UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Selection and Installation Suitable Engine for Agricultural Smart Mover

PSM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honors.

ABDUL HAFIZ BIN ABDUL SAMAT
B071410641 4 BETA 2016/2017
930129-60-5029
SUPERVISOR: AHMAD ZAINAL TAUFIK BIN ZAINAL ARIFFIN

DECLARATION

I hereby, declared this report entitled “Selection and Install Engine for Agricultural Smart Mover” is the results of my own research except as cited in references.

Signature :……..

Name : Abdul Hafiz bin Abdul Samat

Date : 15 December 2017

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 of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

……..

(Project Supervisor)

ABSTRACT

The title of this project is 'Selection and Install Engine for Agricultural Smart Mover'. Agricultural industries in Malaysia are increasing day by day. More oil palm plantation been opened up. This project is to ease the burden of the workers in the oil palm plantation by not needing to use much energy to push the wheel barrow to carry the palm oil fruits from one point to another point. This project covers the selection method by following process flow. Through selection and decision method the suitable engine for the Agricultural Smart Mover was decided. The analytical process on the selected engine went through experimental methods in real time testing to determine the capability of the engine to carry aim load. As a result, the engine selected successfully fulfilled the aim of this project.

ABSTRAK

Tajuk projek ini ialah “Pemilihan dan Pemasangan Enjin yang sesuai untuk Agricultural Smart Mover”. Industri pertanian agrikultur di Malaysia kian meningkat dari semasa ke semasa. Terdapat banyak kebun kelapa sawit yang dibuka. Projek ini bertujuan untuk meringankan beban pekerja di kebun kelapa sawit dengan tidak memerlukan tenaga yang banyak untuk menolak kereta sorong yang dimuatkan dengan buah kelapa sawit dari satu tempat ke satu tempat di dalam kebun kelapa sawit. Melalui proses kaedah pemilihan dan pengutusan, enjin yang sesuai akan dipilih mengikut factor-faktor tetrtentu. Enjin tersebut kemudiannya akan melalui proses menganalisa menggunakan kaedah uji kaji unutk menentukan kebolehan enjin tersebut untuk membawa muatan berat. Hasil dapatan kajian ini, enjin yang dipilih mampu membawa muatan berat yang dicadangkan dalam projek ini.

DEDICATION

This dissertation is decided to all my family members and friends. It has always been my parents Mr Abdul Samat bin Abdul Kareem and Mdm Nur Jasmin Yeoh binti Abdullah who nurses me with affection, trust and moral support whenever any challenges gets tougher. Their unconditional love reminds me that I could not easily disappoint them and even trying harder. All my fellow friends are deserved to be partnership in my success of the project especially my housemates. They have provided me a lot of miscellaneous aids and words of encouragement which make me to think in a positive manner when things go wrong. I also want to dedicate this dissertation to my supervisor and co-supervisor who willing to teach and assist me in any part of the project which I had trouble with.

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I would like to thank my supervisor, Mr Ahmad Zainal Taufik bin Zainal Ariffin and also my co-supervisor Mr Omar bin Asaroon for their essential supervision, support and encouragement towards the completion of this thesis.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The purpose of this project is to select and install the suitable engine for Agriculture Smart Mover. The engine is an important part of the Agriculture Smart Mover as it will play a main role in order to be able the Agriculture Smart Mover to and to reduce usage of man power. The selection and installing of engine for Agriculture Smart Mover will include comparison between a few engines to select suitable engine to be tested and mounted onto Agriculture Smart Mover chassis.

1.1 Project Objective

The aims of this project are as follows:

1. To select a suitable engine to be installed onto the Agriculture Smart Mover based on total design method.
2. To test the capability of the suitable engine to carry the maximum load of 50kg on the Agricultural Smart Mover through experimental method.

1.2 Work Scope

In this project, selection of the suitable engine to be installed on to the Agriculture Smart Mover and its capability to carry the load on the Agricultural Smart Mover. Engine is an important part of this project as it is the heart of the project and to enable the smart mover to move and reduce the man power.

The suitable type of engine will be selected which is suitable and function properly with the Agriculture Smart Mover as it use with heavy loads and uneven road condition in the palm plantation. A few engines will be compared and the suitable one will be tested its capability and finally installed on to the Agriculture smart mover chassis.

Furthermore, the scope of this project is to select the suitable engine which is cost efficient. By means, the cheaper the engine the better, but even though a cheap engine other consideration had to be made on the engine such as the type of engine, power produced by the engine and the cost for maintenance.

