Failure Analysis and Efficiency Value of Shell and Tube Heat Exchanger PT. Pertamina Hulu Rokan Indonesia

By :

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PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING (HONS.)

FACULTY OF INFORMATION SCIENCES AND ENGINEERING

JUNE 2022

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ACKNOWLEDGEMENT

Praise to God, because give mercy and has provide the author for equipped the final project that thesis with the title:

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In equipped this thesis, thereat substantial the adversity and obstacles. However, these ones thesis was equipped in concern with succor by several parties. Thereupon, the authors want to give thank you towards entire party that assist the author to equipped thisone thesis, be fraught with:

1. Management & Science University, as College Institution in Malaysia.
2. Jakarta State Polytechnic, as Vocational Institution in Indonesia
3. Pertamina Hulu Rokan as company which provides project data.
4. Supervisor Associate Prof. Dr. Safaa Najah Saud Al-Humairi, who has been helpand support this project.
5. Evaluator Mr. Asyraff Zulkipli, who has been evaluate this final project.
6. Parents, Mr. Zainal Mutaqin and Mrs. Lisdayani who has been give support foreverything.
7. Mr. Rahman Andre Wijanarko, who has been give support this project.
8. All colleagues who has been support in daily life.

Abstract of the project presented to the Senate of Jakarta State Polytechnic in partialfulfillment of the requirements for the degree Bachelor of Science in Mechanical Engineering (Hons.)

Failure Analysis and Efficiency Value of Shell and Tube Heat Exchanger PT. Pertamina Hulu Rokan Indonesia

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Abstract

Shell and tube heat exchanger is tool to employ shifting midst diverse the temperature of fluids two or more. Ergo, this one thesis employ steam at shell and production fluid at side of tube. In the course of this one thesis, commentary the analysisof modifying 19.05 diameter mm tube in consort with thickness 2.108 mm to 1.651 mm in consort with Design of Experiment (DOE) aggregate for 54 trials. Thereunto, aSolidworks software was employ to establish 3D modelling and validate HTRI. Out of procuration obtained, enhances of the efficiency percentage out of by value 95.33% at the thickness of 2.108 mm to 97.27% at a thickness of 1.651 mm.

Abstrak tesis yang dikemukakan kepada Senat Jakarta State Polytechnic sebagai memenuhi sebahagian keperluan untuk ijazah Sarjana Muda Kejuruteraan Mekanikal (Kepujian).

Failure Analysis and Efficiency Value of Shell and Tube Heat Exchanger PT.Pertamina Hulu Rokan Indonesia

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Abstract

Heat Exchanger ialah peranti yang dfungsikan niscaya memindahkan haba cecairberada pada berbezaan yang suhu. Justeru, kertas kerja ini membentangkan Analisis Kegagalan dan Nilai Kecekapan Shell and Tube Heat Exchanger PT. Pertamina Hulu Rokan Indonesia menggunakan cecair wap di bahagian shell dan cecair pengeluaran pada tiub. Dalam penyelidikan ini dilakukan analisis dengan mengubah suai tiub diameter 19.05 mm dengan ketebalan 2.108 mm hingga 1.651 mm dengan Reka Bentuk Eksperimen sebanyak 54 kali percubaan. Selain itu, perisian Solidworks digunakanuntuk mencipta reka bentuk pemodelan 3D dan HTRI untuk mengesahkan. Daripada keputusan yang diperolehi, pengubahsuaian ketebalan tiub memperoleh peningkatannilai kecekapan daripada nilai 95.33% pada ketebalan 2.108 mm kepada 97.27% pada ketebalan 1.651 mm.

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CHAPTER I
INTRODUCTION

1.1 PROJECT BACKGROUND

Multitude energy in Indonesia with put on by take control by energy non-renewable yield oil and coal by fossil [1]. Bring about shortfall explore and invest makes crude oil go down ever since 1990s [2]. Indonesia have the million of foreign exchange and export income are obtained from the very large and profitable income from the oil and gas industry. Neverthless, ever since 2007 oil go down by 4.41% and most go down in 2013 [3]. PT. Pertamina is oil and gas venture State-Owned Enterprise (BUMN). [4]. Pertamina Hulu Rokan is a subsidiary of PT Pertamina that produces oil and gas using type tool which is heat exchanger bear for use example gas and oil utilize that example of one company.

