

Implementation of Preventive Maintenance Management in Mosque Buildings : Indonesia

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Abstract

Questionnaire result on Schedule/Planning showed that the mosque council already have an awareness about the importance of scheduling and planning in preventive maintenance. Not only aware of the importance but the mosque council also have been implemented it. And then on Technique/Maintenance and Components/Parts and Equipment showed us that the mosque council has great stock management of equipment/spare components. And about Inspection showed us that the mosque council was already aware of the importance of inspection in preventive maintenance. Downtime showed that the mosque facility maintenance would disturb the mosque activities. Not only disturbing the mosque activity, but the mosque maintenance also cost much time. A mosque will continue to be an asset only if it is operated and maintained properly. It requires maintenance to maintain structural integrity as well as aesthetic appearance, even inside and outside This study was conducted to determine the extent to which preventive maintenance was implemented in mosques. The research object of this study is a mosque. The questionnaire will be used for data collection in this study. The questionnaire will be used to determine the criteria and subcriteria which are suitable as the result of this study. The number of respondents for this study is 30 (thirty). The selected respondents are mosque administrators. The Likert scale (1-5) was used to see the opinions of the respondents on whether the proposed criteria and sub-criteria were deemed suitable or not with this study.

Keywords

Preventive Maintenance Mosque, Scheduling/Planning, Mosque

1. Introduction

When the Prophet found himself that the cleaner of the mosque had died, he asked him why he didn't notify. Then he visited the grave of the person and performed the funeral prayer. This shows the importance of mosque maintenance personnel in society. A mosque will continue to be a valuable asset only if it is operated and maintained properly. It requires maintenance to maintain structural integrity as well as aesthetic appearance, even inside and outside. (Ibrahim et al., 2009) maintenance can be interpreted as the maintenance of a building so that it can function properly intended purpose. (Arditi & Nawakorawit, 1999) (British Standard Institution, 1986) British Standard 8210 defines maintenance as a combination of all technical and administrative measures intended to maintain or restore a state in which it can perform its required functions. (Wordsworth, 2001) interprets actions contained in the standard as the initiation, organization, and implementation of series work. Two work processes are imagining, maintaining, and restoring. Maintaining is more on work done in anticipation of failure, and recovery is work done after failure. Mosques located in big cities must implement preventive management so that congregations become comfortable and safe. Limited research has attempted to evaluate the performance of the current system through comprehensive and unit-based costing. (Nurchahyo et al., 2020) Mosque administrators must also be

able to reduce waste, one way is by reusing ablution water as an alternative source of water in the mosque.(Salikha et al., 2020)

1.1 Objectives

This study was conducted to determine the extent to which preventive maintenance was implemented in Mosque

2. Literature Review

Commonly, Preventive Maintenance is divided into two strategies, which are scheduled maintenance and condition-based maintenance. (Yang, 2004) In the Building/Office Maintenance Process the most significant maintenance characteristics towards overall performance are: • Skill and knowledge of maintenance labour • Quality of spare parts and materials • Length of predetermined maintenance interval • Skill and knowledge of maintenance manager • Capability to adopt maintenance equipment and technique • Budget allocation for acquisition of maintenance data • Reliability of maintenance data • Frequency of monitoring and inspection (Au-Yong et al., 2014). In this research we adopt Building Maintenance characteristic as below

2.1 Scheduling/Planning

Maintenance scheduling is a process in which jobs are matched against resources (crafts) and given time slots for execution. Scheduling is divided into three stages based on the time horizon of planning and implementation. The stages are: (1) Long term or master schedule for 3 months-1 years; (2) weekly schedule, is maintenance work covering one week; and (3) a daily schedule that includes work to be completed each day. (Ben-Daya et al., 2009)

2.2 Technique/Maintenance and Components/Parts and Equipment

Points out that maintenance involves sending, receiving, and distributing goods spare parts necessary for the repair, maintenance, and maintenance of factory equipment and machine. It is the maintenance responsibility to keep track of all required spare parts and list all spare parts that deliver and leave inventory. In addition, it is the responsibility of maintenance to set the minimum level and order quantity for each spare part. These two factors are very important where they can result in over costs or production delays if equipment breaks down and no backup is available parts to use. (Wireman, 1994)

