبعض المشاكل التي تم مصادفتها أثناء عملية التصنيع من أجل ضمان جودة عالية للمنتج وبالتالي إرضاء الزبائن.

الكلمات الرئيسية: الجودة - التدقيق - الإجراء - الامتثال - عملية - الإدارة

RESUME

Le premier problème majeur rencontré dans la production industrielle a été le produit qui répond aux besoins des clients, par conséquent, la part de marché la plus importante reviendra sans aucun doute à celle qui répondra le mieux aux besoins des clients. Mais le client a désormais besoin de garanties sur l'amplitude du fournisseur pour maîtriser sa production afin de lui assurer un produit de qualité qui amène l'entreprise TSS (Arcelor-Mittal) à mettre en place un système de qualité strict. Ce système permet à l'entreprise de répondre aux exigences, de satisfaire le client et de lui donner confiance, il exige que l'entreprise soit certifiée. Dans ce travail, on a étudié la maintenance et la certification de l'entreprise selon la norme internationale ISO 9001: 2008 dans le cadre d'un système de management de la qualité. Ce travail consiste à résoudre à certains problèmes rencontrés lors du processus de fabrication pour mieux produire et satisfaire le client.

Mots –clés : qualité - audit - procédure - conformité - - management. Processus.

ABSTRACT

The first major problem encountered in industrial production was the product meets customer needs, therefore, the largest market share undoubtedly revert to that which will best meet customer requirements. But the client now requires guarantees on the amplitude of the supplier to master its production to ensure him a quality product that leads the company TSS (Arcelor-Mittal) to set up a strict quality system. This system allows the company to meet requirements, satisfy the customer and give him confidence, it requires the company to be certified. In our work, we studied the maintenance and certification of the company according to International Standard ISO 9001: 2008 under a system of quality management. This work is to solve some problems encountered during the manufacturing process to produce better and to satisfy the customer.

Key words: quality- audit- procedure- compliance- management- processes.

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1. INTRODUCTION

The opening of the Algerian borders to products and services imposed by the market economy means that the field of competition between companies will no longer be limited to the region or the country but will be expected worldwide. However several trends give the customer and the relationship with this client a structuring place in the operation of the company. It is the race for excellence. But the customer now demands guarantees on the ability of the supplier to master its production tool to ensure a quality product, this leads the company "TSS" to the implementation of a rigorous quality system (fig.1, fig.2).

This system allows the company to meet the requirement and satisfy the customer and gives it confidence; the latter requires the company to be certified, it admits as a supplier in a growing number and realize, an improvement of the organization's processes.

As long as quality is always judged against a reference, the company "TSS" implements a quality management system complying with the requirements specified in the ISO 9001 version 2008 standard [1,2].

The evaluation of the concepts of quality and their increasing application in the various industrial and administrative sectors has led to making quality a recognized management tool [3]. The processing and exploitation of real-time quality defects: control results, identification of production defects or failures of the organization, quality of production or failure of the organization, quality of suppliers, etc .Allowing corrective actions with each anomaly report.

The new definition of the audit which is given in the standard ISO 9000 version 2008 is the following one [4]:

“The audit is a methodical, independent and documented process making it possible to obtain evidence of audit and to evaluate them in an objective way to determine the criteria of audit up to what point are satisfied”.

This work allowed us to study the maintenance, certification and internal audit of the company according to the ISO 9001 version 2008 according to a quality management system and we tried to solve some problems encountered during the trial of Arcelor-Mittal Annaba "TSS" manufacturing unit, which produces seamless tubes, to better produce and satisfy the customer [5].

This company has been certified by ISO 9001/2000 in 1999 and by ISO 9001/2008 in 2003 by AFNOR.

TSS Arcelor mittal was certified by API (American Petroleum Institute) in 2011.



Figure 1: Spheroidizing oven (TSS).

