

RISK ASSESSMENT OF MECHANICAL WORKSHOP AT POLITEKNIK
SULTAN AZLAN SHAH

AHMAD SYARIFUDDIN BIN CHE ABD AZIZ

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ABSTRACT

Politeknik Sultan Azlan Shah (PSAS) is a technical and vocational education institution under Jabatan Pendidikan Politeknik dan Kolej Komuniti emphasizing on the technical and vocational education (TVET) approach. TVET focuses hands on practices, hence engineering students and staffs spend majority of their learning period in laboratory and workshops making them vulnerable to accident risk. As an administrator of facilities, it is imperative for PSAS to prevent hazard and harm from falling onto their staff and students. The study is conducted through method of a survey questionnaire and interview assisted with Hazard Identification, Risk Assessment and Risk Control (HIRARC) form in selected engineering workshops at PSAS. A total of 67 respondents were involved in this questionnaire survey. The result shows the mean average index for the questionnaire items is valued at 4.51. This value of safety practices falls under the “Always” category. Hence, it indicates the mechanical workshop in this study observes and performs high-level of safety practices. For the interview session conducted, two expert respondents have been selected. For welding workshop, the main hazards identified are electric shock, toxic fumes and gases and gas leakage. Meanwhile for lathe machine workshop the main hazards identified are sharp object/ sharp cutting tool material and flying work pieces generated from surface grinding machine. The value of risk for each of the hazards identified is 12, hence falls under medium level risk. Several measures to control the hazards are suggested. For main hazards at welding workshop, which are electric shock, toxic fumes and gases (smoke produce from process) the proposed measures are; follow the safety working procedure, provide extra supervision and additional training. For gas leakage, the suggested control measure is a gas detector system. For lathe machine workshop, proposed counter measures for sharp object/ sharp cutting tool material are; follow the safety working procedure, provide extra supervision and additional training. Lastly, for flying work pieces’ hazard, the proposed control measures are; always check magnetic status in control panel, use appropriate feed rate speed and lastly provide extra supervision and training.

ABSTRAK

Politeknik Sultan Azlan Shah (PSAS) adalah sebuah institusi pendidikan teknikal dan vokasional di bawah Jabatan Pendidikan Politeknik dan Kolej Komuniti yang menekankan pendekatan pendidikan teknikal dan vokasional (TVET). TVET memberi tumpuan kepada amalan, oleh itu pelajar dan kakitangan kejuruteraan membelanjakan majoriti tempoh pembelajaran mereka di makmal dan bengkel membuat mereka terdedah kepada risiko kemalangan. Sebagai pentadbir makmal dan bengkel kejuruteraan, penting bagi PSAS untuk memastikan bahaya dan bahaya daripada jatuh ke kakitangan dan pelajar. Kajian ini dijalankan melalui kaedah soal selidik tinjauan dan temu bual dibantu dengan Borang Pengenalpastian Hazard, Penilaian Risiko dan Kawalan Risiko (HIRARC) dalam bengkel kejuruteraan terpilih di PSAS. Seramai 67 orang responden terlibat dalam kajian ini. Hasil soal selidik tinjauan menunjukkan indeks purata skala penarafan untuk item soal selidik dinilai pada 4.51. Nilai amalan keselamatan ini berada di bawah kategori "Sentiasa". Oleh itu, ia menunjukkan bahawa bengkel mekanikal dalam kajian ini mengamati dan melaksanakan amalan keselamatan peringkat tinggi. Untuk sesi wawancara yang dijalankan, dua orang responden pakar telah dipilih. Untuk bengkel kimpalan, bahaya utama yang dikenalpasti adalah kejutan elektrik, wasap toksik dan gas dan kebocoran gas. Sementara itu untuk bengkel mesin larik, bahaya utama yang dikenalpasti adalah objek tajam / alat pemotong tajam dan kerja-kerja yang dihasilkan dari mesin pengisar permukaan. Nilai risiko bagi setiap bahaya yang dikenalpasti adalah 12, dengan itu berada di bawah risiko tahap sederhana. Akhir sekali, beberapa langkah untuk mengawal bahaya adalah dicadangkan. Untuk bahaya utama di bengkel kimpalan, yang merupakan kejutan elektrik, wasap toksik dan gas (menghasilkan asap dari proses) langkah-langkah yang dicadangkan adalah; ikut prosedur kerja keselamatan, memberi pengawasan tambahan dan latihan tambahan. Untuk kebocoran gas, langkah kawalan yang dicadangkan adalah sistem pengesan gas. Sementara itu, untuk bengkel mesin larik, langkah-langkah kaunter yang dicadangkan untuk bahan tajam / bahan tajam memotong; ikut prosedur kerja keselamatan, memberi pengawasan tambahan dan latihan tambahan. Untuk bahaya kerja yang terbang, langkah kawalan yang dicadangkan adalah; sentiasa memeriksa status magnet dalam panel kawalan, menggunakan kelajuan kadar suapan bahan kerja yang sesuai dan akhirnya menyediakan pengawasan dan latihan tambahan.