2.3 Inspection

Inspection is defined as an official process of checking that things are in the correct condition or that people are doing what they should; an act of looking at something carefully, especially to check that it is satisfactory.(Macmillan, 2014) The inspection involves the measurements, tests, and gauges applied to certain characteristics regarding an object or activity. The results are usually compared to specified requirements for determining whether the item or activity is in line with these targets. Inspections are usually non-destructive. In the same vein, Inspection is seen as the act of looking at something close to learning more about it, to find problems, et cetera; the act of inspecting something. (Merriam – Webster, 2014)

2.4 Downtime

Downtime is any event that stops planned production for some time. Downtime categories are as follows: Planned downtime (PD) is the misplaced operating time due to planned events where there is no intention of keeping the plant operational, for example, breaks, scheduled maintenance, and holidays. Plant operating time (PO(t)) is the total amount of time that the plant is available for operation. Planned production time (PP (t)) is the benchmark against which unplanned downtime events are measured. Unplanned Downtime (UD) is the measure of the loss of planned production time due to unplanned events that cause downtime and negatively affect OEE, events such as operator error, mechanical problems, and lack of oversight are some of the biggest varieties of reasons leading to unplanned downtime. Each of these events results when operations are shut down and each event time is added, hence the total amount of unplanned downtime is derived. (Hechtman, 2011)

3. Methods

To achieve the objectives of this study, the methodology was used for this study is as follows: first, study the literature on research topics to understand what methods can be used, the selection of criteria, and sub-criteria that suit the purpose of this study. The research object of this study is a mosque. The questionnaire will be used for data collection in this study. The questionnaire will be used to determine the criteria and subcriteria which are suitable as the result of this study. The number of respondents for this study is 30 (thirty). The selected respondents are mosque administrators. Society International the Likert scale (1-5) was used to see the opinions of the respondents whether the proposed criteria and sub-criteria were deemed suitable or not with this study. Scale “1” means “very disagree”, “2” means “disagree”, “3” means “neutral”, “4” means “agree” and 5 means “very agree”. We took several mosques in The city of Bekasi, Bogor, Banjar, Jakarta, Jogja, and Tasik as our sample. Each respondent then will be asked to value each sub-criteria according to the scale. Then, we will use the mean as one of the descriptive statistic techniques to find the average value given from all respondents. Descriptive statistics help describe and understand the features of a specific data set by giving short summaries about the sample and measures of the data. The total sum value of the sub-criteria will be divided by the number of respondents to get the average value of the sub-criteria. The criteria and sub-criteria with mean value ‘3’ (three) or below were decided to not be used further in this study because they were deemed to be unsuitable for this study. Drawing conclusions and suggestions. (Kamili et al., 2020)

4. Data Collection

4.1 Schedule/Planning

To examine whether the mosque council implementing a great schedule for preventive maintenance, we asked three of the following questions to our respondents.

- **The Mosque council should have a schedule or plan of mosque’ facility maintenance (S1)**

This question was proposed to examine the awareness of the mosque council about the importance of scheduling and planning in the implementation of preventive maintenance. The most of respondents' respond to this question are 4 and 5 (approximately 64,516% for respond 5 and 25,806% for response 4). This result shows that the mosque council already has an awareness about the importance of scheduling and planning in preventive maintenance.

- **The mosque council already have a schedule and a plan of mosque’ facility maintenance (S2)**

Not only aware of the importance but the mosque council also have been implemented it. This is shown in the response to this proposed question. This question examined whether the mosque council has been applied maintenance scheduling or planning. Most of the respond are 4 and 5 (35,484% and 35,484% of the response, respectively)

- **The existence of the schedule and plan of mosque’ facility maintenance expedite the mosque activity (S3)**

- The next question was examining whether there was an impact of the scheduling on the mosque activity. The response to this question is 58,065% answering 5, 32,258% answering 4, 6,452% answering 3, 0% answering 2, and 3,226% answering 1. This result showed us obviously that the implementation of the preventive maintenance scheduling and planning was expediting the mosque activity.