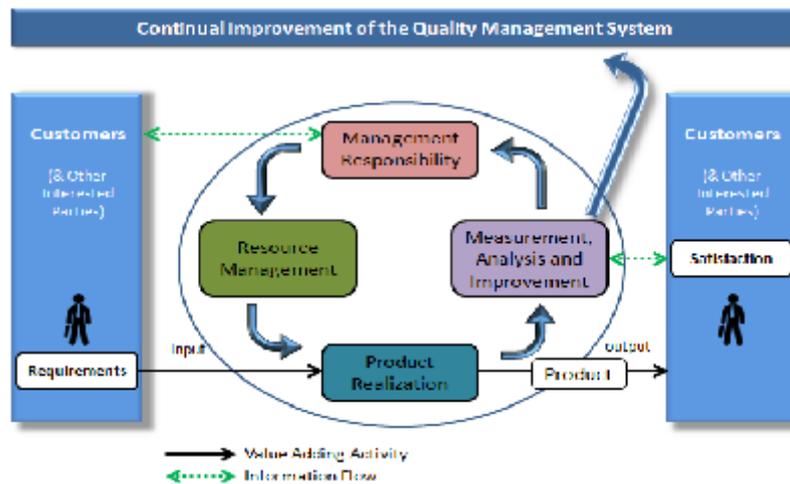


Figure 2: Quality management process model.

2. ISO 19011 / 2011- GUIDELINES FOR AUDITING SYSTEMS

ISO 19011 provides guidance on auditing management systems [6], including the principles of auditing, managing an audit programme and conducting management system audits, as well as guidance on the evaluation of competence of individuals involved in the audit process, including the person managing the audit programme, auditors and audit teams.

ISO 19011 is applicable to all organizations that need to conduct internal or external audits of management systems or manage an audit programme.

The application of ISO 19011 / 2011 to other types of audits is possible, provided that special consideration is given to the specific competence needed.

The ISO 19011/ 2011 guidelines offer four resources to help companies:

- A clear explanation of the principles of management systems auditing.
- Guidance on the management of audit programs.
- Guidance on the conduct of internal or external audits.
- Advice on the competence and evaluation of auditors.

These resources provided by ISO 19011/2011 enable companies to:

- Avoid confusion about the objectives of audit programs.
- Ensure that audit reports follow the best format and contain all of the relevant information.
- Evaluate the competence of the audit team to comply with ISO 19011 standards.

3. METHODOLOGY

3.1. The audit approach

The proposed audit approach consists of three levels [7]:

- 1st level: it describes the four main steps in the conduct of the audit:

- Audit initialization;
- Audit preparation;
- Conducting the audit;
- Drafting and dissemination of the audit report;

- 2nd level: it specifies exhaustively the activities relating to each main stage.

- 3rd level: it gives the supports, records and useful details to the conduct of each audit activity.

Some examples of questions and answers from the audit and the audit planning are presented in the tables (Tab1.and Tab2.).

Table 1: Collection form of observations and answers.

Audit Questions	Points to be Checked	Collecting Evidence
<ul style="list-style-type: none"> - Are the critical equipemnt identified ? - Are the failures Identified ? - Are the failure cods determined ? 	Identifiacation of critical equipement in terms of failure cost.	<ul style="list-style-type: none"> - Sheets of critical equipment. - List of critical failures. - Failure costs -
.....

Table 2: Audit planning.

Audit process	1 J	2 J	3 J	4 J	5 J
Optimisation, Policy and strategy					
Inventories Law consolidated					
Documentation					
.... ...					
Feedback and Analysis					
Ameliorative Studies					
Computer assisted Maintenance					

3.2. Management System of the Maintenance: The proposed approach

Our approach is to divide the maintenance management system into different sections [8, 11]. These are all the essential components which make it (Fig.3).

