

Maintenance Organization and its Impact on the Operational Safety of a Machine Tool: The Case of the Mechanical Lathe

Nzila Kambungu Philippe^{1*}, Ngoie Caleb Caleb²

¹Mechanics Section, Higher Institute of Applied Techniques of Kasangulu, Democratic Republic of Congo

²Research Centre on Mathematics Education, Democratic Republic of Congo

*Corresponding Author: Nzila Kambungu Philippe

ABSTRACT

The organization of maintenance services is based on several factors, including:

- Economic constraints;
- The constraints of information;
- TPM (Total Productive Maintenance);
- Reliability;
- Diagnostic tools built into the machines, etc.

In a mechanical workshop, the main objective of maintenance is to ensure the availability, reliability and safety of equipment in general and machine tools in particular and of personnel while controlling the related costs.

Within the normative framework of the French Standardization Association (AFNOR), through the AFNOR NF 13306 standard, maintenance is defined as the set of technical, administrative and management actions intended to maintain or restore an asset to a state which allows it to perform a required function.

Therefore, a good maintenance organization must be structured, hierarchical and adapted to the available resources of the workshop.

KEYWORDS: organization, impact, operational safety, mechanical lathe.

How to cite this paper: Nzila Kambungu Philippe | Ngoie Caleb Caleb "Maintenance Organization and its Impact on the Operational Safety of a Machine Tool: The Case of the Mechanical Lathe" Published in International

Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-4, August 2026, pp.418-420,

www.ijtsrd.com/papers/ijtsrd142034.pdf URL:



IJTSRD142034

Copyright © 2026 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



I. INTRODUCTION

To implement a maintenance strategy in a mechanical workshop, the following procedure is followed:

- First, an initial diagnosis of the workshop is carried out, which consists of inventorying the different machine tools that make up the workshop: drills, milling machines, shaping vises, parallel lathes, etc.
- Secondly, we choose the machine tool on which the study of this organization will be carried out.

In our case, we targeted the parallel turn, which has very high criticality.

In the case under study, based on the results of the FMEA (Failure Mode and Effects Analysis) and the indicators, the following strategies were selected:

- Corrective maintenance: This is used for interventions after breakdowns, and is suitable for less critical equipment.

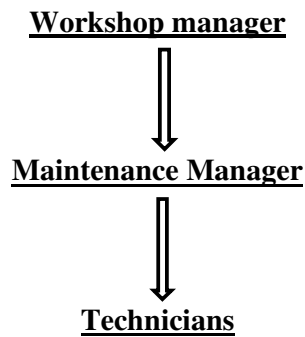
- Systematic preventive maintenance based on time (operating hours). Example: oil change, periodic lubrication.
- Condition-based maintenance: This is based on the condition of the machine (parallel lathe); this maintenance is carried out in case of vibrations or temperature increase.
- Predictive maintenance Based on statistical and historical analysis, this strategy combines corrective maintenance and planned preventive maintenance; it is often optimal.

II. Organization of maintenance for a mechanical turning workshop

II.1. Organizational Structure

A. Hierarchical organization

The hierarchical organization of a workshop is as follows:



B. In an academic context

In this context, the organization is structured as follows:

- Teacher in charge
- Workshop Technician
- Supporting students

II.2. Intervention Planning

Intervention planning takes place at 3 levels, including:

➤ The annual schedule

It concerns the following activities:

- General overhaul of the machines;
- Electrical control;
- Geometric verification of towers

➤ On a monthly level

Activities such as the following are planned:

- Cleaning;
- Control of mechanical play;
- Lubrication check.

➤ The daily schedule

This final stage of planning is characterized by interventions of the following types:

- Visual inspection;
- Checking oil levels;
- Cleaning the wood chips.

II.3. Document Planning

Document planning is one of the major pillars of maintenance organization. It relies on the use of the following essential documents:

- Machine records, preventive maintenance records, intervention reports, breakdown history, modern CMMS tools.

A. Spare parts management

Spare parts management within a mechanical workshop must be done methodically in order to avoid potential stock shortages.

The following methods are used for this purpose:

- ABC analysis of the parts;
- The minimum critical stock method;
- The planned replenishment method

The organization of maintenance also takes into account safety and the environment. From this perspective, maintenance must comply with:

- Industrial safety standards;
- The consignment procedures;
- Wearing PPE (Industrial Protective Equipment)
- Waste oil management

In conclusion, good maintenance organization in a mechanical workshop relies on:

- A scientific approach (FMEA + Indicators);
- Good planning;
- Structured document management;
- Effective staff involvement;

Thus, good maintenance organization allows for:

- A reduction in breakdowns;
- An increase in availability;
- An improvement in security;
- Control of maintenance costs

As for operational safety, it is an activity that aims to maximize confidence in the functioning of systems by combining:

- Failure analysis;
- Effective maintenance strategies;
- Quantitative parameters (reliability, availability, maintainability);
- Assessment and modeling tools.

Thus, an effective maintenance organization directly impacts the operational safety of any equipment when applied correctly. In the case under study, it is sufficient to conduct a thorough failure mode analysis of the parallel lathe and to properly plan maintenance actions to maximize productivity.

Conclusion

The organization of maintenance and its impact on maintenance has allowed us to understand the interdependence of these two concepts in the field of equipment engineering.

Indeed, any maintenance organization that takes into account constraints (technical, economic, environmental, etc.) positively influences the operational safety of the equipment.

From this point of view, we can say that the two concepts "Organization" and "Operational Safety" are inseparable for a long lifespan of equipment.

Bibliographical references

- [1] D. Boite and C. Hazard (1987): guide to maintenance, Nathan Technique.
- [2] Denis Cogniel Y. Gangl off François Castella (1998), Mémotech industrial maintenance, Castella.

- [3] François Monchy (2003): maintenance, methods and organization, Dunod Edition.
- [4] Jean-Pierre Vernier (2012): maintenance, methods and organisation for better productivity, 3rd^{Edition} Dunod.
- [5] JM Auberville (2004): Industrial maintenance: from basic maintenance to safety optimization, Ellipses Edition.
- [6] JM Bleux, JL (2000) Fanchon, maintenance: automated production systems, Nathan Edition.
- [7] Renaud Cuignet, Dunod (2008): Maintenance Management, Ed. Dunod.

