UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FABRICATION AND ANALYSIS OF JOINING PARTS FOR OIL AND GAS PIPING SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Process) (Hons.)

by

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2013

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) Hons. The member of the supervisory is as follow:

……

(Project Supervisor)

ABSTRAK

Sistem perpaipan di Petronas Sdn Bhd Melaka telah digunakan secara meluas dalam penghantaran, pengedaran dan pemprosesan pengeluaran minyak dan gas. Sistem perpaipan telah digunakan dalam jangka masa yang panjang menyebabkan sistem perpaipan yang sudah lama. Dalam keadaan ini, Petronas memerlukan proses fabrikasi baru di beberapa bahagian paip. Oleh itu, kajian ini membentangkan tentang teknik fabrikasi pada bahagian sistem perpaipan minyak dan gas. Di samping itu, terdapat analisis produk baru yang yang direka. Proses analisis yang dijalankan ke atas produk baru yang direka berdasarkan reka bentuk, ciri-ciri dan kos pembuatan. Sistem reka bentuk paip terdiri daripada bebibir dan paip berongga sebagai satu komponen. Satu teknik fabrikasi baru untuk fabrikasi sebahagian bahan kerja telah diperkenalkan dengan menggunakan keluli ringan dan bahan Teflon sebagai bahan terpilih bagi sistem perpaipan. Teknik fabrikasi yang yang dirujuk daripada reka bentuk komponen dan keperluan dimensi. Proses fabrikasi khusus untuk produk baru yang berbeza daripada produk yang sedia ada yang terdiri daripada bahagian-bahagian bahan Teflon sahaja. Bahagian lama sedia ada digantikan dengan produk baru yang direka. Siasatan pada produk yang direka ditambah dengan maklumat tambahan berbanding dengan produk yang sedia ada.

ABSTRACT

Piping system in Petronas Sdn Bhd Melaka has been widely used in transmission, distribution and processing of oil and gas production. The piping system has been used in such a long time resulting of the seasoned piping system. In this condition, Petronas requires a new fabrication process on some of its piping parts. Therefore, this research presents the fabrication technique of joining parts for oil and gas piping system. In addition, there are analyses of the new fabricated product provided. The analysis process is conducted on the new fabricated product based on the design, properties and manufacturing cost. The pipe system fabrication design consists of a flange and hollow pipes as a component. A fabrication technique to fabricate a joining part has been introduced by applying mild steel and Teflon material as selected material of piping system components. Fabrication techniques referred from the component design and the dimensional requirement. This fabrication process proposes for the new product that differs from the existing product that consists of Teflon material parts only. The existing seasoned part is replaced with the new fabricated product. Investigation on fabricated product turn out the additional information compared with the existing product.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Pipe system plays a key role in the day-to-day activities while making possible the delivery of available fuels, including natural gas. They are used in a wide range of transportation services. The major and most important use of pipelines is undoubtedly the energy transportation, such as oil and natural gas [George (2003)]. An interesting use of the pipes can be found in, example, in the Malaysia- Thailand Joint Development Area (JDA), Trans Asean Pipeline system, where gas transportation lines are interconnected by a 1540 km long pipeline system.

In industry and engineering discipline, a pipe is a round-stiff tubular section of the gas system that is made of carbon steel or plastic in function of the inner, outer or nominal diameter and the wall thickness. These measures are imposed by applicable industrial standards, such as ASME/ANSI B36.10/B36.19. The size of a pipe is based on its function and may vary from around 5 cm (2 in) to over 150 cm (60 in) in diameter [Henry (2003)].

Gas pipelines are usually buried underground about 1-2 meters (3-6 ft) in lands or rights-of-way acquired by, or granted to the pipeline company. Whenever burying the pipe becomes less convenient, the strategy is to place the pipeline 5-6 feet above the ground (under strict specifications to withstand environmental conditions) in order to allow for wildlife or any other factor that might damage the pipe [Mohitpur (2007)].

In Petronas Penapisan Melaka, there are sections of operation processing, transmission and testing section. Each section was set up a piping system to operate the plant. Operations are carried out without continuously every day for gas processing and transmission because of the requirement by the customer in the power, industrial and commercial sectors throughout Peninsular and East Malaysia. However, because of the long time usage, some parts are already seasoned thereby require some fabrication of those parts.

Therefore, the aim of this study will be on the fabrication of joining parts for oil and gas piping system as shown in figure 1.1 below. The study involves with the investigation of existing products in term of design, properties, and manufacturing cost. The existing product will be redesigned with the additional of strengthening structures to improve the product. The fabrications then take place after the design is conform. The figure 1.2 below had shown the specific drawing of the parts.

Figure 1.1: Ejector Part [Petronas (2012)].

