

Chapter-1

INTRODUCTION

Jet engine[2] is a class of engines that propels an automobile by means of the rearward discharge of a jet fluid, usually hot exhaust gases generated by burning fuel with air drawn in from the atmosphere. The jet engine is also known as the engine working on the Brayton cycle in accordance with Newton's laws of motion. In general, jet engines are combustion engines but non-combusting forms also exist. These engines offer high speed and greater fuel efficiency than piston and propeller aero engines over long distances. This interesting topic of jet engines thus triggered the topic which is "Investigation, Analysis and Design of a Prime mover, using jet principle to replace the existing I.C engine.

The prime mover^[12] that has been fabricated has 3 regions that are diffuser, combustion chamber and nozzle respectively. There is an ignitor (spark plug) that is welded to the combustion chamber and this is connected to a dimmerstat so that the combustion chamber temperature rises by the heating of the nichrome wire coil. This is required for the spontaneous combustion to take place and to make sure it combusts continuously in the combustion chamber. There are two inlets in the combustion chamber, one for the compressed air and another for fuel (LPG) entering from the copper pipes welded on the combustion chamber. A LPG tank is used as a fuel source and is supplied through a pipe connected to the copper pipe so that it enters the combustion chamber. A compressor tank is used as a compressed air source and is supplied through a pipe connected to another copper pipe so that it enters the combustion chamber at the same point in the combustion chamber so that it mixes correctly. Once this happens the combustion takes place as that region is heated in the combustion chamber by the heating coil or the ignitor and this heat is sufficient enough for combustion to take place. After this happens the temperature rises and the combustion elements slowly move towards the nozzle as one regulates the control valves at the compressor end and the end of the fuel tank. At the final point the fuel supply should be maximum and the compressed air should be around 4 bar in the combustion chamber as this serves as the ideal condition as per the tests conducted. Potential energy of the combustion elements is converted to Kinetic energy at the exhaust end of the nozzle and hence velocity increases and pressure decreases and by Newton's third law thrust is produced. The thrust elements impinge on the rotor blade at 90 degrees to the blade. Hence the rotor blade on one end rotates and this makes the crank shaft rotate and due to this the sprocket assembled with the crank shaft on the other end rotates and this rotary motion is coupled with a chain drive to rotate wheels of an automobile by or could be used to generate power in the required way.

1.1) OBJECTIVE

To build a prime mover to replace the existing I.C engine using Jet Principle is what one aims to achieve. An I.C engine consists of large no. of components which makes the engine less efficient due to losses in friction, complicated, heavy & costly. The automobile also accompanies large and heavy parts in an automobile which is different in the current setup as there are fewer parts which are light in weight, Hence the turning moment on the crankshaft is hence achieved in a simple way. The ultimate aim here is to implement it in the power generation and automobile sector.

1.2) METHODOLOGY

The setup consists of Jets, Rotor, Plummer Block, Fuel Tank, Air Compressor, Shaft, etc. Firstly the compressed air in the Jet (pressure up to 5bar) is forced into the combustion chamber. Here the fuel mixes with the compressed air. At that moment ignition takes place by the spark produced. The pressure created here is around (10-12) bar. This pressure head passes through the converging nozzle, where the cross-sectional area of the outlet of the nozzle decreases. This pressure head is converted into Kinetic Energy where in it passes through the diverging nozzle where the high Kinetic Energy of air is converted into pressure head. This pressure head generates a thrust which is tangential to a Rotor which in turn makes the Crank shaft attached in line with it to Rotate. The Rotary action of the Crank shaft to rotate which in turn could be used to run and deliver a rotary power as a prime mover which will be used to replace an existing I.C engine.