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Performance Of Two Stroke Petrol Engine On The Basis Of Variation In Carburetor Main Jet Using Optimization Techniques

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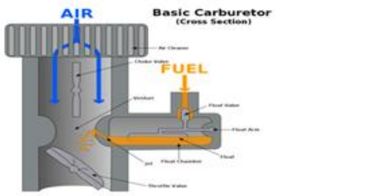
Abstract: **A two stroke engine is one which completes its cycle of operation in one revolution of the crankshaft or in two strokes of the piston. In many two stroke engines the mechanical construction is greatly simplified by using the piston as a slide valve in conjunction with intake and exhaust ports cut on the side of the cylinder. A carburetor is that part of a gasoline engine which provides assimilation air-fuel mixture as and when required. A driver controls the engine speed by increasing or reducing the amount of fuel with the help of accelerator pedal. The experimental results show that which size of main jet gives better result under various load and gear operating condition. The engine is started by kick-start once the gear is at the neutral position. electrical switch is provided on the board to prevent the engine.**

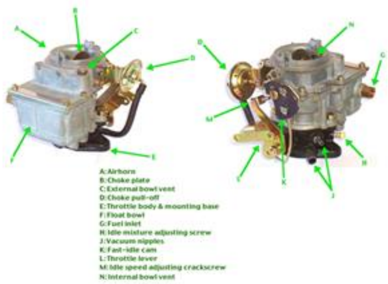
Keywords: **Carburetor; Engine Test Rig; Gear Ratio; Load; Two Stroke Petrol Engine;**

I. INTRODUCTION

Two stroke petrol engines are widely used for two wheelers as a source of mechanical power . Various designs are available for two stroke petrol engine for variety of automotive applications. A two stroke engine works by using an up stroke and down stroke of the piston to complete the process cycle in one revolution of the crankshaft. A carburetor is a device that blends air and fuel for an inside combustion engine. To compound or compound (and so carburetion or carburetion, respectively) is to mix the air and fuel or to equip (an engine) with a carburetor for that purpose. Carburetors have largely been supplanted inside the automotive and, to a lesser extent, aviation industries by the mechanical system. They are still common on very little engines for field mowers, roto tillers, and different instrumentality. The mechanical device works on Bernoulli's principle: the quicker air moves, the lower its static pressure, and therefore the higher its dynamic pressure. The throttle (accelerator) linkage doesn't directly manage the flow of liquid fuel. Instead, it actuates carburetor mechanisms that meter the flow of air being forced into the engine. The speed of this flow, and thus its pressure, determines the quantity of fuel drawn into the airstream. When carburetors area unit employed in craft with piston engines, special styles and options area unit required to forestall fuel starvation throughout the inverted flight. Later engines used an early sort of fuel injection system called a pressure mechanical device.



Cross-sectional schematic of a downdraft carburetor



II. LITERATURE REVIEW

G.Ciccarelli, Steve Reynolds, Phillip Oliver development of The design and performance characteristics of a novel top–down uniflow scavenged gasoline direct-injection two-stroke engine are presented. The novelty of the engine lies in the cylinder head that contains multiple check valves that control scavenging air flow into the cylinder from a supercharged air plenum. When the cylinder pressure drops below the intake plenum pressure during the expansion stroke, air flows into the cylinder through the check valves. During compression the cylinder pressure increases to a level above the intake plenum pressure and the check valves close preventing back-flow into the intake plenum. The engine head design provides asymmetrical intake valve timing without the use of poppet valves and the associated valve-train. In combination with an external Roots-type

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supercharger that supplies the plenum and exhaust ports at the bottom of the cylinder wall, the novel head provide stop–down uniflow air scavenging. Motoring tests indicated that the check valves seal and the peak pres-sure is governed by the compression ratio. The only drawback observed is that valve closing is delayed as the engine speed increases. In order to investigate the valve dynamics, additional tests were performed in an optically-accessible cold flow test rig that enabled the direct measurement of valve opening and closing time under various conditions

INTRODUCTION TO CAD

Computers are being used increasingly for both design and detailing of engineering components in the drawing office. Computer-aided design (CAD) is defined as the application of computers and graphics software to aid or enhance the product design from conceptualization to documentation. CAD is most commonly associated with the use of an interactive computer graphics system, referred to as a CAD system.

