Maintenance Management Of Welding Engineering Workshops In Vocational High Schools In Special Region Of Yogyakarta

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Abstract. This study aimed at investigating the maintenance management of welding engineering workshops and factors affecting the damage of welding equipment in vocational high schools located in Special Region of Yogyakarta. The study employed quantitative descriptive design. It was conducted at vocational high schools SMKN 1 Sedayu, SMKN 2 Pengasih, SMK Muhammadiyah 2 Wates, and SMKN 1 Pundong. The respondents were heads of workshops, teachers of welding engineering subject, workshop technicians, and students. The data were collected through survey, observation, and interview. The quantitative descriptive technique was employed to analyze the collected data. The results of the study show that the maintenance management of welding engineering workshops in some VHS in Yogyakarta is Very Good despite some problems in the maintenance procedure. The factors causing the equipment damage are the unscheduled maintenance procedure, absence of inventory lists, lack of technicians, improper use of workshop equipment, and the limited amount of maintenance budget.

Keywords: maintenance, workshop, welding engineering

1. INTRODUCTION
Vocational high schools generate competent graduates who are ready to work. The graduates are expected to combine their skills and knowledge in working. The skills and knowledge of engineering can be easily mastered when the implemented teaching model combines practicums and in class learning activities (Purwanto dan Thomas, 2015: 293). Practicums are aimed at implementing the techniques which students learn when they are learning the theories.

According to Sukardi (2015: 3), a workshop is one of the vocational high school facilities. It helps students meet the intended learning objectives of developing students’ professional skills. The Ministry of Education Regulation No 40/2008 on Vocational High Schools/Vocational Madrasah Aliyah (VHS/VMA) facility standards constitutes that a welding engineering workshop is wheresome work, such as metal work, plate work, oxy-acetylene fuel welding and cutting, and arc welding takes place. A workshop should be at least 256 m² and should accommodate at least 32 students. There should be bench work, oxy-acetylene, and electric arc welding areas, as well as storage and instructor rooms.
One of the important aspects of a VHS is workshop and equipment maintenance (Putut, 2011: 204). The equipment needs to be maintained since it is frequently used. Furthermore, maintenance management is aimed at keeping the good condition of the equipment. Workshop maintenance management is an effort to manage all activities carried out in workshops (Fajar, 2013: 1). It supports all activities conducted in workshops, so they may run optimally as they are designed. The concept workshop maintenance management is closely related to the support given to workshop facility system.

A study on workshop maintenance management conducted by Nopitri (2016) shows that maintenance is one of the aspects of workshop equipment management. Maintenance keeps the good condition of the equipment. It, basically, is important since the condition affects the teaching learning processes conducted in a workshop.

Based on the observations of welding engineering workshops which are located in VHS in Yogyakarta (SMKN 1 Sedayu, SMKN 2 Pengasih, SMK Muhammadiyah 2 Wates dan SMKN 1 Pundong), it was assumed that maintenance management was not optimally conducted. The maintenance was not organized well, and there was damaged equipment which hindered teaching learning processes. Thus, a study on workshop maintenance management was conducted. The study focused on some aspects of the maintenance management, such as: the plan, organization, maintenance, supervision, and the factors causing equipment damage. The findings of this study might be a source of information and evaluation about the maintenance management of welding engineering workshop. The good management may support the practicums conducted in workshops.

2. RESEARCH METHOD
2.1 Research Description
Erwan and Dyah (2011: 94) point out that descriptive research aims at providing information about the collected data. The information makes the data meaningful or conveys meanings. This study employed a quantitative descriptive design to assess the qualities of the maintenance management of welding engineering workshops in VHS in Yogyakarta.

2.2 Research Setting
This study was conducted at vocational high schools SMKN 1 Sedayu, SMKN 2 Pengasih, SMK Muhammadiyah 2 Wates, and SMK N 1 Pundong in March to May 2018.

2.3 Research Population
This study was conducted by involving four heads of workshops, eight teachers, four technicians, and 97 students. Disproportionate stratified random sampling was employed to collect the data from heads of workshops, teachers, and technicians. Meanwhile, cluster random sampling was used to collect the data from students.

