

An Investigation on the Prevalence of Maintenance Workers Practicing or Applying Lockout Tagout During Maintenance Process

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Abstract

Manufacturing industry has many machines and equipment that require frequent maintenance, repair, and service. The presence of dangerous sources of energy such as electricity, mechanical, hydraulic, pneumatic, chemical, thermal or other in machines and equipment can be dangerous for workers. National standards in numerous countries emphasize the necessity of managing hazardous energy associated with machinery to prevent unforeseen events triggered by the sudden release of energy. This study aimed to determine the prevalence of maintenance workers practicing or applying lockout tagout during maintenance process. The quantitative data gathered through the questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) software, employing descriptive analysis. The qualitative interviews were utilized to enrich the research findings and provide supporting information for the proposed LOTO procedure for this manufacturing industry. The results indicated that maintenance workers have a high (93.3%) level of practicing and applying LOTO during machine maintenance process. This research offers a valuable contribution in determining the percentage of the maintenance worker practices on LOTO due to prevent incidents and risks occur towards workers, property, and the environment.

1. Introduction

The present era has witnessed rapid progress in the field of science and technology. Consequently, manufacturing processes involve numerous machines and equipment that demand regular maintenance, repair, and servicing by dedicated maintenance workers. They were exposed daily to machinery that has multiple energy sources. The uncontrolled release of energy may end up in machine-related injuries or fatalities while machines maintenance process. [1]

Lockout tagout (LOTO) is one of the specific practices and procedure used in manufacturing to ensure that dangerous machines are properly shut off and not started up again prior to the completion of maintenance task.[2] Several of the maintenance workers of this manufacturing have claimed there was lack of knowledge

about LOTO, and the maintenance teams occasionally implement LOTO only if their superior decides that it is required to apply.

The objectives of this study was to determine the prevalence of maintenance workers practicing or applying LOTO during maintenance process. There is a minor gap in part of this study which is with one respondent stating that they will not isolate the hazardous energy before performing the maintenance process. The enforcement of safety practices on LOTO as practicable workplace, may reduce the likelihood of death or accidents and significantly increase occupational safety.

2. Methodology

This research study design uses a cross-sectional approach, incorporating a quantitative method. Past study, journals and research were studied and gathered to get better understanding of this study specifically in LOTO specifically for maintenance task. It was all related to the issues with maintenance task that required LOTO and determine percentage current safety practices on LOTO among maintenance workers.

2.1 Data Collection

This study was conducted among maintenance workers. The total of all workers from maintenance workers was 15 respondents. Google form was chosen as the survey platform used in this study as it is free and easy to use. Part of this study is focused on safety practices associated with applying lockout tagout during machine maintenance. The dichotomous scale was employed for this section featuring options such as yes and no.

The questionnaire required validation from experts before proceeding to the data collection step. Besides, two experts from the safety department in this manufacturing endorsed the validity of the questionnaires concerning the lockout tagout topic. The consent form was included for the data collection process allowing respondents to indicate whether they agreed or disagreed with participating in the study.

In this research, a pilot study was conducted with a 10% sample size, consisting of two respondents. This allows the questionnaire developer to identify potential confusion or gather feedback on possible improvements from respondents.[3] Upon data was gathered, the data were analyses using IBM Statistical Package for the Social Sciences (SPSS) software for further analysis.

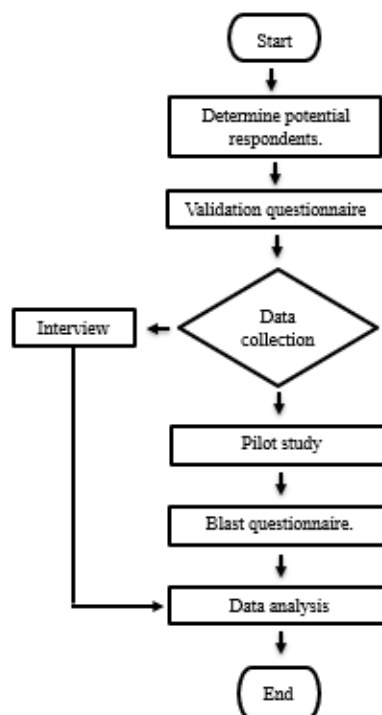


Figure 1 Research flowchart

The reliability test for data pilot test, was subsequently input into the IBM SPSS Software for analysis to determine the reliability of the questionnaire. The Cronbach Alpha test was employed for this purpose, with a threshold value greater than 0.7. Post-analysis revealed a Cronbach Alpha test value of 1.00. This study employed descriptive analysis and the result interpreted and presented in a tabular format.