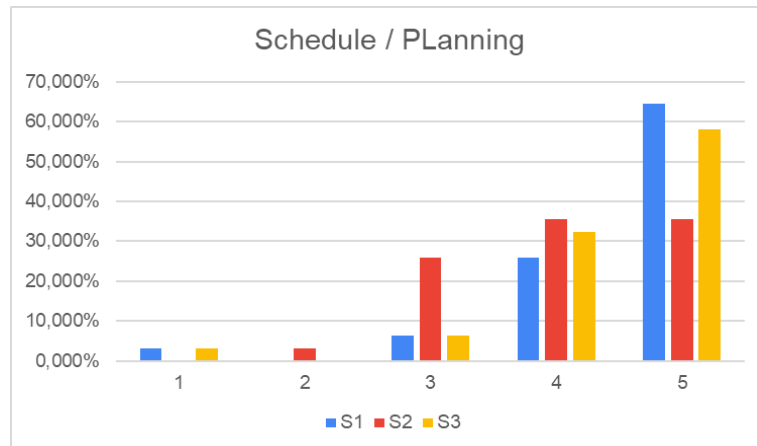


Figure 1. Questionnaire result about schedule/planning

4.2 Technique/Maintenance and Components/Parts and Equipment

The existence of proper technique/components/parts/equipment was also very important in preventive maintenance. Preventive maintenance cannot be running without great management of components/parts/equipment stock. That's why we examine the existence of technique/maintenance and components/parts and equipment through the following questions

- **The mosque council should have an operational standard/technique in maintaining the mosque facilities (T1)**

As the former part, the question started with examining the awareness of the mosque council about the importance of the existence of technique/operational standard of preventive maintenance. They respond 5 and 4 that covered 80,645% of the response showed us obviously that the mosque council is highly aware

- **The mosque council already have the equipment/spare components always available in the mosque (T2)**

The next question was examining the implementation. Most of the respondents chose 5 and 4 in this question (45,161% answering 5 and 32,258% answering 4). This result showed us that the mosque council has great stock management of equipment/spare components.

- **Technique/maintenance in the mosque has been well applied, so there is no obstacle in running mosque activity (T3)**

The last question of this section was examining whether there was an impact of having a great technique/maintenance on reducing the mosque activity obstacles caused by a broken facility of the mosque. The respondents strongly agree (5) and agree (4) with this statement (41,935% and 38,710% of the response, respectively). Those were proofing the importance of great stock management and great technique in running preventive management.

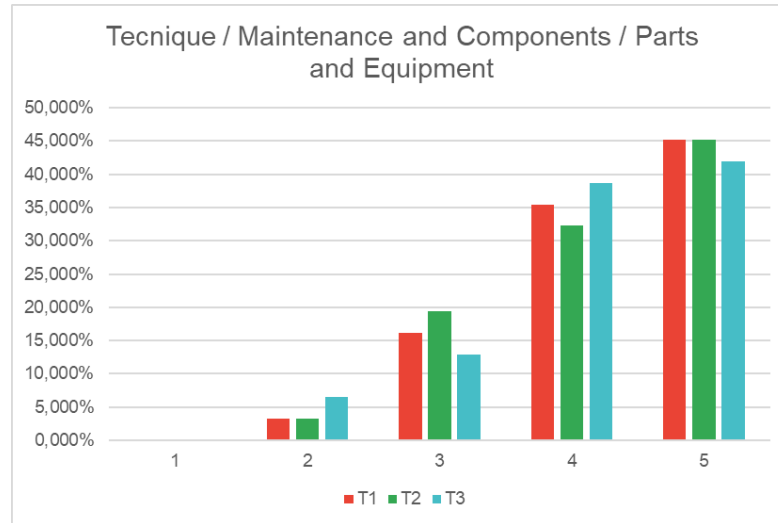


Figure 2. Questionnaire result about technique/maintenance and components/parts and equipment

4.2 Inspection

To examine whether the mosque council implemented an inspection or not, we asked three of the following questions to our respondents.

- **The mosque council should inspect/investigate the mosque facility as scheduled and get noticed about the feasibility of the facility, so every facility is always ready to use (I1)**

Most of the respondents answered 5 (54,839%) in this statement. This showed us that the mosque council was already aware of the importance of inspection in preventive maintenance.

- **The mosque council has already inspected/investigated the facility as scheduled and the procedures (I2)**

Most of the respondents answer 4 (45,161%) to this statement. This result indicates that the mosque council already implementing the inspection.

- **Mosque facilities are always ready to use (I3)**

Most of the respondents answer 4 (48,387%) to this statement. This result indicates that the implementation of the inspection was create a better mosque service.