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LIST OF ABBREVIATIONS

CIDB	-	Construction Industry Development Board
OSH	-	Occupational Safety and Health
DOSH	-	Department of safety and health
OSHA	-	Occupational safety and health act
SIRIM	-	Standard and industrial research institute of Malaysia

LIST OF SYMBOLS

Σ	-	Summation
$\times i$	-	Frequency of response
αi	-	Index of a class

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CHAPTER 1

INTRODUCTION

1.1 Background of the Problem

A risk assessment is a method that is used to identify hazards, processes and circumstances that can potentially cause harm, to both human and assets. Essentially by identifying the potential hazards, the risk associated with those hazards could be analyzed and evaluated, hence the proper actions to control or remove those hazards are determined. Risk assessments also help to create awareness and emphasis on preventing accidents and work-related ill health, rather than just responding to incidents, and creating improvements after the event., hence an important element in the prevention of injuries and illnesses. In the past, industry has concentrated its efforts on reducing injuries by focusing on physical conditions such as the guarding of equipment or other factors that exposed employees to energy sources (Henrich, 1959).

As safety policy now becoming a priority a lot of effort has been implemented proactively. Risk assessment one of the measures that have been implemented to lessen the risk. The most common method of doing risk assessment is via Hazard Identification Risk Assessment and Risk Control (HIRARC). In order to identify, assess/measure and to manage hazard and risk of one workstation the usage of HIRARC form is a robust tool. It is a general approach generally utilized by Occupational Health and safety practitioner and by implementing it, the possibility for any accidents to occur could be, reduce/control or eliminated. Due to the influence of the organization infrastructure, apparatus and resources at the workplace, hazards are generated in the area of the workplace caused by actions that is work-related. These actions by people who have access to the working area can negatively affect the health and safety of people which within the influence of the

working area and organization. An education institution is considered as a place of work as stated in the (DOSH, 1994) “place of work” means premises where persons work or premises used for the storage of plant and substance.

Politeknik Sultan Azlan Shah which is a technical and vocational educational institution under Jabatan Pendidikan Politeknik dan Kolej Komuniti aims of pioneering the technical and vocational education (TVET). All of this effort is in line with Vision 2020 towards developing high level technology and high skills thus delivering the government's aspiration in helping Malaysia to achieve the status of modern and developed nation. There are two aspects of teaching in technical and vocational subjects which are theoretical and practical approach. To help Malaysia achieving more a developed and competitive status, Politeknik Malaysia as one of the TVET institution aims to produce potential and talented talents of the technical field. It is important to note that with the intention of producing these skilled professionals, excellent and quality training in technical education is crucial. Consequently, students will be engaged heavily in technical workshop thus would be highly exposed to risks of accident.