INTRODUCTION TO PRO/ENGINEER

Pro/ENGINEER, PTC's parametric, integrated 3D CAD/CAM/CAE solution, is used by discrete manufacturers for mechanical engineering, design and manufacturing. This powerful and rich design approach is used by companies whose product strategy is family-based or platform-driven, where a prescriptive design strategy is critical to the success of the design process by embedding engineering constraints and relationships to quickly optimize the design, or where the resulting geometry may be complex or based upon equations. Pro/ENGINEER provides a complete set of design, analysis and manufacturing capabilities on one, integral, scalable platform.

INTRODUCTION TO FEA

FEA consists of a computer model of a material or design that is stressed and analyzed for specific results. It is used in new product design, and existing product refinement. A company is able to verify a proposed design will be able to perform to the client's specifications prior to manufacturing or construction. Modifying an existing product or structure is utilized to qualify the product or structure for a new service condition. In case of structural failure, FEA may be used to help determine the design modifications to meet the new condition.

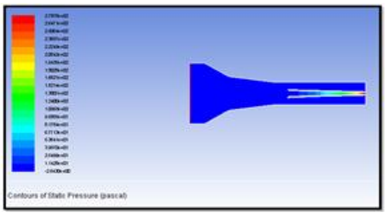
INTRODUCTION TO ANSYS

ANSYS is general-purpose finite element analysis (FEA) software package. Finite Element Analysis is a numerical method of deconstructing a complex system into very small pieces (of user-designated size) called elements. The software implements equations that govern the behaviour of these elements and solves them all; creating a comprehensive explanation of how the system acts as a whole. These results then can be presented in tabulated, or graphical forms. This type of analysis is typically used for the design and optimization of a system far too complex to analyze by hand. Systems that may fit into this category are too complex due to their geometry, scale, or governing equations. ANSYS provides a cost-effective way to explore the performance of products or processes in a virtual environment. This type of product development is termed virtual prototyping.

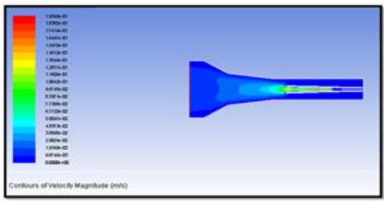
CFD ANALYSIS OF MAIN JET OF CARBURETOR

Rated Power Output : 5HP AT 2000

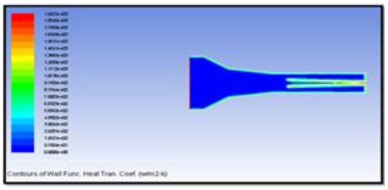
Static Pressure



Velocity Magnitude



Heat Transfer Co-Efficient



Mass Flow Rate

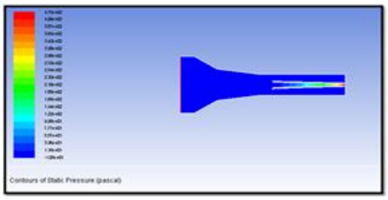
Mass Flow Rate	(kg/s)
inlet	0.053710505
interior-_trm_srf	0.72678369
outlet	-0.053793754
wall-_trm_srf	0
Net	-8.3249062e-05

HEAT TRANSFER RATE

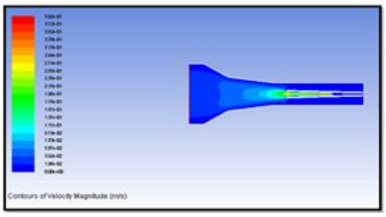
Total Heat Transfer Rate	(w)
inlet	8241.4746
outlet	-8254.2412
wall-_trm_srf	0
Net	-12.766602

Rated Power Output : 5HP AT 4000

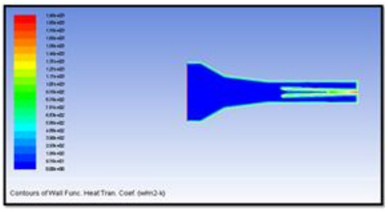
Static Pressure



Velocity Magnitude



Heat Transfer Co-Efficient



Mass Flow Rate

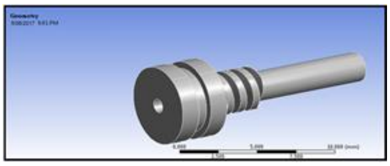
```
                Mass Flow Rate                  (kg/s)
-------------------------------- --------------------
                         inlet            0.10642599
          interior-_trm_srf               1.4222957
                        outlet           -0.10687909
                wall-_trm_srf                     0
              ---------------- --------------------
                           Net       -0.00045309961
```

