Implementation of occupational safety and health management system (OSHMS) on work-related accident rate in the manufacturing industry, Indonesia

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Abstract. The Occupational Safety and Health Management System (OSHMS) is an important part of the protection of the workforce so that workers remain safe, healthy and safe. Every year in the manufacturing industry in the Sleman area, Yogyakarta Special Region, work accidents result in losses for the company because they have to be taken to the hospital. This study aims to determine the application of OSH to the occurrence of work-related accidents. This type of research is qualitative. The research was carried out in the manufacturing industry of the Hospital Equipment (HE) Division of the Pre-Treatment and Painting Unit. The research instrument uses the criteria for the OSH audit checklist, Government Regulation Number 50 of 2012, which consists of 5 principles, 12 criteria, and 166 items. The range of results from the audit achievement is 0 – 100%. The implementation of OSH in the company is 76.5%, in the category of good implementation, namely for the level of achievement of 60 – 84%. The number of findings was 39 criteria with major non-conformance categories 0 criteria and 39 minor criteria. The implementation of OSHMS can minimize the incidence of work accidents in workplace.

1. Introduction
In the current era of globalization, technology is increasingly advanced for industries such as mechanization, electrification, and modernization processes. The ASEAN-level free market, commonly known as the ASEAN Free Trade Area (AFTA), requires increased in work productivity to compete and produce goods and services of good quality. Occupational Health and Safety (OSH) is closely related to the production process, services, and industry. The rapid development of Indonesia can increase the intensity of work, resulting in an increased risk of accidents in the work environment [1]. This shows the importance of implementing OSH in the industry so that the OSH culture is realized with the hope that its output reduces the incidence of work accidents or even zero accidents, preventing occupational diseases, and increasing productivity. The fulfilment of OSH in a company environment would impact the health quality of its workers [2].

Indonesia issued regulations regarding the implementation of OSHMS, namely Government Regulation Number 50 of 2012. The OSHMS is a protection system for workers and construction services to minimize the risk of moral, material loss, loss of working hours, as well as human safety and the surrounding environment to support more effective and efficient performance improvements [3]. However, only 2.1% of large-scale companies have implemented OSH in Indonesia [4]. According to Kemas & Hasmawaty (2019), work productivity can be influenced by sources of hazards and risks in the workplace that threaten the safety and health of the workforce. In Indonesia, work accidents have increased from year to year [5]. Based on the Ministry of Manpower (2020) data, the number of work accidents in 2020 was 177,000 cases, increasing 35.6% from 2019.
The manufacturing industry is a private company in Indonesia engaged in manufacturing and engineering, focusing on hospital equipment products. The products produced include patient beds, wheelchair trolleys, patient room furniture, operating tables, examination tables, shelves, cabinets, folding beds, and so on [6]. The Hospital Equipment (HE) Division has four processing units, namely Welding, Pre-Treatment & Painting, Assembling, and Packing. The company obtained OHSAS 18001:2007 certification in the Pre-Treatment and Painting Unit because this unit has a higher potential hazard level than other units.

Every year in the manufacturing industry, work accidents result in losses for the company and must be taken to the hospital. Accidents that occur such as broken fingers, pinched fingers, eyes hit by grinding sparks, and so on. The field study results show that in 2014 there were 19 cases of work accidents; in 2013, there were 23 cases; in 2012, there were 25 cases; and in 2011, there were 24 cases of work accidents. Based on observations, the application of OSH signs in the manufacturing industry has not been optimal. Some workers still take unsafe actions such as violating the work area boundary line, not using glasses when grinding, and not using safety shoes. Based on the description above, this research needs to be carried out to determine the application of the OSHMS to work accidents.

2. Materials and Methods

This study uses qualitative analysis and research design in case studies that aim to describe or describe the situation, assess and find out the implementation of OSHMS. This research was conducted in one of the manufacturing industries in the Hospital Equipment Division of the Pre-Treatment and Painting Unit. The reason for choosing the research location is because the unit has implemented OSHMS through OHSAS 18001:2007 certification regarding OSHMS. In this study, an audit of OSHMS was conducted to determine the implementation of OSHMS in the company and then associated with the incidence of work accidents. The success rate of the OSHMS audit results can be known through calculations using the following formula:

\[
\text{Level of success} = \frac{\text{number of criteria set} - \text{number of findings}}{\text{number of criteria set}} \times 100\% \tag{1}
\]

In this study, an audit of OSHMS was conducted by checking documents, implementation, field observations, and interviews with management and workers in the field. The research instrument used is the OSHMS audit checklist criteria in Appendix II of PP 50 of 2012 Ministry of Transmigration of the Republic of Indonesia, consisting of 5 principles, 12 criteria, and 166 items. With the results of the audit achievement that is 0 – 100% [7]. In this study, an audit of OSHMS was conducted by checking documents, implementation, field observations, and interviews with management and workers in the field.