1.3 Research Background

Malaysia is a nation that is progress of farming division. The agrarian party has given the open doors for Malaysians to bolster themselves. One of the developed agricultural part is palm oil in Malaysia. Palm oil stands out amongst the most exchanged agribusiness products on the planet. Worldwide palm oil generation is expanding each year, provoked to a great extent by growing bio fuel markets and by nourishment request. In Malaysia, palm oil industry has been a vital agribusiness segment in the economy for as long as three decade. There are many strides that have been taken by the agriculturist and business visionary to guarantee the best strategy for better palm creation.

Fast developing of worldwide request for palm oil in the previous decade mirrors the aggregate development of oil palm in the creating nation, for example, Malaysia. The improvement in palm oil industry must be able to have the capacity to tackle the issue and the quality to meet client prerequisite. However, we discover that one of the issue in the oil palm production is the way to gather the palm fruit that have been picked from palm tree before it is loaded on to the truck. Typically, in palm ranch, they are utilizing an ordinary wheelbarrow to accumulate the oil palm starting with one tree then onto the next tree. This strategy has been utilized by specialist for 10 years. This strategy will build the quantity of labourers and man power, keeping in mind the end goal is to spare time amid to gather the palm fruits will influence the costing as they should pay the workers wage.

The point of this venture is to help the workers in the palm manor with some of issue that been confronted. Among the objective is to resolve of the issue in the palm oil industries, we make sense of the most ideal approach to settle that issue by building an AGRICULTURAL SMART MOVER. This Agricultural Smart Mover will lessen the time of labourer to get and accumulate the palm fruits by the innovation that we have composed.

Engines can be used to an extensive variety of usage extending from the marine, inland (off-road) up till light weight aerial vehicles. In Malaysia there a various four stroke and two-stroke engines are for all intents and purposes imported. All have been making in-streets for over 40 years taking into account the requirements of developers, agriculturists and various utility clients. The price ranged from as low as RM 900.00 to RM 5,000.00 varies on quality, branding and system. From between January the year 1999 to December 2000 Malaysia had imported RM55.94 billion of machinery, equipment and parts (MITI,2001).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews about engines where will be used to run the Agricultural Smart Mover. The engine is the heart of the project. The engine provides power to be able the Agricultural Smart Mover to move on its own. There are many types on engine for example two-stroke engine, four-stroke engine, steam engines, rotary engines, boxer engines and etc.

2.2 Background of Two-stroke Engines

It is by and large acknowledged that the two-stroke cycle engine was created by Sir Dugald Clerk of England toward the finish of nineteenth Century. It is a type of motor utilizing crankcase pressure for the enlistment procedure, including the control of the planning and area of the fumes, exchange and admission ports by the cylinder (C.F. Caunter, 1970)

Two-stroke engines are broadly utilized for bikes, bikes and mopeds being used of general transport and for recreational purposes, in spite of the fact that the authoritative weight on emissions in a few nations has created a swing to a four-stroke motor substitution now and again. Some different applications with motors which are comparative in configuration terms to those utilized for cruisers, and the games of go-kart and hydroplane hustling would fall into this class.

The two-stroke motor is likewise utilized for lightweight power units which can be utilized in different mentalities as handheld power instruments. Such apparatuses are cutting tools, brush cutters and solid saws for examples, and these are made with a view to gentility and high particular power execution.

2.2.1 Operation of 2-stroke Engine

In a Two-Stroke motor the piston moves downwards, the fuel mixture under the piston compressed and blowing it into the cylinder. As this blend blows in it likewise blows the consumed debilitate gasses out. The fuel blend is blown into the chamber through sections (Ports) in the cylinder walls. The cylinder comes up, covering the ports in the chamber dividers and compacting or crushing the blend. This likewise makes a vacuum in the crankcase under the cylinder, sucking the fuel blend into the crankcase. The start then lights the blend and the torching gasses push the cylinder, beginning everything once more. This is altogether done in two strokes of the cylinder (Gordon P. Blair, 1996).