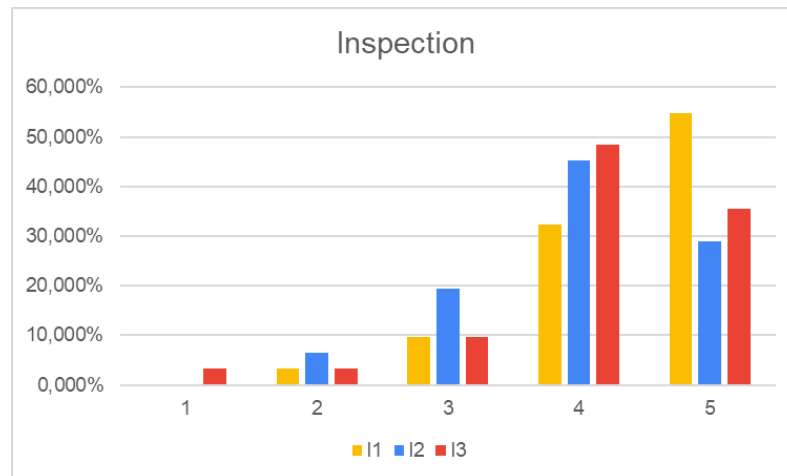


Figure 3. Questionnaire result about inspection

4.4 Downtime

To examine whether downtime occurs when maintaining the mosque facility, we asked three of the following questions to our respondents.

- **The mosque facilities maintenance would disturb the mosque activity (D1)**

Most of the respondents chose 4 and 5 (67,742% of the response). This result showed us that even though the mosque council has already implemented great scheduling and planning, a great technique, great stock management of components/equipment/parts, and a great inspection, maintenance downtime is still unavoidable. The mosque facility maintenance would disturb the mosque activities.

- **The facilities maintenance would take cost so much time (D2)**

Not only does disturbing the mosque activity, but the mosque maintenance also costs much time. This condition was proven by the respondent's response to this statement. Most of the responses were 4 and 3, which covered 29,032% and 32,258% of the responses, respectively. This result emphasizes the importance of great management of maintenance. Building maintenance management is not enough only through scheduling and planning, technique/equipment and components, and inspections.

- **Damages never occur in the mosque facilities (D3)**

Considering the result of this statement, which is the most of respondents choose 1 (35,484%) in this statement, the importance of preventive management grew up as most mosques cannot avoid the damaged facility that disturbing the mosque activity in much time.

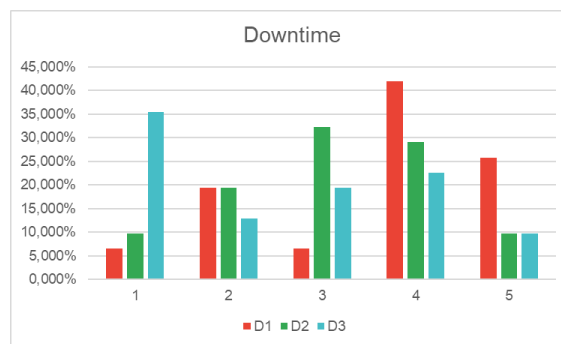


Figure 4. Questionnaire result about downtime

3. Results and Discussion

5.1 Schedule/Planning

To examine whether the mosque council implementing a great schedule for preventive maintenance, we asked three of the following questions to our respondents. This question was proposed to examine the awareness of the mosque council about the importance of scheduling and planning in the implementation of preventive maintenance. The most of respondents' respond to this question are 4 and 5 (approximately 64,516% for respond 5 and 25,806% for response 4). This result shows that the mosque council already has an awareness about the importance of scheduling and planning in preventive maintenance. Not only aware of the importance but the mosque council also have been implemented it. This is shown in the response to this proposed question. This question examined whether the mosque council has been applied maintenance scheduling or planning. Most of the respond are 4 and 5 (35,484% and 35,484% of the response, respectively). The next question was examining whether there was an impact of the scheduling on the mosque activity. The response to this question are 58,065% answering 5, 32,258% answering 4, 6,452% answering 3, 0% answering 2, and 3,226% answering 1. This result showed us obviously that the implementation of the preventive maintenance scheduling and planning was expediting the mosque activity.