3. Result and Discussion

Based on Attachment II of Government Regulation Number 50 of 2012 concerning the Implementation of OSHMS, the audit was obtained in the production division of the Hospital Equipment Division of the Pre-Treatment and Painting Unit of the Manufacturing Industry. According to the Regulation of the Minister of Manpower of the Republic of Indonesia Number 26 of 2014 concerning the Implementation of OSH Implementation Assessments, manufacturing industry audits are included in the advanced level criteria by fulfilling 166 criteria with 39 findings totalling 39 criteria with details of major non-conformance categories of 0 criteria and 39 minor criteria. The success rate of the OSH audit results can be known through calculations using the following formula:

\[
\text{Level of success} = \frac{\text{number of criteria set} - \text{number of findings}}{\text{number of criteria set}} \times 100\% = \frac{166-39}{166} \times 100\% = 76.5\% 
\]
Based on the calculations that have been made, the achievement of the implementation of OSH in the manufacturing industry for the production division of the Hospital Equipment PreTreatment and Painting Unit is 76.5%. The results of the OSH audit are in a good category, with a range of implementation achievements of 60 – 84%. When a work accident occurs in the company, it is necessary to identify an investigation report on all cases of non-compliance [8]. The overall findings of the OSH audit can be seen in Table 1.

**Table 1. Description of OSHMS Audit Findings at Manufacturing Industry**

| No | Criteria Number | Criteria | Objective Evidence | Category | Follow-Up (Suggestions for Correcting Non-Conformities) |
|----|-----------------|----------|--------------------|----------|--------------------------------------------------------|
| 1  | 1.4.1           | The involvement and scheduling of labour consultations with company representatives are documented and disseminated throughout the workforce. | There is no documentation and scheduling of OSH issues Occupational Safety and Health Committee (P2K3) (as in the P2K3 forum) labour consultations with company/management representatives. | Minor | Manpower consultations are carried out with company representatives and documented in activity minutes, activity tables, and attendance lists. |
| 2  | 1.4.8           | P2K3 holds regular meetings, and the results are disseminated in the workplace. | The P2K3 meeting is not held, it should be done at least once a month or according to the provisions of the P2K3 procedure. | Minor | It is clear. Conducting P2K3 meetings or coordination, and the results are disseminated in the workplace, about regulation No: Per. 04/MEN/1987. |
| 3  | 1.4.9           | P2K3 reports its activities regularly by regulations. | Not making regular activity reports to the local Manpower Office. | Minor | According to Peraturan Menteri Tenaga Kerja No: Per. 04/MEN/1987 every three months, P2K3 activities must be reported to the local Manpower Office using the reporting format provided by regulations (distribution of reporting & recording of action plan results). |
4. 2.4.1 The required information regarding OSH activities is disseminated systematically to all workers, guests, contractors, customers, and suppliers.

- Information related to OSH in the field is minimal (posters, signs, labels, photos). Like the installation of labels on the control panel is still lacking.
- During the pre-work briefing, issues/information related to OSH are also not included.
- Contractors/vendors, guests, are not given a briefing or safety induction regarding the hazards that exist in the workplace.

5. 6.1.3 There are documented procedures or work instructions to control identified risks based on input from competent personnel and related workers and are approved by authorized persons in the company.

- There is no such procedure, and there is no procedure for hot work permits, confined space permits, work at heights.

6. 6.1.5 There is a work permit system for high-risk tasks.

- There is no work permit system such as work at height, work permit, confined space permit.

7. 6.1.6 PPE is provided as needed, and used correctly and consistently maintained in a usable condition.

- PPE such as safety shoes are not provided, even though in the pre-treatment and painting work environment there is a risk of falling hard objects
- Based on observations in the field, workers are still less aware of using PPE, for example, workers do not wear boat shoes in the painting section, do
not wear helmets and gloves.

8. 6.1.8 Risk control efforts are evaluated periodically if there are discrepancies or changes in work processes.  
- There has not been a review of risk control to determine its effectiveness.
- The company has not reviewed the effectiveness of the use of PPE, such as in the painting work area.
- Minor Supervision is carried out for workers to use PPE completely by the potential hazards in their respective work areas.
- Control is carried out so that dust and paint odours in the painting section do not spread to all other work areas; isolate the room in the paint section and then add an exhaust fan to suck up the dust.