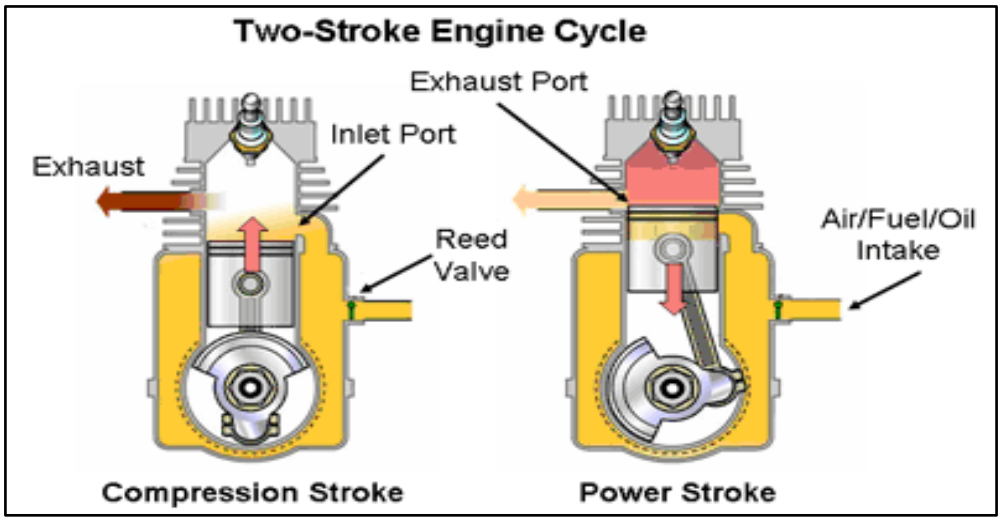

Figure 2.1 Two-stroke engine cycle

From figure 2.1, the spark plug sparks and ignites the mixture in the chamber hence producing an increase of temperature and pressure which will push the piston downwards on the power stroke. Under the piston, the inlet port allows air from the outside to enter through it into the crankcase due to low pressure in the crankcase by increasing the crankcase volume. When volume increase hence pressure decrease. Fuel is the injected into the engine by using a carburettor or fuel is injected directly into the cylinder before or after the exhaust port is closed.

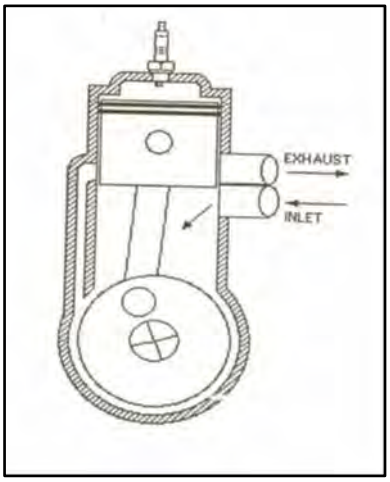

Figure 2.2: Compression and induction

Figure 2.2 shows the release point in the cycle where the exhaust port is opened. This permits the transmission into the fumes conduit of a beat of hot, high-weight fumes gas from the ignition process. The port area increases with the crankshaft area hence the cylinder pressure decreases. Beneath the piston, compression for the new charge takes place.

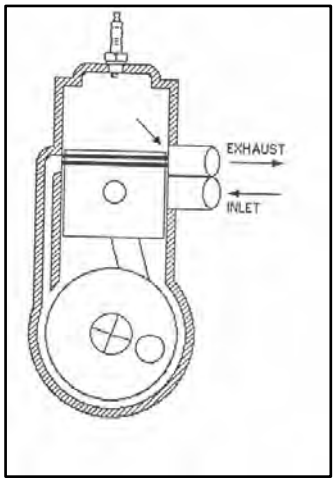

Figure 2.3: Blow-down exhaust period

When scavenging process, the intake and exhaust ports are both open at the same time. During this process, some of the fresh air-fuel charge is lost through the exhaust port and it is known as short-circuiting. During this scavenging process the typical two stroke engine fuel loses is 30%-40%, and losses of up to 70% under idle conditions. Short-circuiting effects are one of the unlikely effects of two-stroke engine.

2.2.2 Advantages and Disadvantages of Two-stroke Engine

Advantages	Disadvantages
Two-stroke engines doesn't apply valves, simple build of the engine	Two-stroke engine parts wears out faster due to non-lubrication system
Two-stroke engines combust once each revolution. More power boost created.	Two-stroke oil cost more than the four stroke engine oil.
Two-stroke engines weighs less, and cheaper to manufacture.	Two-stroke engine produce more pollution.
Two-stroke engines produce twice the power because there are twice as many power strokes per revolution.	The combustion of the oil in the gas produces smokes and a not maintained well engine produces more oily smoke.

Table 2. 1 Advantages and Disadvantages of Two-stroke Engine

2.2.3 Application of Two-stroke Engine

According to Sanjaikumar, P. (2013), two-stroke engine are used widely worldwide. In Asia alone, over 50million two-stroke engines, been used on motorbikes, scooters, “three-wheelers”, “auto-rickshaws”, “tuk-tuks”, and “tricycles”. High demands of two-stroke engines keeps the engine manufacturers producing 2-stroke engines but towards a greener and more efficient 2 stroke engine. Some of the 2-strokes engine application shown in Figures 2.4 to Figure 2.5.

Figure 2.4: Tuk-Tuk

Figure 2.5:Genarators

2.3 Background of 4-stroke Engine

According Lynwood Bryant (1966), Nikolaus Otto first demonstrated the four stroke engine in 1876, also known as Otto cycle. It consist of 4 strokes, 4 strokes completes one cycle operation of the piston that is in every 2 revolutions of the crankshaft one cycle is completed. 180° of crankshaft rotation each stroke consists and hence a cycle consist of 720° of crankshaft rotation. An internal explosion resulted in this operation.

