International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

Non-Aircraft Application of Mini Jet Engine

Somesh A. Chincholikar[1], Aman Deshmukh[2], Yashodanand More[3], Mahesh Waybhat[4], Prof. Sanjay Nikhade[5]
[1, 2, 3, 4, 5]*Dept. of Automobile Engineering, Dr D.Y. Patil School of Engineering and Technology*

Abstract: ***The content of this publication deals with design and manufacturing of cycle that is powered by mini jet engine. We reviewed literature regarding turbine engine, design cycle according to the purpose of application and manufactured them accordingly. We then manufactured cycle and planned for testing mini jet engine on it.***
Keywords: Mini jet engine, Turbojet engine, Jet cycle, Gas turbine.

I. INTRODUCTION

The mini jet engine is a machine that, according to the thermodynamic Brayton Cycle, does work by harnessing energy from a working fluid and converting the energy into useable form. Various types of gas turbines are designed to perform a range of tasks but all operate on similar principals. Air enters the engine, is compressed, mixed with fuel, combusted, and then expanded through a rotating turbine.

The goal of this project is to call on the literature available regarding small gas turbines in order to design and manufacture a cycle which is powered by mini jet engine. Jet engines are currently not used to power any vehicles that run on ground, but these engines have very great potential to adapt for its application on ground vehicles. We modelled the cycle with CATIA software and then manufactured with material processing capabilities available in Dr. D. Y. Patil School of Engineering and Technology workshop

II. SCOPE

The scope of this project is based on the following:

A. Design and fabrication of cycle suitable for application of mini jet engine.
B. Great power to weight ratios can be attained using jet engine.
C. To use LPG as fuel.
D. Lesser vibrations produced.
E. Simplicity of components due to no requirement of power train to transmit power to wheels.

III. COMPONENTS

In order to better understand our design, one must understand the purpose of the important components

A. Mini Jet Engine

A turbine jet engine is widely used in commercial aircraft and jet fighters. It comprises of four main parts, which are a compressor, a combustion chamber, a turbine and a nozzle. The compressor increases the pressure and temperature of air before entering the combustion chamber. The high pressure and high temperature air then enter the combustion chamber where it is mixed with fuel and ignited, in a constant pressure process. The combustion gasses afterward flow through a turbine which connected to a compressor with common shaft. The turbine extracts energy from gases resulting in reduction of pressure and temperature of the gas. The remaining gases flows through a nozzle where it is accelerated to produce thrust. These process of compression, combustion, extraction and exhaustion are continuous and self-sustaining.

B. Throttle control

Controlling the throttle of a jet engine speed that is the thrust produced by the engine. In jet engines throttle control are connected to a fuel control unit. Jet engine run on Brayton cycle which is isobaric (constant pressure) combustion from a thermodynamic perspective. Assuming the engine is already in a steady state, when you open the throttle you introduce more fuel. More fuel translates as more heat into the combustion chamber. As we calculate this as constant pressure this mean we increase the volume of the fluid flowing through, thus increasing the thrust produced by the flow of the fluid.

C. RPM sensor

To measure the speed at which the turbines of the engine are running to monitor it within safe range.

D. Fuel supply

Fuel lines to carry fuel from the fuel tank to the engine are required. A fuel pump is required to pump fuel into the engine, the speed of the fuel pump is monitored using the throttle control. Suitable fuel injectors are used to inject pressurised fuel into the combustion chamber of the jet engine.

IV. CONSTRUCTION AND WORKING

We designed the cycle to meet our requirements, we wanted it to be light to provide a good power to weight ratio, this requirement was served by the jet engine itself as it does not require a power train to transmit power to the wheels like the traditional IC engines. The cycle is designed using CATIA software. The throttle control is located at the handle of the cycle similar to a motorbike, which controls the fuel supply which in turn controls the thrust produced by the engine. As there is no need of a power train, we choose a scooter cycle over the traditional cycle and mounted the jet engine above the rear wheel.

A. Working Principle

To understand the working of the jet engine one has to know the working principle of gas turbine engine.

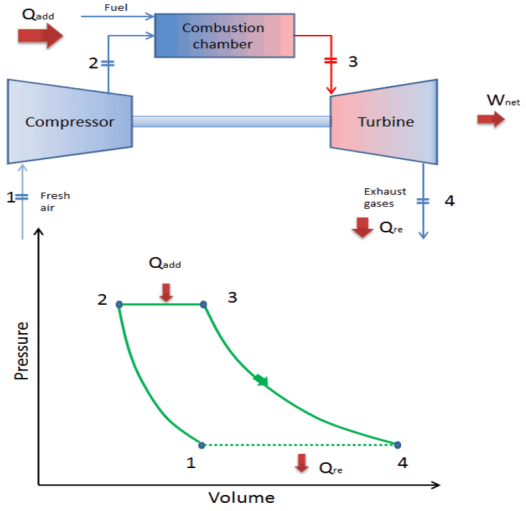

Fig. 1 Brayton cycle-Gas turbine engines

The jet engine works by the principle of Brayton's cycle. The air from the atmosphere is taken and compressed and then sent to the combustion chamber. Where the fuel is mixed along with the air and ignited. The large amount of energy is released which is used to run the turbine and the work done by the turbine is used to run the compressor as well thus the cycle continues. In this cycle the heat addition is at a constant pressure. This represents the gas turbine or internal combustion turbine in its simplest form. If working concept of a simple gas turbine is clear than understanding the working of the jet engine project shouldn't be difficult because the working cycle of the model is same as that of simple gas turbine.

V. CONCLUSIONS

Over the course of this project we successfully designed and manufactured the cycle and mounted all the other components. The volume of research and information gas turbine is simply immense and often difficult to navigate. Considering these factors, it becomes evident that our project was quite ambitious. However, through our struggles, we gained first-hand knowledge of gas turbines.

REFERENCES

[1] Edwin Cyril, B Shobin Mathew, Akhil Mathew, Gino Sunny, "A Study on Mini Jet Engine" IJIRSET, Volume 6, Special Issue 4, March 2017.
[2] Simon Fahlström, Rikard Pihl-Roos, "Design and construction of a simple turbojet engine", Uppsala Universitet, September 2016.
[3] V. Raviteja, T. Kashivishwanath, V. Ashok Kumar, N. Venugopal, R. Pavan Kumar (asst. prof.), "Design and Fabrication of a Model Jet Engine (Sivani 150)" IJMER, Vol-5 Issue-12 December 2015.
[4] Edwin Cyril, B Shobin Mathew, Akhil Mathew, Gino Sunny, "A Study on Mini Jet Engine", IJIRSET, Volume 6, Special Issue 4, March 2017.