9. 6.2.3 Supervisor participates in hazard identification and makes control measures.  
There is no evidence of implementation inspection reports/hazard source reports, or others.
- Minor Inspection of work areas with potential hazards and documented/ reported.

10. 6.2.4 Supervisors are involved in conducting investigations and making reports on accidents and occupational diseases and are required to submit reports and suggestions to the entrepreneur or management.  
- The company has made a work accident report but has not reported and investigated occupational disease.
- The company has conducted periodic health checks for all workers, but has not reported and investigated occupational disease experienced by workers to the authorized agency (local Manpower Office).
- Minor The company investigates occupational diseases, which have been checked on workers and then traced and made a report.
- The reference in diagnosis and reporting of occupational disease is Keputusan Menteri Tenaga Kerja No. Kep.333/MEN/1989 concerning Diagnosis and Reporting of Occupational Diseases.

11. 6.2.5 Supervisor/supervisor participates in the consultation process  
There is no consultation meeting for supervisors on OSH issues in their work area.
- Minor Conducted consultation meetings related to OSH issues in the area of supervision.

12. 6.4.1 Employers or administrators conduct a risk assessment of the work environment to  
There is no document or list of areas in the workplace that require an entry permit.
- Minor It is making documents or creating a work area that requires an entry permit.
|   | 6.4.2 | There is control over the area/place with restrictions on entry permits. | No control can be in the form of written permission, locking, signs, etc. | Minor Making written permits or signs. |
|---|---|---|---|---|
|   | 6.4.3 | Availability of facilities and services in the workplace in accordance with technical standards and guidelines. | • The company does not have a polyclinic at work  
• The supply of drinking water in pre-treatment painting is still minimal and its reach is far. | Minor • The provision of polyclinics in the company is in accordance with Peraturan Menteri Tenaga Kerja 03/MEN/1982 concerning health services (polyclinics).  
• Adding a drinking water container so that the workers are not too far away and glasses are provided according to the number of workers. |
|   | 6.4.4 | OSH signs must be installed in accordance with technical standards and guidelines. | OSH signs are still lacking in the work area. | Minor Addition of OSH signs in the workplace. |
|   | 6.5.7 | There is a system for tag-out for equipment that is no longer safe to use or is no longer in use. | There is no lock-out and tag-out (LOTO) procedure. | Minor Making procedures and signing about the LOTO. |
|   | 6.5.8 | If necessary, a lock out system is implemented to prevent production facilities from being turned on prematurely. | There is no locking mechanism in its implementation. | Minor LOTO is installed to prevent accidents so that production facilities such as machines are not turned on when repaired. |
|   | 6.59 | Some procedures can guarantee the safety and health of workers or other people near production facilities and equipment during the inspection, | There is no maintenance/repair request procedure to ensure that the repaired equipment is safe for reuse. | Minor Making the procedure. |
|   |   |   |
|---|---|---|
| **19. 6.5.10** | There is a person responsible for agreeing that the production facilities and equipment are safe to use after the maintenance, repair or alteration process. | No person in charge. | Minor | Appointment of person in charge. |
|   |   |   |
| **20. 6.7.6** | Emergency alarm equipment and systems are provided, checked, tested and maintained on a regular basis in accordance with statutory regulations, relevant technical standards and guidelines. | • There are 2 fire extinguishers in the painting that have expired and most of them for 3 months until December are not checked. • The contents of the first aid kit are lacking and it has not been checked for 2 months (the last check was in September). | Minor | • Refilling the expired fire extinguisher and checking regularly every month. • Filling out the completeness of the first aid kit and checking it regularly every month. • **Peraturan Menteri Tenaga Kerja No.PER-04/MEN/1980** concerning the Requirements and Maintenance of fire extinguisher |
|   |   |   |
| **21. 6.7.7** | The type, number, placement and ease of obtaining emergency equipment are in accordance with statutory regulations or standards and are assessed by competent and authorized officers. | • There is no hydrant as an emergency tool in the event of a fire. • There is no smoke detector/fire detector to detect a fire early | Minor | • Installation/procurement of hydrants and smoke detectors/fire detectors. If a fire occurs and cannot be handled by the fire extinguisher, the second layer must have a hydrant or fire extinguisher from the local government. However, there are many obstacles when contacting the fire engine because it takes quite a long time. • **Peraturan Menteri Tenaga Kerja Regulation No.PER-02/MEN/1983** concerning Automatic Fire Alarm Installation, **Keputusan Menteri Tenaga Kerja No.KEP-186/MEN/1999** |
concerning Fire Prevention in the Workplace, 02/MEN/1983 concerning Automatic Fire Alarm Installation, and Keputusan Menteri Tenaga Kerja No.KEP-186/MEN/1999 concerning Fire Prevention in the Workplace.