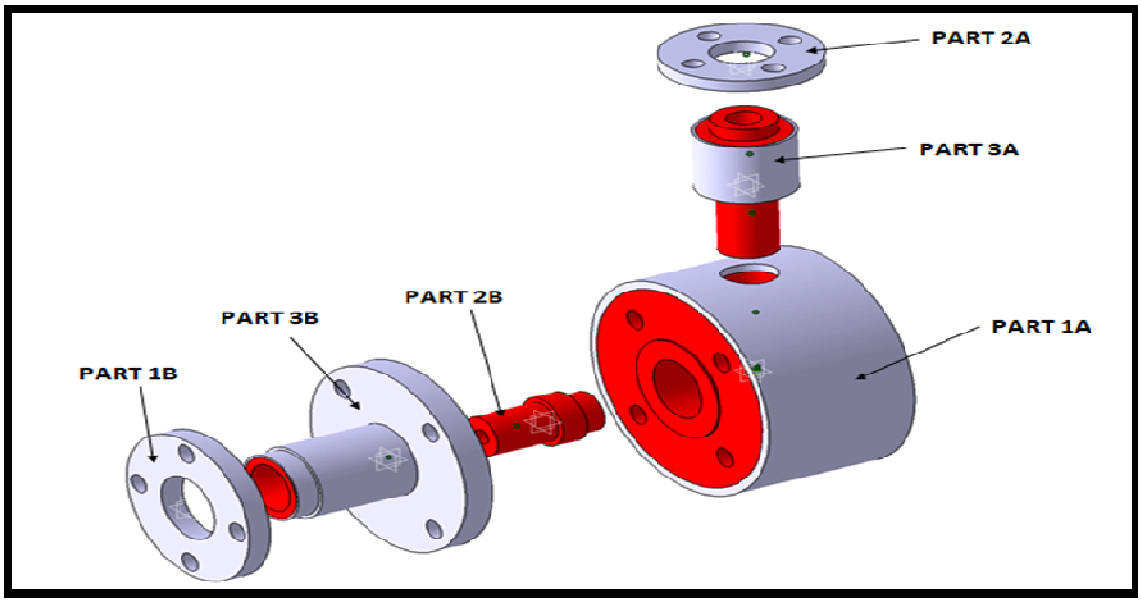

Figure 1.2: Specific Drawing of joining parts [Petronas (2012)].

The method approach of this study based on the fabrication technique for assembly the ejector part by existing product and drawing provided as a reference material. Figure 1.3 below had shown the existing product that from the ejector part that required for investigation process. Analysis of existing product design, properties and manufacturing cost will be conducted comparing with the new joining part fabrication after the fabrication process. Analysis of the result contributes to the improvement of the existing part with the new fabricated product.

Figure 1.3: Existing Part of Ejector [Petronas (2012)].

This study's important to the oil and gas company where it can be a guideline for the company in implementing the suitable design and pipe fabrication processing and future work for piping fabrication. Besides that, the application of the proposed piping system can help them to increase the productivity and maintain high piping resistibility. In addition, this study's importance to become reference material for further piping development research and studying.

1.2 Aim and Objectives of the Research Work

This study essentially consisted of the following major categories which encompass,

I. Fabrication of joining parts for oil and gas piping system
II. Investigation of the existing product in terms of design, properties and manufacturing cost.

1.3 Scope of the Report

This report is divided into two phases which is Final Year Project (FYP 1) and 2. Overall, this report contains 6 chapters. There are introduced, literature review, methodology, result and discussion, and conclusion and recommendation.

In Chapter 1: Introduction, is briefly explained the background of the study, the design and fabrication of joining part for oil and gas piping system, followed with the problem statement, objective of the study, scope, importance of this study and the organization of the report.

In chapter 2: Literature review, the theory of piping selection and selected component with support ideas that taken from journal, books, and articles are explained in detail.

In Chapter 3: Methodology, all methods that will be discussed to achieve objectives and obtained the result explained. The systematic planning and process flow diagram (PFD) also provided to show the overall study flow.

In Chapter 4: Result and Discussion focuses on the result and data being collected from the study. Beside, the discussion of the result been gained is explained further in this chapter.

In Chapter 5: Finding and Conclusion, the final chapter of this report concludes all the finding of the study and present the suggestion and recommendation in order to improve this study in future.

1.4 Gantt Chart of the report

Table 1 shows the Gantt chart of the study for FYP 1 and 2. It illustrates the duration of the study start from August 2012 until Jun 2013. The Gantt chart pictured the whole tasks that are needed to be done for the specific of the project.

No.	Year	2012												2013											
	Activity	August				September				October				November				December				January			
1	PSM title confirmation																								
2	Problem statement identification																								
3	Objective and scope of the study																								
4	Finding literature review																								
5	PSM 1 report writing																								
6	PSM 1 report review																								
7	PSM report submission																								
8	Prepare for PSM 1 presentation																								
9	PSM 1 presentation																								
10	Improvement on PSM 1																								
11	Data collection																								
12	Design development																								
13	Data analysis																								
14	PSM report writing																								
15	PSM 2 review																								
16	PSM 2 submission																								
17	Preparation PSM 2 Presentation																								
18	PSM 2 Presentation																								

Table 1.1: Gantt chart for Final Year Project 1&2 (PSM 1&2)

CHAPTER 2
LITERATURE REVIEW

2.1 Piping System

Term pipe is defined herein as a closed conduit, usually a circular cross section. It can be made of any appropriate material such as steel or plastic. The term pipeline refers to a long line connected segments of pipe, with pump valve control devices, and other equipment need for operating the system [Henry (2003)].

Piping system is a set of components including pipe, pipe fittings, flange, bolting, gasket, relief devices and the pressure retaining parts included in any stress analysis. It also includes the hangers, supports, and any other equipment necessary to prevent over stressing of the pressure retaining parts. It does not include the structure and equipment and foundations, except they may affect the stress analysis. That reason to define the design and fabrication of a system that offers a reasonable expectation of being safe when operated as intended [Philip (2005)].

When selecting a piping material for any component of piping-related system, the applicable piping code is of primary importance. Here, the allowable piping materials

had be listed as well as any restriction for their use. In addition the code will also stipulate various accepted standards that govern the manufacture, tolerance and installation of all components [Micheal (2003)].

Figure 2.1: Piping system [Allen (2010)].