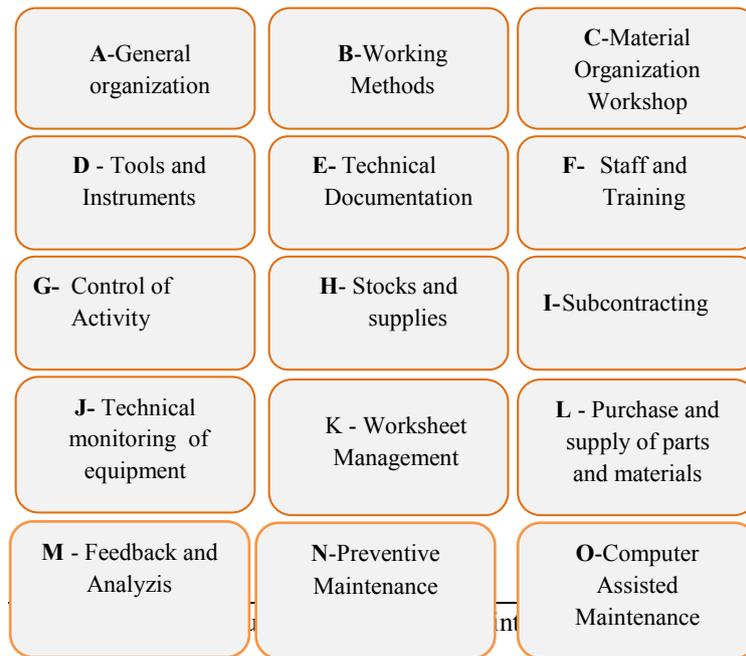


Figure 3: maintenance management system into different sections

Each rubric is, in turn, divided into a set of sub-rubric. They will provide a detailed and comprehensive representation of the logical flow of their related maintenance activities. In the following, we present as examples developed subtopics for registration. Feedback and analysis (N) and Preventive maintenance (M).

Feedback and Analysis (N)

- Intervention traceability report
- Lubrication plan record
- Round record
- Operating Maintenance Record
- Historie
- Accounting
- Periodic analysis
- Determination of technical indicators: TRS, (Failure rate), MTBF, MTTR, (Turnover of stock)...
- Determination of economic indicators: direct costs and indirect costs for equipment, (design), workshop, factory... By specialty, for maintenance strategy, stock value, consumption value...
- Development of dashboards (technical and economic)
- Benchmarking
- Actions
- Optimization of frequency response
- Ameliorative studies
- Modification of Maintenance strategy
- Changing procurement policy
- Trainings.
- Changing operators
- New acquisitions

Preventive maintenance (M)

- Identification of critical equipments in terms of cost of failure
- Systematic maintenance outside the annual revisions
- Maintenance of operations
- Predictive Maintenance
- Rounds
- Maintenance of exploitation or of conduct

- Maintenance strategy selection procedure for each critical component
- Maintenance Plans
- Records revisions: Maintenance Studies AMDEC and the manufacturer's recommendations to define the preventive work which to be done
- Range of maintenance
- Plans of greasing and lubrication
- Work planning by Gantt or Pert
- Load Optimization
- Preparation of important works
- Resource reservation: Men, machinery, tools, local,
- Maintenance Consultation Operation for Planning

So we will have a total of 246 sub-rubrics (referential). They will be establishing a global representation of the shares of the maintenance function as a description of its internal mechanisms every time this latter is activated as part of the fulfillment of its mission within the company.

- The referential thus formulated, it is up to the auditor initially to ask relevant questions in order to understand the reality to understand the reality of the maintenance function through capturing and processing of the collected information. Then, compare the reality to our repository, set a finding of compliance and assess differences. Our approach can also be applied for positioning relative to a prior situation, as part of a process of continuous improvement of the maintenance function.
- During our audit approach, the auditor is free to ask useful questions to estimate the reality (progress, performance ...) of each sub-rubric. He can therefore add or subtract other issues. These latter may differ in situation from one company to another. They depend on the history, implementation, and sector of activity and peculiarities/specificities of the company in question.