Engineering workshops are among the most dangerous places in the education institution due to high accident rate and exposure to various chemical, electrical and mechanical hazards that require laboratory, fire and other related safety procedures (Misnan, Mohammed, & Dalib, 2011). As a result, laboratory management and maintenance play a key role in a laboratory because with good management and maintenance, the teaching and learning process can run smoothly and effectively, so the accident can also be avoided. (Ismail *et al.*, 2017) noted that safety environment in workplace can be created with knowledge and safety practice. For enhancement, laboratory staff and lecturers must be provided with information and occupational safety and health training that relevant to the hazards present in their workshop. The training must be provided including new exposure situations. Thus, the frequency of accidents in the industry can be decreased if undergraduates in technical educational institutions are taught and given exposure to occupational safety and health issues. (Barahim, 2010) suggested routine safety walk through inspections. This drill should be led by highest administration, safety and health

officers and also members of safety committees to. By implementing this, the safety efforts are visible and leads the increase of everyone's safety awareness. Additionally, workplace inspections should be supported by a checklist which has been developed specifically for that workplace. These inspections are important and can identify areas that need to be addressed. The lecturers or staff technician in charge could also conduct appropriate supervisory practice to ensure safe environment during teaching and learning at the workshop (Ugwulashi, 2016).

As a technical institute which hands on practices are common to students, Politeknik Sultan Azlan Shah (PSAS) accommodates numbers of laboratories and engineering workshops. From the basic fundamentals to the high-end laboratories, there might be possibilities for the operators; including technicians, and students to get involved in accidents. As a proprietor of the laboratories and engineering workshop it is imperative for PSAS to make sure prevent hazard and harm from falling onto their staff and students).

HIRARC typically aims at recognizing all the causes that may affect workers and other (hazards) factors. In addition, HIRARC should also consider what the chances of this damage eventually fall to anyone in the contexts of a specific case and the probable severity that could result from it (the risk) and allow employers to plan, implement and monitor preventive actions to ensure that the risks are appropriately regulated throughout all times. This HIRARC format was designed to accommodate Occupational Health & Safety Practitioner's needs in fulfilling their risk management assignment. The tool was integrated with OHSAS 18001 standard accordance through readily integrated risk factor and hazard-risk aspects relinquishment. The hazard comes from sources such as work environment, energy, mechanical, chemical, biological, environmental, animal insects, catastrophic event, radioactive materials, as well as other hazards.

1.2 Problem Statement

There have been a number of engineering lab or workshop accidents cases reported occurred at several higher learning institutions in Malaysia as reported by (OSHE UTM, 2014); (OSHE UTM, 2013); (Ishak, 2013); (Che Juhan Negara, 2012); (SA, 2001). Based on the findings of these cases, the accident occurred in the workshop were; shortness of breath caused by poisonous gas, wounds due to sharp objects, burns, eye injuries, electric shock, loss of hearing and broken limbs. Recently there have been mercury spilled incident and a minor accident involving student, occurred at an engineering workshop in Politeknik Sultan Azlan Shah. Although there have been no major injury or fatality reported, these incidents caused a growing concern over the need for a better awareness of safety management at the engineering workshop. It is important to note that (DOSH, 1994) stated that it is the duty of the employer to ensure and provide a safe workplace for their workers. As safety and the wellbeing of students and staffs is becoming a major issue, the potential fatalities, severe injuries and financial losses that could befall demonstrates that there is a serious need for better risk management practices within academic teaching and experimental research labs.

Therefore, a proper risk assessment study via hazard identification, risk assessment and risk control (HIRARC) is critically required, this is significant so that the prospect of an accident happening could be reduced or eliminated.

Additionally, the HIRARC ability in assessing the risk could be used to find out all the possible hazard found in the mechanical workshop, thus the probability of incident can be managed and control. By using Risk Matrix, we can identify which operation and activities contribute from the lowest to the highest risk. Risk assessment is conducted, to suggest the best way to implement the control measure and reducing the hazard. OSHA 1994 should be one of the policies that need to be referred as a guidance.

