
# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

# DESIGNING SMALL SCALE GASIFICATION BIOMASS TECHNOLOGY

The report submitted in accordance with requirement of the University Technical Malaysia Melaka (UTeM) for the Bachelor's of Electrical Engineering Technology (Industrial Power ) with Honours.

by

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2018

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk: DESIGNING SMALL SCALE GASIFICATION BIOMASS TECHNOLOGY

Sesi Pengajian: 2018/2019

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Author : HARIHARAN A/L MATHANASUNDRAN

Date:

## APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor's of Electrical Engineering Technology (Industrials Power) with Honour's. The member of the supervisory is as follow:

Signature: …….

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## ABSTRAK

Sebagai sisa pepejal biomas dan perbandaran menjadi alternatif bahan bakar fosil yang semakin banyak. Biomas adalah salah satu daripada tenaga boleh diperbaharui yang menyelesaikan kesan alam sekitar yang merugikan dan masalah lain bahan bakar fosil tenaga. Ia biasanya terdapat dalam bentuk sisa pertanian serta sisa-sisa lain seperti sisa pepejal industri dan perbandaran. Projek ini membentangkan reka bentuk gasifier berskala kecil untuk tujuan penyiasatan untuk memenuhi dan menyelesaikan masalah tertentu dengan menggunakan proses pengegasan kaedah biomas dan sisa pepejal perbandaran. Pelabuhan pengekstrakan gas sama rata di sepanjang proses untuk mengekstrak gas produk. Gas yang boleh dihantar di sepanjang garisan-garisan, 'syngas' yang, dimana tertunggak dan ramuan proses industri dan menawarkan pilihan yang hebat untuk penjanaan kuasa tinggi keberkesanan skala yang luas dan bahan kimia. Selepas bahan mentah yang dibakar dalam, gas ini dihantar ke saluran. Semasa prosedur saluran, pemisah penapis telah disatukan untuk mengurus gas-gas ini dan di samping itu membebaskan bio-oil. Gas-gas yang sempurna telah hantar ke enjin yang dikenali sebagai enjin gas. Gigi gear pada engine tersebut akan disambung dengan gear gigi motor dc untuk membuat putaran tenaga yang dihasilkan. Akhirnya, tenaga akan membekalkan kepada penyongsang dari dc motor di mana masuk penyongsang 12v at ke au 230v 50 Hz dan beban tenaga elektrik 100w. Objektif utama untuk menunjukkan yang menarik dan kemungkinan system ini berjaya keputusan percubaan membentangkan saiz kecil pengegasan berikutan struktur dan manfaat bagi orang-orang luar bandar yang kekurangan tenaga elektrik.

## ABSTRACT

As biomass and civil strong squanders turn out to be progressively and suitable non-renewable energy sources choices. Biomass is one of the sustainable power source that purposes the hindering ecological effects and different issues of petroleum derivative type of vitality. Gasification is one of procedures and center of this task, in spite of the fact that the innovation exists as of now for quite a long time, it is as yet being created for cutting edge employments of biomass and waste analyze incinerator. This task show outline of a little scale gasifier to investigate to meet and take care of certain issue by utilizing strategy gasification procedures of biomass and city strong waste. The gas extraction ports are equally conveyed along of the procedure to extricate item gases. The gas which can be delivered along these lines, a syngas, is an outstanding ware in the vitality age and concoction process industry and offers great choices for high effectiveness extensive scale power generation and chemicals. After the feedstock is scorched in chamber, the gas is stream to channel. During the channel procedure, a twister separator was consolidated to clean the gases and additionally extricate bio-oil. From the perfect gases were send to engine which known as gasoline engine, The engine rotator teeth will connected with dc motor teeth to make rotation for produced power. At last, the energy will supply to inverter from dc motor where the inverter incoming 12 v dc to inverting 230v ac with 50 Hz as electricity grid requirement and load power 100w. The ultimate objective to show the compelling and feasibility of the system, thru succeed this paper presents trial result of the little size of gasification following structure and benefit for rural area peoples who lack of electricity energy.

## DEDICATION

I might want to dedicate my thesis work to the God for his adoration and favours. Particularly committed to my beloved guardians and relatives. Whose inspirational statements and conjointly for their endless love, consolation and support all through the entire time of finishing my studies. To my kind and supportive project supervisor Sir Adlan Bin Ali, who have ceaselessly constantly supported me and listens to my issues and who's her great illustrations have shown me to work hard for the things that I try to accomplish. I conjointly commit this work to all my family and fellow friend's companions who have supported all the way, been giving consolations all through the project. I will have the capacity to ceaselessly welcome all they have done. I commit this work and gives uncommon in view of the considerable number of individuals that have helped all throughout the complete bachelor degree project in a direct or indirect way. Every one of them is my best team well-wisher.

## ACKNOWLEDGEMENTS

At the start, I might want to express my appreciation to the University Technical Malaysia Melaka (UTeM) for furnishing me with a chance to extend my insight into innovation at this prestigious University. My genuine gratefulness additionally goes to my regarded and recognized supervisors, Sir Adlan Bin Ali, who guided me in my exposition work, and furnished me with significant exhortation and proposals driving me to achieve the thesis. I might likewise want to thank all instructors in Faculty of Engineering Technology has conveyed significant addresses to upgrade my insight amid the semesters. Ultimately, i express my true appreciation to my folks, whose favours and direction have empowered me in keeping on making progress in my life.

