TECHNOLOGY READINESS OF WELDING TECHNOLOGY TO ENHANCE PERFORMANCE… A STUDY ON FOUNDRY COMPANIES.

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DECLARATION

"I admit that this thesis is the result of my own, except certain explanations and passages where every of it is cited with sources clearly."

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DEDICATION

I would like to dedicate the appreciation to my beloved parents who have been my constant source of supported, supervisor and panel who guided me throughout the research as well as my friends that helped me along of research**.** Without them, this project would not be completed possible.

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ABSTRACT

In this modern civilization, the rising of welding technology has ease the work of every welders. Welding is a process where the materials are joined together through heating with particular filler metal to form a strong joint. There are few welding technologies often used in the welding sector by foundry. For instance, Gas Welding and Cutting, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) and Gas Tungsten Arc Welding (GTAW). Some of them are often used in welding ferrous metal and some of them are more suitable in welding non-ferrous metal. This paper aims to identify the readiness welding technology used by foundry companies and also to find out their level of change readiness towards the welding technology in foundry. This research will be carried out by using qualitative method through interview session with five different interviewees from different welding foundry in the location of Nibong Tebal, Pulau Pinang. Next the data collected will be analysed and transcribed into sentences. Consequently, the data will be arranged into themes in order to find out their percentage of coverage. Furthermore, researcher also states the personal opinion to these participants especially who can make improvement in their current situation in this paper. Lastly, researcher hope this paper can help to open the eyes and increase the awareness of welding technology of readers.

ABSTRAK

Dalam tamadun moden ini, peningkatan teknologi kimpalan telah memudahkan kerja setiap pengimpal. Kimpalan adalah proses di mana bahan disatukan melalui pemanasan dengan logam pengisi tertentu untuk membentuk sambungan yang kuat. Terdapat beberapa teknologi kimpalan yang sering digunakan dalam sektor kimpalan dengan faundri. Contohnya, Gas Welding and Cutting, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) and Gas Tungsten Arc Welding (GTAW). Sesetengahnya sering digunakan dalam kimpalan besi dan sesetengahnya lebih sesuai dalam kimpalan logam bukan ferus. Kertas ini bertujuan untuk mengenal pasti teknologi kimpalan kesediaan yang digunakan oleh syarikat pengecoran dan juga untuk mengetahui tahap kesediaan perubahan mereka terhadap teknologi kimpalan dalam faundri. Penyelidikan ini akan dijalankan dengan menggunakan kaedah kualitatif melalui sesi temu duga dengan lima orang yang ditemu duga dari pelbagai kimpalan kimpalan di lokasi Nibong Tebal, Pulau Pinang. Seterusnya data yang dikumpul akan dianalisis dan diterjemahkan ke dalam ayat. Akibatnya, data akan diatur ke dalam tema untuk mengetahui peratusan liputan mereka. Tambahan pula, penyelidik juga menyatakan pendapat peribadi kepada para peserta terutama yang dapat memperbaiki keadaan semasa mereka dalam makalah ini. Akhir sekali, penyelidik berharap kertas ini dapat membantu membuka mata dan meningkatkan kesedaran teknologi kimpalan pembaca

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SMAW	=	Shielded Metal Arc Welding
MMA	=	Manual Metal Arc Welding
GMAW	=	Gas Metal Arc Welding
MIG	=	Metal Inert Gas
GTAW	=	Gas Tungsten Arc Welding
TIG	=	Tungsten Inert Gas Welding

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

In this modern civilization, make some changes is a trait and is a must to every business. Technology plays a crucial role in every sector. An advance technology would bring a lot of benefits to society and industry. It would enhance their working performance, productivity and profit.

This study is focus on the readiness of the welding technology used by the foundry, level of readiness for the foundry to acquire new welding technology, and what is the new welding technology that may be used by the foundry owner to enhance their performance. The technology that used by the foundry maybe outmoded, low efficiency and productivity. By choosing the right welding technology, it would bring lot of advantages and convenience to welder. An appropriate welding technology would ease the work and make the work perfect. In this rat race society, customer's needs must be fulfilled in order to gain their loyalty. So, welding artwork must be fine and solid.

Besides that, several issues must be considered by the foundry company before adopting new and more suitable welding technology. The level of readiness of the foundry company must be examined before implement the new changes, new technology. Foundry company should find out whether it is time to change, ready to change and the benefits after make those changes. This is because, make changes usually need a huge amount of financial expenses. Sometimes, some small-scale foundry companies are not affordable to pay these expenses and they are not brave

enough to take risk. Consequently, no changes are made and no improvement are done by these companies. Employer should be a risk taker, dare to make changes and also encourage their employee to follow his way, take responsibility and be a part of those changes (Gioia et al., 2013; van et al., 2013).

In a nutshell, it is crucial to figure out which welding technologies is most suitable to be used in order to enhance the overall performance. Large-scale change requires lot of organizational resources (Bennet and Segerberg, 2012). Foundry companies only carry out changes when they are afforded and able to do so.