1.3 Aim and Objectives of the Study

The aim of this study is to perform hazard identification, risk assessment and risk control analysis (HIRARC) on the specific operation, design plan layout and activities in mechanical workshops at Politeknik Sultan Azlan Shah (PSAS), Behrang, Perak. To achieve the aim, the following objectives are set as:

- a) To measure safety practices in the mechanical workshops.
- b) To identify potential hazards generated from activities in the mechanical.
- c) To assess the risks level from potential hazards found in objective (2).
- d) To propose possible control measures based on the level of risk found in objective(3).

1.4 Scope of the Study

The area of study will be focused at Polytechnic Sultan Azlan Shah (mechanical workshop). The scope of this project is to perform risk assessment through direct observation, document search and target respondents' interview in mechanical workshop in specific area. Mechanical workshop is one of the workshops which involves a lot of operation, activities and dealing with some sort of electrical aspect.

Hazard are identified in specific area which involve the operation and workshop activities and person who are involve directly and indirectly. Emphasizing the control measure need to be done to control and reduce the risk in the minimum level. Risk assessment should cover the following area:

- a) Operations involve in mechanical workshop
- b) Activities and person involve in the workshop
- c) Equipment in the workshop
- d) The arrangement of the workshop

It is important to note that due to the small sample size findings from this study, caution should be exercised in applying the results to institutions in other places. Furthermore, as this study focuses only at Polytechnic Sultan Azlan Shah, the generalisation of the results achieved, to other institutions should be carried out with caution. This is because the facilities feature of other higher institution would not be identical.

1.5 Significance of the Study

Sub-Section 15(2)(b), (DOSH, 1994) states that the making of arrangements for ensuring, so far as is practicable, safety and absence of risks to health in connection with the use, operation, handling, storage and transport of plant and substances. All the action is emphasizing the action to prevent rather than controlling the risk.

As stated in the earlier objectives of this study, Hazard Identification, Risk Assessment and Risk Control (HIRARC) study for occupational safety and health evaluation at mechanical engineering workshop will help to increase the awareness of the management on the existing hazards.

The results attained from the study can be used as a guideline to minimize the associated risk and increase the safety of workshop handlers. This study is decently significant due to the fact OSHA main principle aims to prevent the accident which causing the injury or maybe fatality. Another factor which are involve include damage to the equipment and environment as well as work related ill health. Arrangement of equipment is one of the factors that needs to be considered

rearrangement should be carried if results from the indicated the need for it. Implementing the outcomes from this case study could, consequently, warrant enhancement of productivity and workmanship amongst staff and students.

1.6 Methodology used for the Study

Research methodology for this study will use a Mixed Method data collection where its involving collection and integration of both quantitative and qualitative data in a study (Creswell, 2013). This study will be divided into 4 Stages as given below;

- a) Preliminary Study,
- b) Data Collection Stage,
- c) Data Analysis Stage and
- d) Clarification of research output.

All these stages will contain the desktop study, literature review, observation of area studied, case study, and research analysis with structured survey and interview. This chapter discusses the methods adopted in carrying out this study. It explains how the necessary data and information to address the stated research question and objectives was collected, presented and analysed

1.7 Report Structure

The project summary of this master is summarized in five chapters: introduction, analysis of literature, approach, findings and interpretation, and conclusion. Chapter 1 is the study's introductory chapter, acting as a description of the research as a whole but with more specifics than the abstract. It basically describes the research context, a succinct description of the issue, illustrates the purpose and priorities. It then lists the nature of the analysis, followed by the context,

then the accepted methodologies. The study's form comes to an end. Chapter 2 is a survey of recorded literature on all facets of the nature of the research. The literature review is largely based on earlier research on the provision of healthcare services at construction sites.

The approach followed to explain the data collection technique and process used in Chapter 3. It also included a description of the methods used for the research of data analysis. Chapter 4 provides a detailed overview of the analysis, findings and interpretation of the details. The conclusions are presented in reference to the goals of the report. Following that, in Chapter 5, conclusions were drawn to align with the aims of the research as well as the target. Recommendations have been made based on the findings.

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