3.3. Evaluation of the audit

3.3.1. Evaluation of the rubric

- 1- We have assigned to each sub-rubric a mark N_i between 0 and 10. It constitutes an estimation of its degree of realization with respect to the reference. The determination of this mark is set through a questionnaire on the implementation of sub-rubric in question.
- 2- We have assigned for each sub-rubric a weight P_i between 1 and 3; it constitutes an estimation of its degree of importance (Tab.3) [9, 10].
- 3- We determine the evaluation of the efficiency degree of the rubric in question by calculating the (global average) of the sub-rubrics that form it:

$$M = \frac{\sum (N_i * P_i)}{\sum P_i} \quad (1)$$

Were N_i is: estimation the degree of realisation of sub-rubric, and P_i is the estimation the degree of importance of sub-rubric.

Table 3: An example of the scoring grid of sub-rubric.

Sub-rubric	N	P	NP
N1			
N2			
.....			
N12			
Rubric Score N			

3.3.2. Evaluating the maintenance function

For evaluating the effectiveness of the global maintenance function, we proceed as follows:

- 1- We determine for each rubric its degree of implementation (efficiency) by calculating its average M_i with the previous method. It constitutes an estimation of the efficiency of its progress.
- 2- We assign to each rubric a weight K_i between 1 and 3; it constitutes an estimation of its degree of importance, [11, 13].
- 3- We determine the degree of the efficiency of the progress of the global maintenance function by calculating the global average of the average of the rubrics which make it up (Tab.4):

$$MG = \Sigma (M_i * K_i) / \Sigma K_i \quad (2)$$

Were M_i is a global average of sub-rubrics,
 And K_i is: estimation the degree of importance of sub-rubric (it is between 1 and 3).

Table 4: Scoring grid rubrics

Rubric	N	P	NP
A- General Organization			
B- Working Methods			
.....			
K-Worksheet Management			
L- Purchase and supply of parts and materials			
Score of maintenance System			

These various coefficients as calculated, will allow us to evaluate the performance of the maintenance function in the manufacturing companies and estimate the reference. They also allow to assess the effectiveness of flow of each of these internal components [12].

Finally, a representation by graphic radar allows us to trace the profile of each rubric and determine thereafter [14,15], the position of the company in terms of maintenance (maintenance profile) (Fig.4).

4. RESULTS AND ANALYSIS

4.1. Implementation of the Audit Approach in a Company

According to all these questionnaires which were made within the services of the company " TSS " Arcelor-Mittal, following results were obtained and presented in the table 5:

Table 5: Results of the questionnaire.

Studied Topic	Percentage
	%
A - General organization	82
B - Working methods	79
C- Material organization workshop	83
D – Tools and Instruments	91
E - Technical documentation	58
F - Staff and training	94
G - Control of activity	81
H – Stocks and supplies	65
I - Subcontracting	54
J - Technical monitoring of equipment	92
K- Worksheet Management	86
L - Purchase and supply of parts and materials	89

4.2 Polar diagram of the maintenance profile

After the treatment of the questionnaire, with results are represented in the table (5) above by the use the graphic tool “polar diagram” carried out by the Microsoft excel software, used in the field of analysis of quality and allowing to represent and compare several indicators by report with the objectives of the company, by identifying the ideal situation and the real level of various indicators (in our case, brakes with certification) [16, 17].

This diagram allows seeing in only one glance the whole of the current situation of the company as well as strong points and the weak points on which to concentrate.