1.2 Problem Statement

Nowadays, there are more lesser teenagers want to learn and apply the job as a welder due to hot weather condition in Malaysia and its heavy workload. This industry is now lacking of local workforce, many foreigners are taking this job in Malaysia. According to TWI general manager Mohd Darus Taib, there is a shortfall of 15,000 welders in Malaysia each year, which he noted was a conservative estimate (Joy Lee, 2013).

Besides that, some foundries are still using some inefficient welding method to weld on iron metal. For instance, using Manual Metal Arc Welding (MMA) method weld on an iron window. Welding on an iron window requires professional welding skills due to the appearance on the iron window must be fined. However, the weld times by using MMA welding are rather slow, since the consumable electrodes must be frequently replaced and because slag, the residue from the flux, must be chipped away after welding to ensure the best outlook of iron window. Teenagers need to be motivated and encouraged to try involve in welding. A platform is created by Welding Institute (Malaysia) Berhad (WIM), a non-profit membership organisation to raise the awareness, and provide courses to people about welding. People can go to their website and apply to attend the training courses.

In a nutshell, lacking of knowledge, professional welding skill and low readiness level to adopt welding technology are the roots of low performance.

1.3 Research Questions

The main purpose of this research is to determine the change readiness and find out what other welding technology that can be used by foundry companies to enhance performance.

1. To identify the new and suitable welding technology.
2. To uncover the level of change readiness of welding technology by foundry companies.

1.4 Research Objectives

In this research, the below questions are the main question of the research which guide their research going smooth/ the main questions are shown in below:

1. What is the readiness welding technology?
2. What is the level of change readiness towards the welding technology in foundry company?

1.5 Scope and Limitation

This study focuses on the current technology used by the foundry and their change readiness. In this research, qualitative method (interview) will be used to communicate and understand the current situation of the foundry companies. However, financial and time constraints will be the weakness in this study as time is limited to conduct this study.

1.6 Summary

The main purpose of this study is to identify the current welding technology that are being used, what other new welding technology that can be recommended to them in order to enhance their performance, and find out their change readiness. In this rat race society, customer's demands are become higher. In order to sustain in the market place, foundry companies have to make changes and increase their performance and welding piecework quality to retain their customers. Lastly, new welding technology would be very helpful in reducing cost, time and boost the performance.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The main purposes of literature review are conduct the process of analyzing, reading, evaluating and summarizing research materials of this research topic. This literature review is crucial as it can be used as framework to develop clear theoretical in achieve research objective and also fulfil the hypothesis. In chapter two, every single part of important key mechanism will be analyzed in order to extract all useful information and obtain a better result such as welding technology in Malaysia, Gas Welding and Cutting, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW) and the change readiness of the foundry.

2.2 Iron and Steel Industry in Malaysia

Iron and steel industry is a crucial sector in Malaysia as it would supply the most basic raw material or inputs to some major sectors. These major sectors would be construction industry, engineering and machinery industry, transport equipment industry and electrical appliances industry.

Iron and steel covers manufacturing of ferrous such as iron and steel and also covers non-ferrous such as tin, zinc, aluminium and copper.

Besides that, this industry can be divided into two main sub-sectors such as long products and flat products. In long products category, it includes sections, billets, wire rods and bars, blooms and also the downstream wire products. Meanwhile, in flat product category, it includes cold rolled coils and sheets, hot rolled coils, plates and sheets.

Recently, this industry is more focus and centre on nation's infrastructural and construction needs. The production is mostly dominated by the long product such as wire rods and bar. Due to the setting up of heavy section plant in Malaysia, the local sourcing of steel materials by downstream customer industries is gaining momentum. According to (MIDA, 2017), there are 2,611 projects that are producing the products which approximately will have the total potential employment of 196,311 workers. According to (Malaysian Iron and Steel Industry Federation, 2017), Malaysia's steel demand is currently 4th largest in ASEAN. The challenges in the steel industry is the price of steel. Since the price of steel will be depended by the demand and supply. Malaysia imported 9.13 million metric ton of steel and iron product such as cold-rolled and hot-rolled from China in 2016 (Malaysian Iron and Steel Industry Federation, 2017). Moreover, China remains as the largest source of import for local industry with the volume of 3.67 million mt which increased by total of 6.7 percent compared to year 2015. The price of steel will become fluctuated due to the supply and demand factor.