22. 6.8.1 The company has evaluated the first aid kit and ensured that the existing first aid system complies with laws and regulations, standards and technical guidelines. The contents of the first aid kit are lacking and it has not been checked for 2 months (the last check was in September).

- Filling out the completeness of the first aid kit and checking it regularly every month.
- Regulation that regulates Keputusan Menteri Tenaga Kerja No.PER-15/MEN/VIII/2008 concerning First Aid.

23. 7.1.1 Inspection/inspection of the workplace and working methods are carried out regularly. There is no regular schedule of inspection activities on a regular basis.

- Establishment of regular inspection schedules and officers who carry out inspections in the work environment.

24. 7.1.2 Inspections/inspections are carried out by competent and authorized officers who have received training on hazard identification. There are no regular inspections and no monthly inspection reports.

- It is necessary to carry out inspections in the field regarding OSH issues and a monthly report is made.

25. 7.1.3 Inspection/inspection seeks input from workers who perform tasks at the inspected place. There are no inspections and no records of input from workers in the work area.

- Records of inspection results are made, in the form of findings that are not appropriate.

26. 7.1.4 A workplace checklist has been prepared for use during inspections. There is no document in the form of a workplace inspection checklist in accordance with the conditions of the workplace.

- Creation of inspection checklists in the workplace.
27. 7.1.5 The inspection/inspection report contains recommendations for corrective action and is submitted to the management and P2K3 as needed.

There is no recommendation from the results of the inspection report for improvement.

Minor Inspections are carried out and corrective actions are also carried out.

28. 7.1.6 The entrepreneur or management has determined the person in charge for the implementation of corrective actions from the results of the inspection report.

There is nothing related to the assignment of responsibility for the implementation of corrective actions.

Minor The responsibility for the implementation of corrective actions is determined.

29. 7.1.7 Corrective actions from the results of the inspection/inspection report are monitored to determine their effectiveness.

There is no corrective action result from the inspection report to be monitored to determine its effectiveness.

Minor Monitoring is carried out.

30. 7.4.4 The company provides occupational health services in accordance with the laws and regulations.

The absence of health services (polyclinics) in the workplace.

Minor Procurement of polyclinics in companies in accordance with Peraturan Menteri Tenaga Kerja Per 02/MEN/1982.

31. 8.3.5 Corrective actions are informed to workers who work at the place of the accident.

Workers are not informed of the corrective action to be taken and there is no proof of the worker's signature that the repair has been carried out.

Minor Discuss with workers about corrective actions and document the form of repair reports signed by workers.

32. 8.3.6 The implementation of corrective actions is monitored, documented and/or informed to the entire workforce.

There is no documentation and no information on corrective actions to the entire workforce. The report status form (closed) or initial corrective action has been completed.

Minor Informed about corrective actions to all employees and the status report (closed) or initial corrective action has been completed.
|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 33. | 9.3.2 | There are Material Safety Data Sheets (MSDS) which include information on material safety as stipulated in the legislation and can easily be obtained. | In the field there is no MSDS behind the pre treatment section, (only in front of the door in the manual painting section). While in the EHS unit office there is an MSDS but it still uses English. | Minor | Provision of MSDS for each chemical used and MSDS in Indonesian so that it is easily understood by workers. |
| 34. | 9.3.3 | There is a system for identifying and labeling hazardous chemicals. | Not everything is labeled. There is no label on the back near the pre-treatment of the chemicals used. | Minor | Labeled all chemicals. |
| 35. | 10.1.2 | Relevant statutory regulations, standards and technical guidelines are maintained in an easily accessible place. | There are already laws and regulations relating to OSH but only a small part and not yet complete. | Minor | It is necessary to update the OSH regulations and be equipped with regulations related to OSH. |
| 36. | 10.2.2 | Regular OSH performance reports are generated and disseminated in the workplace. | OSH performance reports are not disseminated in the workplace, for example work accidents, Loss Time Injury (LTI) and monitoring of OHS programs. | Minor | Dissemination of OSH performance in the workplace can be in the form of a board containing information on working hours, number of accidents, LTI and OSH performance. |
| 37. | 12.2.1 | Members of executive management and management participate in training which includes explanations of legal obligations and principles as well as the implementation of OSH. | Executive/senior management not involved in OHS training. There is no record of training, certificates or seminar activities attended. | Minor | Executive management is included in training related to OSH in order to know the implementation of OSH in accordance with regulations. |
| 38. | 12.3.1 | Training is provided to all workers including new and transferred workers so that they can carry | The provision of initial training/orientation on OSH to new/transferred workers does not | Minor | Scheduling or providing OSH training for new/transferred employees. |
out their duties safely. exist/the implementation cannot be ascertained.