Extremely famous type for heat exchanger is that kind of because this equipment canbe used for many various temperatures and operating pressures, making it suitable for industrial manufacturing, power generation, chemical processes, and others. This is equipment that we can used for transfer heat that differs among variant kind of fluids with a temperature. In as much as adequate temperature and pressure, adequate manufacture, chemical processes, and others [5].

Industries especially chemical industries the example of failure issue in this type equipment are to makes a discussion a chronic matter. Inherent for design to safety judgement and meager which obvious matter result for the failure in heat exchangersEnhances heat transfer enhances STHE efficiency [6].

Failure major establish leakage of fluid [7]. Convection and conduction clandestine multitude liquid, way transfer, shape surface, arrange flow, scaffolding, heat transfer process [8]. ISO standards, TEMA standards, Asme Boiler, and Pressure Vessels areguideline famous [9].

1.2 PROBLEM STATEMENT

Problem that failure of the heat equipment for exchanger which type it shell and tubes make the issue it the causes a decrease in the efficiency of oil production in Indonesia. This issue causes an increase in oil prices in Indonesia which causes disruption of the activities of the community and industrial companies to carry out production this problem issue causing a decrease in state income.

1.3 OBJECTIVES

1. Study failure analysis at PT. Pertamina Hulu Rokan Indonesia of the heatequipment for exchanger which type it shell and tubes.
2. Design that will be modificate with taken the issue problem consideration ofefficiency using Solidworks and HTRI softwares.

1.4 SCOPE OF PROJECT

1. Use Solidworks software to create a physical design.
2. Modify tube $Ø_{OD}$ 19.5 mm from thickness 2.108 mm to 1.651 mm.
3. Use TEMA 9^{th} standard and Kern Method for international standard designguidelines.
4. Use saturated steam fluid in shell side and production fluid.
5. Use HTRI software's for validation of U_{actual} and $U_{required}$ of Heat Exchanger.

1.5 SIGNIFICANCE OF PROJECT

Accordance with SDG number 9 for makes ductile of the infrastructure, drive sustainable industrialization, and maintain reform. The aim of this project for resultinnovation in oil and gas industry in order to get oil and gas the products effective. This analysis is used to obtain comparisons to reduce or avoid failures to make thatcompany profits increase.

1.6 LIMITATIONS OF PROJECT

The limitation of the project is:

1. This analysis can only be applied on shell and tube heat exchanger PT. Pertamina Hulu Rokan Indonesia, because the data analyzed comes from that

company.

2. This analysis uses TEMA 9th standard and the Kern Method.
3. This analysis only focused on efficiency which is affected by modifications tothe tube only.

CHAPTER V
CONCLUSION

From this analysis we can draw the conclusion that, under different conditions, the thermal conductivity of the SS 316 L material on the Tube is constant 16.3 W/mC in 54 trials in consort with temperature, mass flow, and pressure as input with low, medium, and high range.

In consort with steam IAWPS at shell side and Production Fluid at tube side API 19.5, the tube thickness from 2.108 to 1.651 can affect capability type shell and tube equipment in this company that we called it heat exchanger that be transferring heat and efficiency by increasing output value efficiency from 95.49 % to 97.41 % with the highest efficiency is found in the 25th trial with a thickness of 1.651 mm of 97.41 %. The thinner the tube thickness, the higher the heat transfer and efficiency.

The influence that greatly capability the equipment for transferring the hot of the heat in this equipment and value of efficiency which we already calculated by use the formula that already given and known in this analysis is temperature followed by second position is flowing fluid that having mass that be flowing. When thickness 2.108 mm efficiency get this maximum value calculation 4.2 kg/s and temperature itself are known 31.85 ℃. When thickness 1.651 mm mm efficiency get this maximum value calculation at known 4.3 kg/s and with the temperature itself are know 31.85 ℃.

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