The four-stroke cycle was patented by a French engineer, Aphonse Beau de Rochas in 1862. However, the first to build a four-stroke cycle engine was Otto. However, when Rochas' patent was revealed in 1886, Otto's patent was revoked.

Karl Benz, a German mechanical engineer in 1885 designed and built a practical automobile to be powered by an internal-combustion engine, the world's first. A very light engine was constructed by Gottlieb Daimler, using Otto's model and install one of them to a bicycle hence becoming the world's first motorcycle.

Karl Benz invented his first three wheeler by applying Otto's engine. Daimler then also constructed a car, applying Otto's engine. These to engineers merged and formed Mercedes-Benz which is now very famous with their vehicle on the road. Nowadays, most of the automotive vehicles are using 4 strokes engine. It is widely been used all over the world from light weight vehicle to heavy weight vehicles.

2.3.1 Operation of four-stroke engine

In a four-stroke engine, there is four strokes which are; firstly intake/suction stroke. Next is compression stroke. Third is the expansion stroke and the exhaust stroke comes last.

First is the suction stroke. In suction stroke, piston is at the Top Dead Center (TDC) of the cylinder and moves to the Bottom Dead Center (BDC). During this process, the outlet valve will be closed and the inlet valve will be opened to allow the fresh charge of mixture fuel & air into the combustion chamber. Shown in Figure 2.6

In compression stroke, once piston reaches Bottom Dead Center (BDC) and moves back upwards to Top Dead Center (TDC), exhaust valve and inlet valve will be closed. It compress air fuel mixture in the cylinder as the piston moves towards Top Dead Center (TDC), compression occurs and the spark ignites. Hence it is called compression stroke. Shown in figure 2.6 (Heywood, J.B., 1988).

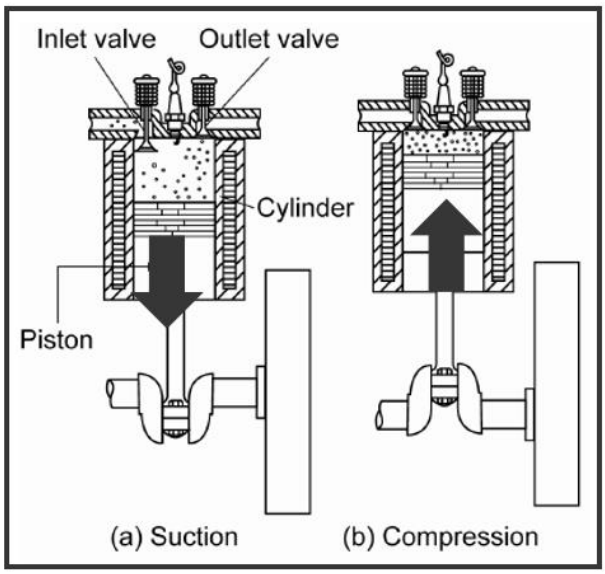

Figure 2.6: Suction and Compression

In expansion/power stroke, Figure 2.7, both the valves are closed. The fuel mixture is ignited when piston reaches top of its stroke by spark plug cause by spark at high temperature. The piston pushed down to bottom dead centre (BDC) by pressure generated inside the cylinder. This is called expansion stroke.

Lastly exhaust valve is opened in exhaust stroke, while the inlet valve closes, when piston reaches bottom dead centre (BDC), it moves upwards to top dead centre (TDC). The burnt gases was pushed out to the atmosphere by the piston through the exhaust valve. Hence known as exhaust stroke and the engine begins a new cycle. Refer figure 2.7.

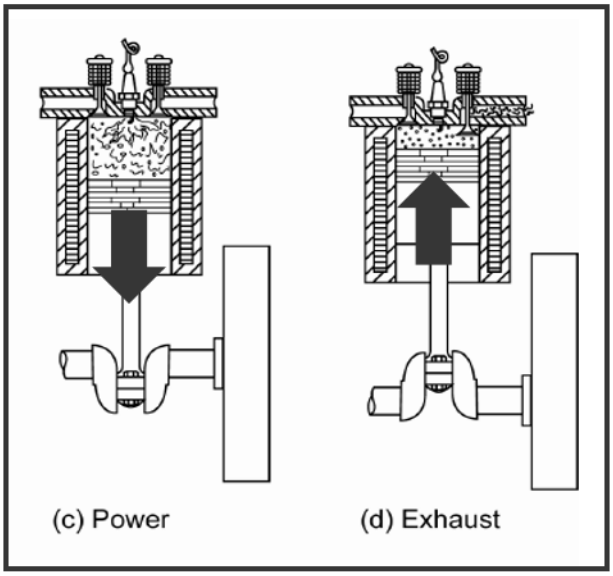

Figure 2.7: Power and Exhaust