2.4 Research Procedure
The research procedures were the planning stage (observation, instrument development, research, instrument validation development, and submission of research licenses), the research stage (interview, documentation collection, and questionnaire administration), and the data analysis stage. Data collected from interview and documentation were reduced in accordance with the research method. Then, the data collected from the questionnaires were analyzed quantitatively in Microsoft excel 2010.

2.5 Data, Instrument, and Data Collection Technique
The main data were collected through survey while the secondary data were collected by means of observation, documentation, and interview. The questionnaires were administered to the heads of vocational programs, heads of workshops, teachers, technicians, and the students. Interview guidelines were used in the interviews with the heads of workshops. The observation sheets were used to validate the data collected from the survey and observation. Then, documentation (photographs) showed the real conditions of the workshops.

2.6 Data Analysis Technique

The technique employed to analyze the data was quantitative descriptive. According to Sugiyono (2016: 147), the technique was used to analyze the data by presenting or describing the collected data without drawing any general conclusion. The collected quantitative data were processed by applying the following formula.

\[ P = \frac{\text{the scores acquired}}{\text{the maximum score}} \times 100\% \]

Note:

- \( P \) = Percentage of score

The percentage of the students’ scores was then classified into some categories, namely Very Good, Good, Fair, Poor, and Very Poor. The categories were based on the general classification. The categories and their ranges are presented in the following table.

| Score Percentage | Category      |
|------------------|---------------|
| 80.00 - 100.00   | Very Good     |
| 60.00 - 79.99    | Good          |
| 40.00 - 59.99    | Fair          |
| 20.00 - 39.99    | Poor          |
| 0.00 - 19.99     | Very Poor     |

3. RESULT AND DISCUSSION

This section presents the results of study and discussion of workshop maintenance management in vocational high schools in Yogyakarta. The discussion focuses on the aspects of maintenance plan, organization, the maintenance, supervision, and evaluation. Besides, this section discusses factors causing the damage of equipment in workshops.

3.1 Workshop Maintenance Management

The overall data of the maintenance planning aspect of welding engineering workshops in VHS in Yogyakarta are presented in Table 2.

| Indicator         | Percentage |
|-------------------|------------|
| Planning          | 87.50      |
| Inventory List    | 67.30      |
| Schedule of       | 72.50      |
Table 2 shows that the percentage of the planning aspect is 87.50% which is categorized as Very Good. The aspect includes the activities of determining some targets and actions which are in accordance with the goals of each VHS. Then, the table above shows that the percentage of the inventory list aspect is 67.30%. Based on Table 1, it belongs in the Good category. The high percentage was because the inventory lists made by the schools covered the equipment inventory and equipment borrowed by students. Moreover, the table shows that the percentage of the inventory schedule aspect is 72.50% which is categorized as Good. However, there was only one school that managed scheduled inventory procedures because other schools managed the procedure based on the school programs or individual intention.

Table 2 shows that the average percentage of workshop maintenance planning aspect is 75.77%. Based on Table 1, the percentage average belongs in Good category although, in fact, there were some problems due to the incomplete inventory data and the absence of scheduled maintenance procedures.

The overall results of the workshop maintenance organization aspect in VHS in Yogyakarta are presented in Table 3.

| Indicator       | Percentage |
|-----------------|------------|
| Work Procedure  | 88.89      |
| Job Description | 89.69      |
| Technician      | 76.85      |
| Average (%)     | 85.14      |

Table 3 shows that the percentage of the aspect of work procedure is 88.89%. It belongs in Very Good category although in fact, there was only one school implementing the work procedure. Then, the table above shows that job description aspect percentage is 89.69%. Based on Table 1, it belongs in Very Good category. Moreover, the table shows that the percentage of the technician aspect is 76.85% which is categorized as Very Good. The workshop technicians’ expertise was in accordance with the field of welding engineering, so they were able to carry out their duties well. Besides, they actively participated in some trainings to develop their skills.

Table 3 shows that the average percentage of maintenance organization aspect is 85.14%. Based on Table 1, the percentage belongs in Very Good category although there were problems in relation to the absence of maintenance organizations and sufficient number of technicians.