# TABLE OF CONTENTS

## LIST OF TABLE

## LIST OF FIGURES

## LIST OF GRAPHS

## LIST OF ABBREVIATIONS

| | |
|---|---|
| MSW | Municipal Solid Waste |
| WTE | Waste to Energy |
| LFG | Landfill Gas |
| CHP | Combined Heat and Power |
| CO2 | Carbon dioxide |
| CH4 | Methane |
| CO | Carbon Monoxide |
| H2 | Hydrogen |

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Small Scale Gasification Biomass

This venture referring to biomass gasification machine project which offer a much broader gadget that used to lessen rubbish and municipal strong waste. Biomass is any herbal trouble, as an instance, wood, vegetation, ocean increase, creature squanders in that may be applied as a vitality supply. Biomass is probably our maximum settled wellspring of imperativeness after the sun. For a big variety of years, people have consumed timber to warm their homes and prepare dinner their sustenance. Biomass gets its power from the solar. All natural issue carries positioned away vitality from the sun. Amid a procedure called photosynthesis, daylight offers flowers the power they must change over water and carbon dioxide into oxygen and sugars. Those sugars, referred to as carbohydrates, deliver flowers and the creatures that devour plant life with vitality.

Sustenance's rich in sugars are a decent wellspring of electricity for the human frame. Biomass is a sustainable energy source for the reason that its provisions aren't restricted. We will simply increase trees and yields, and waste will dependably exist. We utilize some sorts of biomass nowadays, inclusive of wood, rural gadgets, strong waste (MSW), landfill gas and biogas, and biofuels.

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## 1.2 Statement of the Purpose

Designing Small Scale Gasification Biomass Technology will be the aim of following these objectives:

a) To design a system for effective and efficient method of Municipal Solid Waste (MSW) disposal.
b) To develop a prototype-based small scale gasification biomass technology.
c) To access the effectiveness of prototype-based small scale gasification biomass technology

## 1.3 Problem Statement

a) Increasing number of uses large areas of land and the production of leachate, where leak from landfills and pollute groundwater.
b) Increasing number of population directly contribute to 1200 ton municipal solid waste (MSW) per day.
c) The societies are not seeking any alternatives to substitute the consumption of garbage or wastes to energy.

## 1.4 Statement of the Purpose

This project consists of several main parts in these scopes of work. First the project mainly to comparing of incinerator and gasification in form process, hazardous, and effective. Then to collecting data and analysis gasification biomass. Finally to create prototype of small scale of biomass gasifier.

## 1.5 Report Layout

This task essentially examined about the examination and advancement of Small Scale Biomass Gasification System. There will be five sections that will portray and clarify assist about this venture.

Chapter I will depict about venture presentation. This subject portrays the presentation of the Biomass Gasification Framework and the principle targets of the undertaking. General points incorporate the extent of the undertaking, venture procedure and the issue statement are incorporated into this subject.

Chapter II will examine writing survey subject as known Literature Review. This theme centers around the hypothesis of each framework identified with Biomass Gasification Framework. Assets got from diaries, theory, journals , books and site containing all the data identified with the venture.

Chapter III will clarify the philosophy of the undertaking. This theme exhibits the means to actualize the venture from the underlying outline to fruition. System and timing, arranging are appeared in this subject.

Chapter IV will advise the investigation and task result. This section depicts the examination and the advancement that were done keeping in mind the end goal to show signs of improvement result to the undertaking.

Chapter V will portray the finishes of the theme, I to subject IV. The conclusion and suggestion will be finished up toward the finish of over all parts.

# CHAPTER 2

## LITERATURE REVIEW

### 2.1 Introduction

As the price of oil and gas and further the energy emergency are always increasing, there is a developing interest for the energy which is natural neighbourly and more affordable. Biomass is one of the decisions among these sorts of vitality assets. This most established wellspring of energy known to the humanity does not make any expansion to the world's carbon dioxide levels. Since the majority of the biomass develop through photosynthesis by engrossing carbon dioxide from the air. When it proselytes to vitality, just as of late assimilated carbon dioxide will discharge [1]. Biomass can be imitated and does not take a huge number of years to create, which is considered as a sustainable power source. Also, a wide assortment of biomass can be utilized as crude material for the creation of energy, for example, squander wood chips, agrarian products and creature squander and so forth. In this regard, biomass is a standout amongst the most encouraging vitality sources in the prompt future. Biomass is changed over into gases and after that integrated into the coveted chemicals or utilized specifically.

Waste to Energy (WTE) includes any waste treatment procedure to change over non-recyclable waste materials into useable vitality through an assortment of procedures, including ignition, gasification, pyrolization, anaerobic absorption, and landfill gas (LFG) recuperation.

Because of the immense measure of the civil strong waste (MSW) delivered every day in urban regions, the considerations are centred on MSW preparing as the feedstock to such advances. The most well-known and broadly utilized MSW-to-Energy advancements are burning in a joined warmth and power plant (CHP) and controlled landfill to catch methane from squander (LFG)[1].

Biomass gasification for consolidated warmth and power (CHP) generation offers substantially higher vitality productivity. This innovation has been marketed effectively in a few nations [2].Gasification alludes to a gathering of procedures which feature the transformation of strong or fluid powers into a flammable gas in nearness or nonattendance of a gasification operator. It is typically completed by responding fuel, for example, coal, biomass, oil or coke with a negligible measure of oxygen frequently in blend with steam.

## 2.2 Background of Biomass and Gasification System

### 2.2.1 Biomass and Its Product

Biomass is shaped from living species like plants and creatures - that is, anything that is currently alive or was a brief span back. It is framed when a seed grows or a life form is conceived. Not at all like petroleum product, does biomass not take a large number of years to create. Plants utilize daylight through photosynthesis to use climatic carbon dioxide and develop. Creatures develop by taking in sustenance from biomass. Non-