2.3 Overview of Welding Technology in Malaysia's Foundry Company

Welding is a kind of process where materials are joined together through heating with filler metal to form the strong join (U.S. Department of Labor, 2013, OSHA Fact Sheet: Controlling Hazardous Fume and Gases during Welding). Nowadays, advance welding technologies have all been transferred from developed country to local and adopted by Malaysia's foundry company. In Malaysia, there are five common welding technologies used by local people, they are Gas Welding and Cutting, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) and Gas Tungsten Arc Welding (GTAW). There are still have people that does not know the existence of welding technologies. Therefore, Welding Institute (Malaysia)

Berhad (WIM) is formed as a non-profit membership organization in order to raise the awareness on the practice of cutting, welding, and joining in welding piecework. By mastering the right welding technology to weld on the right metal, it would increase the productivity and ease the work. In this rapid pace society, foundry have to provide some value-added design related services in order to keep compete with their rivals.

The most popular welding technology used by local foundry company are Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW).

2.4 Gas Welding and Cutting

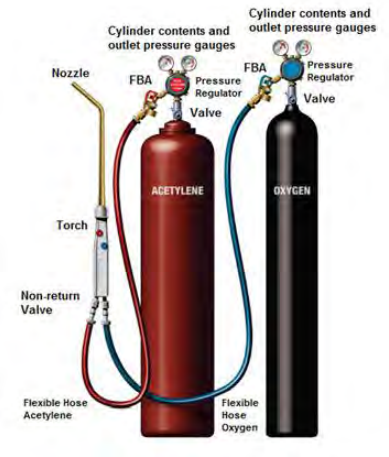

Figure 2.1: Gas Welding and Cutting

In 18th century, gas welding and cutting was developed and very popular. Men from England called by Edmund Davy and Sir Humphry Davy were the benefactors to welding history. They had discovered acetylene gas and produced an arc between two carbon electrodes by using a battery. This is the only method that have few functions, which it can used to cut, weld, heat up, straighten and descale the metals by just changing the torch. This welding and cutting technology consists of one cylinder of oxygen, one acetylene gas, one welding torch, one cutting torch, two hose pipes, cutting nozzles, flashback arrestors for torch and regulators, one oxygen regulators, one acetylene regulators and flint lighter. This technology requires professional skills and well-trained technique as it is the most dangerous method to carry out welding and cutting tasks. This is due to acetylene gas and oxygen gas are highly flammable, they would form explosive mixtures when they meet together. Gas leaks are the most common issue that often happening and causing severe injured to welder. Explosion would be the worst situation when accident occur. Although, this is a dangerous welding method, but it comes with few benefits. This equipment is cheap, easy to move and very versatile.

2.5 Shielded Metal Arc Welding (SMAW) or Manual Metal Arc Welding (MMA)

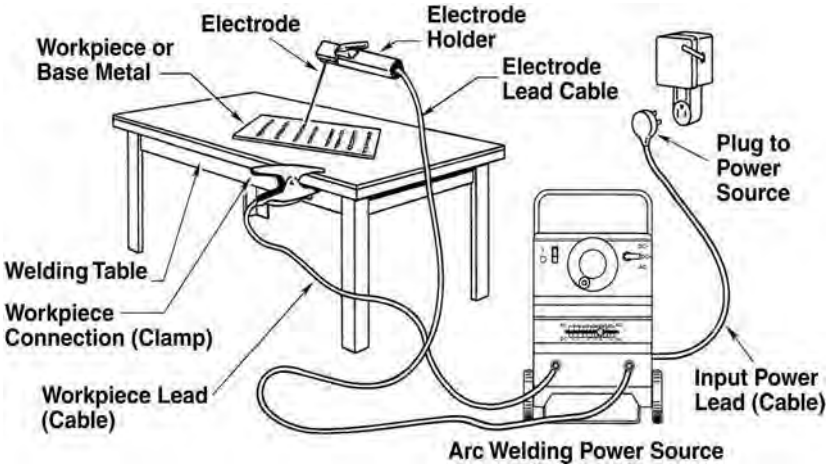

Figure 2.2: Shielded Metal Arc Welding (SMAW)

Shielded Metal Arc Welding (SMAW) or known as Manual Metal Arc Welding (MMA) was invented in 1888 in Russia. It is a process that joins metals by heating the metals to its melting point with an electric arc. Arc welding processes uses an electrical power supply to create and maintain an electric arc between an electrode and the base material to melt metals at the welding point (Finbar Smith, 2014).

It this welding process, the weld is formed by using a flux-coated electrode. The electrode is commonly called as stick, this stick contains a solid coating of inert materials and it will vaporize during welding. Consequently, it creates a gas or inert cloud to protect molten metal and also displace the oxygen that will contact with it.

In SMAW Welding, the filler matter which is welding electrode must be used in order to carry out welding activities. The welding electrode is clamped by the welding torch. During the welding process, electric arc will burn between the workpiece and the coated electrode. Therefore, the electrode holder will hold an electrode and touches shortly on the piecework. The ‘slag’ will be formed after welding when gas cloud settles on the molten pool after it cools. The slag must be cleaned by using grinder.

MMA Welding method consists of one MMA Welding machine, one earth clamp, one welding torch, welding cables and filler material. Apart from these, MMA Welding can be used in different welding positions with suited equipment and it is an