

HEAT STRESS ON 500-660 MM PIPE WORKERS IN OIL RIG JACKETS  
ASSEMBLY WELDING WORKS

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*To my parents, Mohd Salleh b. Tahar and Rosminah bt Bibet, appreciation for all efforts and supports from both of you during the time since I started this project. Without your blessing, I cannot complete this project well.*

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## ABSTRACT

The research is to study the problem related to the heat stress among workers at heavy industrial yard. Heat stress occurrence would cause several problems such as heat stroke, heat exhaustion, heat syncope, heat cramp and heat rash (Christopher et al. 2004). This condition could affect workers capability, health, perception and judgment in which it will reduce the efficiencies of work. The objective of the research is to show the time region that worker might suffer from heat stress, compared the heat stress before and after safety procedure been executed, showed the correlation between several factors that contributes to the heat stress among workers and proposed a better work practice to the industry management. The respondent of the research is a worker who was involved in working inside the pipe. This was carried out using the heat environment tools (QuesTemp34). The methodology of the research is based on observation in which the data was collected and plotted to find the correlation between factors that are significant to the heat stress occurrence. Other method used to support the data is by using a quantitative method such as questionnaire which contains a question related to the effect of heat stress, thermal comfort and bodywork physiology. Expected result from the research is to identify the factors for heat stress occurrence, the duration of time that is most high possibility of heat stress to occur and to compare the reduction of heat stress level between two different conditions which is with the safety applied and not applied.

## ABSTRAK

Kajian ini adalah untuk mengkaji tegasan haba ke atas pekerja dalam industri berat. Tegasan haba boleh menyebabkan beberapa masalah seperti *heat stroke*, *heat exhaustion*, *heat syncope*, *heat cramp* and *heat rash* (Christopher et al. 2004). Masalah-masalah ini boleh menyebabkan kepada pengurangan kecekapan seseorang untuk melakukan kerja. Bagi mencapai tujuan kajian ini, 4 objektif telah ditentukan iaitu bagi mengenalpasti waktu kritikal di mana tegasan haba boleh berlaku, membina satu carta matriks bagi menghubungkan faktor-faktor berkaitan dengan tegasan haba dan untuk mengenalpasti amalan bekerja yang lebih baik yang boleh dicadangkan bagi mengurangkan risiko tegasan haba dari berlaku. Responden bagi kajian ini adalah dikalangan pekerja SimeDarby yang mempunyai risiko untuk mengalami tegasan haba. Pengukuran ke atas suhu, kelajuan angin dan tahap kelembapan akan dibuat dengan menggunakan alat yang dikenali sebagai *Environment Thermal Monitor, QuesTemp34*. Kajian ini adalah berasaskan pemerhatian di mana data akan di ambil dan diplotkan bagi mendapatkan hubungan yang mempengaruhi tegasan haba dengan faktor-faktor persekitaran. Kaedah lain yang digunakan bagi menguatkan data adalah berasaskan kuantitatif iaitu dengan menggunakan soal selidik terhadap pekerja yang terlibat di mana ciri-ciri soalan adalah mengenai faktor penyebab berlakunya tegasan haba, zon keselesaan dan fisiologi badan manusia. Jangkaan dapatan bagi kajian ini adalah diharapkan dapat memperbaiki ketidaksesuaian di antara pekerja dengan faktor-faktor persekitaran yang boleh menyebabkan penurunan kualiti dan kecekapan bekerja di industri berat Negara.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Malaysia is located at the equatorial monsoon region which is hot and humid throughout the whole year. The annual average temperature is around 20°C to 30°C. This hot condition may result in heat stress to workers who work in industrial areas that may contain in hot air near the furnace or outside the building at an open space where direct sunlight cannot be avoided. This situation occurs at heavy industry yard that involved workers whose activities involve the onshore jobs under direct sunlight. There are also other factors that contribute to heat stress besides working under direct sunlight. These additional factors increase the possibility for the workers to experience heat stress at work.

The rational of this study is to help both the company and its employees since every manager need to care for their employee welfare. This include the manager who should provide safe workplace, enhance employees with good tools and method, proper selection of job, gives the employees a comfort zone for resting purpose and educate them on how to avoid from heat stress. All of these criteria is related to heat stress problem.

This study is worth to be invested since a common goal of any company is to maximize profit by utilizing any resources available and to increase the efficiency of work by increasing the productivity. Some companies experience losses when they keep pushing among employees to work hard to meet the goal and end up with injuries and accidents. The study of heat stress will provide the company with information of the causes of heat stress occurring among workers, time duration during which heat stress might possibly occur. From the information given the company can take a preventive action by doing a proper work scheduling, training and facilities.

Result of heat stress might contribute not only for the heavy industry but also the establishment of good working environment in all sectors of industries. Internationally as the world become borderless with rapid production and communication, going global is common activities done by many people all over the world. Visiting branches or even changing a workplace to a different region may need the workers to acclimatization to the new environment. This study shall provide and gives the information so that the acclimatization process is successful and safe. The information gain from study can be used as a guideline on how to avoid and to resolve heat stress from occur. It can also help the manager to educate the employees on the cause and effect of heat stress.