Table 1 Reliability Statistic

Cronbach's Alpha	N
1.00	2

The mean score interpretation table was used in their research to identify the categories of percentages for result [4]. After calculating all responses, predefined categories were recode in SPSS as per interpretation table 2.

Table 2 The Percentage Interpretation Table

Percentage	Level
75% - 100%	High
50% - 74%	Moderate
0% - 49%	Low

Source: Nurul & Suziyani (2018)

2.2 Result and Discussion

This part was focused on the prevalence of maintenance workers practicing or applying LOTO during maintenance process. Additionally, this part also consists of steps on applying LOTO such as prepare shutdown the machines, notify affected personnel, isolate the energy sources, applying LOTO devices, control of all stored energy and verify lockout.

On the other hand, to address the research objective of this study, a binary approach was employed, using either yes or no options in this section. All items within this section underwent analysis to determine the frequency and percentages (%) of safety practices concerning the implementation of LOTO during the machine maintenance process. The findings of this analysis are detailed in Table 3.

The results indicate that approximately 9 out of 10 items show the highest percentages, reaching 100%. However, for item C4, 14 respondents (93.3%) responded 'yes' to the statement related to isolating hazardous energy before performing the maintenance process, while 1 respondent (6.7%) responded 'no.' The result of the prevalence of safety practices in practicing and applying LOTO during the machine maintenance process, represented in table 4.

Table 3 Frequency analysis and percentage (%) based on the prevalence of maintenance workers practicing or applying lockout tagout during maintenance process. (N=15)

No	Item	Item	Frequency	Percentages (%)
C1	You will identify the energy sources of the machines before performing maintenance process.	Yes	15	100
		No	-	-
C2	You will inform all affected employees that a machine needs to apply LOTO devices for maintenance process.	Yes	15	100
		No	-	-
C3	You will shut down the machines before performing maintenance process.	Yes	15	100
		No	-	-
C4	You will isolate the hazardous energy before perform maintenance process.	Yes	14	93.3
		No	1	6.7
C5	You will ensure the lockout device is suitable for the machine.	Yes	15	100
		No	-	-
C6	You will ensure no affected employees are exposed to hazard while performing maintenance.	Yes	15	100
		No	-	-
C7	You will only begin the maintenance process when it is confirmed as safe.	Yes	15	100
		No	-	-
C8	You will restart the machine once the maintenance process is finished.	Yes	15	100
		No	-	-

Based on table 4, it illustrates that the prevalence of safety practices in applying LOTO procedures during machine maintenance is high, at 93.3%. There were no moderate or low levels of LOTO procedure adherence, with both at 0%.

Table 4 Result of the prevalence of safety practices in practicing and applying LOTO during the machine maintenance process.

	Interpretation	Frequency (N)	Percentage (%)
Prevalence of safety	High	15	93.3%
Practices in practicing	Moderate	-	-
And applying LOTO	Low	-	-
During the machine			
Maintenance process			

4.0 Conclusion

This study sought to evaluate the current practices related to LOTO among maintenance personnel during machine maintenance. The prevalence of safety practices in applying LOTO procedures during machine maintenance is high, at 93.3%. There were no moderate or low levels of LOTO procedure adherence.

The result presents very positive of practicing or applying LOTO safety practices by maintenance workers during machine maintenance process. This data verifies that the maintenance workers have excellent practicing and execution of proper LOTO implementation. On the other hand, continued training and refreshing on energy control principles could help address the minor deficiency seen in isolating all energy sources. Finally, an underlying safety-focused organizational culture is likely a key driver empowering diligent LOTO adoption by workers during machine servicing and repairs.

There were a few limitations to consider in this study. Firstly, the sample size of respondents was relatively small, possibly consisting of fewer than 15 workers. This limited sample size could have affected the generalizability of the findings and the ability to draw definitive conclusions about the overall safety practices in lockout tagout within the manufacturing industry.

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