5.2 Technique/Maintenance and Components/Parts and Equipment

The existence of proper technique/components/parts/equipment was also very important in preventive maintenance. Preventive maintenance cannot be run without great management of components/parts/equipment stock. That's why we examine the existence of technique/maintenance and components/parts and equipment through the following questions. As the former part, the question started with examining the awareness of the mosque council about the importance of the existence of technique/operational standard of preventive maintenance. They respond 5 and 4 that covered 80,645% of the response showed us obviously that the mosque council is highly aware. The next question was examining the implementation. Most of the respondents chose 5 and 4 in this question (45,161% answering 5 and 32,258% answering 4). This result showed us that the mosque council has great stock management of equipment/spare components. The last question of this section was examining whether there was an impact of having a great technique/maintenance on reducing the mosque activity obstacles caused by a broken facility of the mosque. The respondents strongly agree (5) and agree (4) with this statement (41,935% and 38,710% of the response, respectively). Those were proofing the importance of great stock management and great technique in running preventive management.

5.3 Inspection

To examine whether the mosque council implemented an inspection or not, we asked three of the following questions to our respondents. The question started with the mosque council should inspect/investigate the mosque facility as scheduled and get noticed about the feasibility of the facility, so every facility is always ready to use. Most of the respondents answered 5 (54,839%) in this statement. This showed us that the mosque council was already aware of the importance of inspection in preventive maintenance. The next question is the mosque council has already inspected/investigated the facility as scheduled and the procedures. Most of the respondents answer 4 (45,161%) to this statement. This result indicates that the mosque council already implementing the inspection. The last question is Mosque facilities are always ready to use. Most of the respondents answer 4 (48,387%) to this statement. This result indicates that the implementation of the inspection was create a better mosque service.

5.4 Downtime

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activities. Not only does disturbing the mosque activity, but the mosque maintenance also costs much time. This condition was proven by the respondent's responses to this statement. Most of the responses were 4 and 3, which covered 29,032% and 32,258% of the responses, respectively. This result emphasizes the importance of great management of maintenance. Building maintenance management is not enough only through scheduling and planning, technique/equipment and components, and inspections. Considering the result of this statement, which is the most of the respondents chose 1 (35,484%) in this statement, the importance of preventive management grew up as most mosques cannot avoid the damaged facility that disturbing the mosque activity in much time.

4. Conclusion

The purpose of this research is to determine the extent to which preventive maintenance was implemented in mosques. The results of this study can be used as evidence and reference that preventive maintenance at several mosques has been carried out properly. Questionnaire result on Schedule/Planning showed that the mosque council already have an awareness about the importance of scheduling and planning in preventive maintenance. Not only aware of the importance but the mosque council also have been implemented it. And then on Technique/Maintenance and Components/Parts and Equipment showed us that the mosque council has great stock management of equipment/spare components. And about Inspection showed us that the mosque council was already aware of the importance of inspection in preventive maintenance. Downtime showed that the mosque facility maintenance would disturb the mosque activities. Not only disturbing the mosque activity, but the mosque maintenance also cost much time.

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Biography

Lutfie Hidayatullah is a postgraduate student at the Department of Industrial Engineering, University of Indonesia, he obtained a Bachelor's degree in Industrial Engineering from the Industrial Engineering Study Program, Faculty of Industrial Technology, Islamic University of Indonesia and graduated in 2016, he has worked at PT Indonesia Epson Industry, East Jakarta Industrial Park, Cikarang , Bekasi as Total Quality Assurance Staff. and Worked at the Indonesian Ministry of Public Works and Public Housing, the Citanduy River Basin Center as Administrator at the Situ, Embung, Lake Department (DSE) and Supervisor for the Karohroy Lake Project Construction, Tasikmalaya

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Michael Alfonsus L. Suryo S. is currently a master's degree student in the Industrial Engineering Department, Faculty of Engineering, Universitas Indonesia. He took his Bachelor of Management (S.M.) from Universitas Pembangunan Nasional "Veteran" Yogyakarta (UPN "Veteran" Yogyakarta). He has published several articles in international journals and presented several articles at international conferences. His published articles, both journal articles, and paper articles are in the area of strategic management and digital marketing management. In 2019 he won two business case competitions on a national scale, held by universities in Indonesia. The first business case competition is in marketing management. He won second place in the first business case competition. The second business case competition is in logistics. He won third place in the second business case competition. In 2020 he also published two books in strategic management and digital marketing management. His research interest includes strategic management, strategic formulation, marketing management, digital marketing management, human brand.