39. 12.4.1 There is a procedure that stipulates the requirements to provide briefings to visitors and business partners to ensure OSH.

Minor Making procedures and conducting safety induction for guests, contractors, visitors who enter the company area in order to know the potential dangers in the company era.

Based on the results of the OSHMS audit in the company, the results showed that the achievement of OSHMS implementation was in a good category, with a score of 76.5%. According to Peraturan Menteri Tenaga Kerja Number 26 of 2014, if a company certifies the implementation of OSHMS with achievements (60-84%), then the company is entitled to a certificate and silver flag for that achievement. The certification chosen by the manufacturing industry is OHSAS 18001:2007 because it is an international trade requirement. The OHSAS 18001:2007 certificate serves as a form of the company's commitment to labour protection if the company wants to send products abroad. The manufacturing industry carries out OHSAS 18001:2007 certification only in the Pre-Treatment and Painting Unit. These units have a higher risk of potential hazards than other units in the HE Division. The potential hazards in the unit include gas pipes that can cause explosions and fires and workers who come into direct contact with chemicals when painting.

Research by Mahdaniah et al. (2013) stated a decrease in the number of work accidents if the implementation of OSH was categorized as good. There is a significant relationship between the number of work accidents and the level of compliance with OSH implementation [9][10]. These results predict that an increase in compliance with the application of OSH by 1 criterion will reduce the number of work accidents by 12 cases. According to the ILO, OSH has been proven to reduce the number and severity of work accidents, which in turn reduces the amount of work accident insurance (work accident compensation costs) [9][10]. The implementation of OSH is determined by the willingness and involvement of all management and workforce, as well as the participation of the Occupational Safety and Health Committee (P2K3) in the implementation of OSH in the company, which has an impact on the number of work accidents and work accident claims. One of the main keys to working safely, safely, and in a healthy working environment is the comprehensive implementation of OSH [10].

The results of secondary data analysis of work accidents in the company show a decrease in the number of work accidents in the Hospital Equipment Division, which has implemented OSH, namely Pre-Treatment and Painting Units. From a total of 26 work accident cases in the HE Division in 2011-2014, units that have implemented OSHMS have a lower work accident rate than units that have not implemented OSHMS. There are 9 cases of work accidents in the Assembling Unit, 11 cases in the Welding Unit, 4 cases in the Packing, and 2 cases in the Pre-Treatment & Painting Unit. This shows that the implementation of OSHMS can significantly reduce the incidence of work accidents in the company. Units that have implemented OSH based on OHSAS 18001:2007 have a lower or smaller number of work accidents when compared to units that have not implemented OSH. Efforts that can be made to minimize work accidents are by supervising workers using PPE, warning workers to be more careful, and conducting routine checks on workers, tools, and various matters related to OSH [10].

The application of OSH in the construction sector, in general, could reduce the number of work accidents by 67% and, in particular, fatal accidents decreased by 10.3% [11]. Occupational safety and health will be maximized to reduce the number of work accidents in certain groups or organizations if the organizational and administrative aspects of occupational safety and health management are addressed with socialization and motivation. Therefore, it is necessary to conduct thorough socialization to all employees' work environments [12]. Roga (2015) research shows that organizational and
administrative factors as an element of OSH management significantly reduce the number of accidents due to work. This is also in line with Stave (2005), who stated that the OSH implementation program requires parties such as leaders or chairpersons and other administrators to be involved in it.

4. Conclusion
Based on the results of research conducted on applying the occupational health and safety management system to work accidents, the results of the audit of the implementation of OSHMS in the manufacturing industry, Sleman Regency, amounted to 76.5%. The implementation of OSHMS can significantly reduce the incidence of work accidents in the company. Units that have certified implemented OSHMS have a lower or smaller number of work accidents when compared to units that have not implemented OSH. Nowadays, the new standard ISO 45001:2018 about OSHMS, standard or regulation one of effort can minimize the risk of work accidents and occupational diseases in workplaces.

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