The overall data of the aspect of workshop maintenance in VHS in Yogyakarta Special Region are presented in Table 4.

| Indicator | Percentage |
|-----------|------------|
| Maintenance | 86.76 |
Table 4 shows that the percentage of maintenance aspect is 86.76% which is categorized as Very Good although in fact there were students who did not make use of equipment as its’ standards suggested. Then, the table shows that the percentage of maintenance administration aspect is 86.45%. Based on Table 1, the percentage is in Very Good category because the administration procedure was in line with the intended targets of maintenance plan. Moreover, the table shows that the percentage of funding aspect is 36.29% which is categorized as Fair. The sources of funding, such as School Operational Assistance (BOS), Regional Budget (APBD), the Budget of the Yogyakarta Special Region Provincial Work Unit (SKPD D.I.Y), and the School Committee Fund were limited in amount.

Besides, Table 4 shows that the percentage of spare part aspect is 82.08%. Based on Table 1, the percentage belongs in Very Good category, and it was due to the availability of sufficient spare-parts, spare-parts replacements, and spare-parts which were appropriate for the equipment specification. At last, Table 4 shows that the percentage of equipment storage aspect is 92.71% which is categorized as Very Good because the equipment was kept in cupboards and boxes in accordance with its types and functions.

Table 4 shows that the average percentage of maintenance aspect is 76.86%. Based on Table 1, the average percentage belongs in Good category despite the problems in maintenance procedure, such as: the students’ improper use of workshop equipment, absence of some maintenance administration, limited amount of funding, and the absence of maintenance funding documentation.

The overall data of the aspect of supervision and evaluation of the maintenance program conducted in welding engineering workshops in VHS in Yogyakarta are presented in Table 5.

| Indicator      | Percentage |
|----------------|------------|
| Supervision    | 82.00      |
| Evaluation     | 88.85      |
| **Average (%)**| **85.42**  |

The percentage of the aspect of supervision and evaluation is 85.42%. Based on Table 1, the percentage belongs in Very Good category because teachers had roles in the processes of buying, replacing, and storing the equipment. They supervised the maintenance procedures carried out by students. Those activities were then reported and evaluated in order to improve the workshop maintenance management quality.

The average percentages of every aspect examined in this study are presented in Table 6.

| Indicator                        | Percentage |
|----------------------------------|------------|
| Average (%)                      | 85.42      |
Table 6 shows that the average percentage of workshop maintenance management in welding engineering workshops in VHS in Yogyakarta is 80.80%. Based on Table 1, it belongs in Very Good category.

3.2 Factors Influencing Damage to Workshop Equipment

There are supposed to be factors influencing the damage of workshop equipment. The data of workshop maintenance management provides information for investigating those factors. It is indicated that those factors include the lack of inventory data, absence of scheduled maintenance procedure, absence of maintenance organization, lack of technicians, improper use of workshop equipment, incomplete maintenance administration, limited amount of funding, and the absence of workshop maintenance funding documentation.

4. CONCLUSION AND SUGGESTION

4.1 Conclusion

The maintenance management of welding engineering workshops in VHS Yogyakarta is categorized as Very Good because maintenance procedures, such as maintenance planning, lists of inventory, a book loan scheme, skilled technicians, equipment maintenance, maintenance administration, spare parts, storage rooms are in place. However, based on the evidence, there are still problems concerning the absence of scheduled maintenance procedure, absence of maintenance organization, lack of technicians, improper use of workshop equipment, incomplete maintenance administration, limited amount of funding, and the absence of workshop maintenance funding documentation.

The factors affecting the damage to workshop equipment are the absence of scheduled maintenance procedure, absence of maintenance organization, lack of technicians, improper use of workshop equipment, incomplete maintenance administration, limited funding, and the absence of workshop maintenance funding documentation.

4.2 Suggestion

Based on the research findings, the researchers suggested the schools complete the inventory data, make maintenance schedules, organize the maintenance procedure, hire more technicians, educate students about the proper use of workshop equipment, evaluate the maintenance administration, put more budget on maintenance management, and establish workshop maintenance programs.

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