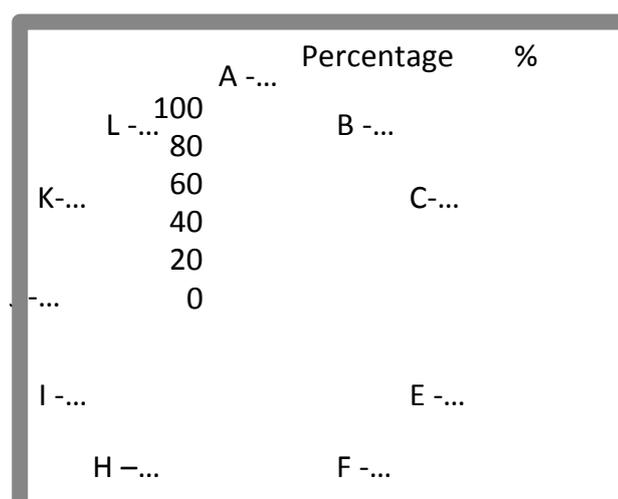


Figure 4: Maintenance profile.

According to the examination of questionnaire, one traced the profile of maintenance .we locate the points which are below mean level of the function maintenance (items weak < 95.80%).

In our case, we identify three (3) priority fields to engage of improvement.

They relate to the:

- Stocks and supplies

- Technical documentation
- Subcontracting

For the other fields, they are strong what watch the effort provides by « TSS » to improve quality on the level of its service of maintenance.

4.3. Some comments on the results

Socks and supplies Obtained score: 65 %

For this (rubric), we can notice:

- The absence of monitoring gears for spare parts consumption ;
- The actual value of the replacement stock cannot be easily creditable;
- The thresholds of supplies are to be set;
- The (consolidation) of stocks (elimination of (unnecessary events), duplicates, ...) is insufficient;
- The absence of (correlation tables of maintenance codes), store, manufacturer;
- A lack of commutable identification;
- Application procedures for deleting items (obsolete, (not compliant), deteriorated...) is not systematic;
- The lack of use of anticipation techniques of consumption;
- Insufficient data analysis, dashboards development and reporting;
- Insufficient inventory optimization studies and supplies of standardization;
- The lack of communication on the objectives and results of the Inventory Management and supplies;
- The (issuance) of order is too slow;
- The lack of coordination between the purchasing department and maintenance department during the various negotiations with suppliers.

Technical documentation Obtained score: 58%

The findings for this (rubric) are:

- Acquisition of technical documentation for new equipment
- Making available reprographic, filing and archiving facilities

Subcontracting Obtained Score: 54 %

The findings for this (rubric) are:

- Follow-up to the work of subcontractor and maintenance Team.

4.4. Recommendations

Socks and Supplies

Update of the codification grid: Standard, Specific;

-Organization of stores: Storage of the PDR (new arrival), Update address sheets;

-Study of dormant stock.

-Analysis and liquidation of dead stocks (reformed installation)

-Determination of the security stock levels for the PDR in stock

-Improved support for movements: Entrance, Exit, Back, Inventory;

-Development of management procedures.

Technical Documentation

- Make efforts to create documents and data sheets for old equipment;

Subcontracting Obtained

- Monitoring the work of subcontracting the maintenance team.

5. CONCLUSION

The objective of this work is the audit of the function maintenance of an organization in general. This objective is justified by the importance of the service maintenance within much undertaken and with the more particular SMQ (standard ISO 9001) which implements by the search for a certification of a company or to preserve it.

According to the theoretical concepts related to certification according to the ISO9001 / 2008 standard, more specifically concerning the audit, we started by carrying out a diagnosis and measuring the performance of the maintenance function based on a set of questionnaires that we used with the staff of this company.

The counting of these questionnaires allowed us to elaborate the profile corresponding to the maintenance service. The analysis of this profile showed that the company TSS made a major effort to improve the quality of its maintenance service. However, the effort must be maintained in the sense that we have defined the properties in the treatment of fields for which the quality of the maintenance service is insufficient.

We also carried out the audit quality in order to study conformity of this service compared to the requirements of the standard ISO 9001/2008.

We noted that the set objectives are not reached at 100% although the procedures are applied in accordance with the standard.

In conclusion, we can say that the maintenance service is efficient and that the management can eliminate the maximum of the weak points detected (the stocks and supplies, technical documentation, subcontracting).

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