The study of heat stress need to be done and cannot be left uncovered. This is because it can cause harmful to the employees such as heat cramp, heat exhaustion, heat rash and heat syncope. This phenomenon will initiate the employees to make mistake in their job and increase the probability of accident occurring.

## 1.2 Background to the Problem

Safety procedure is a must for any company to implement it into their program as in Malaysia there are rules and regulations that restrict the safety procedure for employers on their respective employees. Some of the safety procedures that the employees need to follow are the wearing of personal protective equipment (PPE) like clothing, safety hat, gloves, safety shoes, goggles and etc. The PPE have been used according to the situations or works that need to be done such as material handling activities in metal fabrication where the employees need to wear gloves to avoid injuries due to sharp edges of work pieces.

Workload for a given task to the employees also need to be highlighted since the same work does not have the same quality and efficiency for a different person who done it. For example a lifting work is more efficient if been done by bigger worker rather than smaller worker. As at heavy industry yard, the material handling sometimes needs to be done manually and if there is an overload work occur, the possibility of heat stress from happening is high.

As the heat stress is about to take place for the discussion, the employers are responsible to manage a good working scheduling for the workers. This includes when to give the employees a perfect duration time to rest and a suitable place which is under a comfort zone. All this effort will reduce the stress experienced by the employees who work repetitively and for a long period of time.



### 1.3 Problem

The actual problem of the study been conducted is about the heat stress experienced among workers at heavy industry yard on the basis of environment temperature. Environment temperature is referring to the working hours under direct sunlight. In addition of the open spaces as the study is focusing for the onshore job. There are several factors that can contribute to the heat stress from occurring to the worker.

As the location of the heavy industry chosen is near the sea, there is a factor of where the nature of sea that evaporate from direct sunlight may increase the humidity of the air around. When humidity is high then the body sweating system cannot pull out the excessive heat in the body efficiently. This factor might increase more when the working hours are near noon period.

The layout of the facilities also need to be highlighted, this can be seen where the raw material are not properly been organized in terms of heat stress criteria. Shelter can be used for employees to rest a while under hot environment and to help reducing the rate of heat from increasing more than it flows out from the body.

As for safety precaution step and procedure, employees are compulsory to wear personal protective equipment when there are at work. This term and condition will increase the possibility a worker would experience a from heat stress since the personal protective equipment like clothing, gloves, safety helmet and safety shoes are not helping the human body system to sweat properly.

Metal fabrication work is included the job of lifting, welding, blasting, assembly and etc. If the manager could not design a proper job for employees, then the workload overload will happen where the employees is working beyond it limit. Human body generates heat through muscle activities by doing work, if the work is overload then the heat generated is excessive too.

## **1.4 Scope**

The scopes of the study have been developed in the research which included four aspects such as the data taken only for onshore work at one heavy industry only, data collection is taken during working hours excluding the overtime during night, data collection is valid during good weather only, area of study is focus on the pipe welding working environment and the respondent of the research is less than 45 workers.

## **1.5 Objectives**

The objectives of the study is to show the time duration (during the day) that worker might suffer from heat stress, to compare the heat stress before and after safety procedures have been executed, to show the correlation between several factors that contributes to the heat stress among welders and to proposed a better work practice to the industry management.

## **1.6 Organization of Thesis**

This thesis is containing about six chapters. Chapter One provides the information briefly about the background of the study and an introduction that related to the research study that includes scope, objective, problem and background of the problem. This chapter also discussed the importance and benefit for the study to be made.

Chapter Two provides the literature review for the research that has been done related to heat stress such as the effect of environment temperature to human, physiology of human body to the heat stress, comfort zone for human, a human body temperature controller, human body metabolism and etc.

Chapter Three provides the information on how the research had been conducted at heavy industry yard. This chapter shows the method used to collect the data, the procedure on how to collect the data and the safety precaution step that been taken during the collection data period.

Chapter Four provides the information on the transformation of data collection into an analysis point of view. This includes the step on how to interpret the data, management of data collected to the graph, table, calculation and software used to find the correlation of heat stress factors.

Chapter Five provides the analysis done by researcher related to the topics of heat stress. This chapter will highlight the pros and cons of the research study and finding the causes of the problem occurred in the area of research. This chapter also provides the discussion on how the current research and previous research can develop a method that solved the problem of related area of the study. This chapter will compare the result gain from previous study to be added into the current study for a better result.

Chapter Six provides the summary for the entire research as well as the result gain. This chapter also recommending a future work that might improve the result of the study on the area of heat stress.

## **1.7 Conclusion**

This chapter has justified the research study on heat stress among workers heavy industry yard. It includes the introduction of the study, actual problem, scope, objective and also the organization of this thesis. The following chapter will discuss the literature review of the area of heat stress.