HEAT TRANSFER RATE

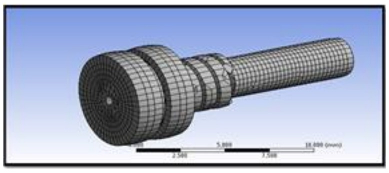
```
   Total Heat Transfer Rate                      (w)
-------------------------------- --------------------
                         inlet             16330.271
                        outlet            -16399.809
                wall-_trm_srf                      0
              ---------------- --------------------
                           Net            -69.538086
```

THERMAL ANALYSIS OF MAIN JET OF CARBURETOR

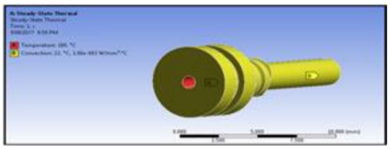
Imported Model



Meshed Model

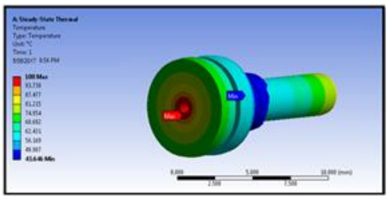


Boundary Conditions

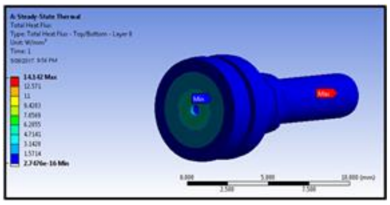


MATERIALS : BRASS

Temperature

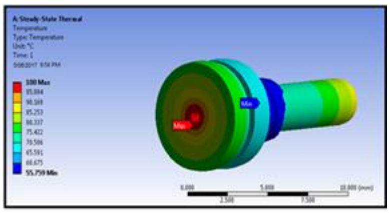


Heat Flux

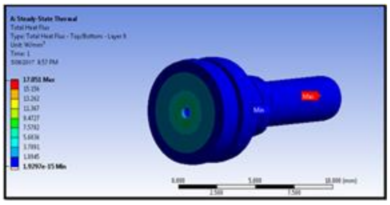


MATERIAL – COPPER

Temperature Distribution



Heat Flux



III. RESULT TABLE

CFD ANALYSIS

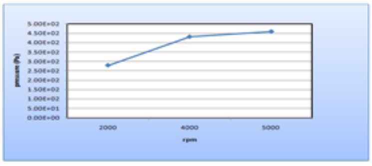
Rpm	Pressure (Pa)	Velocity (m/s)	Heat transfer coefficient (w/m2-k)	Mass flow rate (kg/s)	Heat transfer rate (W)
2000	2.7878e+02	1.9349e-01	1.96e+03	0.00008324	12.766602
4000	4.31e+02	3.92e-01	1.96e+03	0.000453099	69.538086
5000	4.59e+02	4.97e-01	1.96e+03	0.0009175	140.79297

THERMAL ANALYSIS

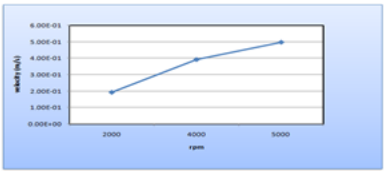
Material	Temperature (^{0}C)		Heat flux(w/mm^2)
	Max	Min	
Brass	100	43.646	14.142
Copper	100	55.759	17.051
Aluminum	100	36.03	12.016

GRAPHS

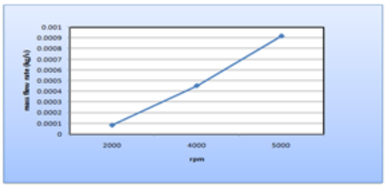
Pressure Plot



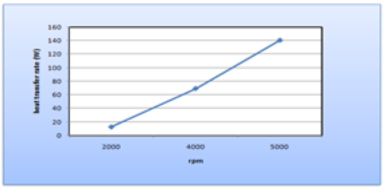
Velocity Plot



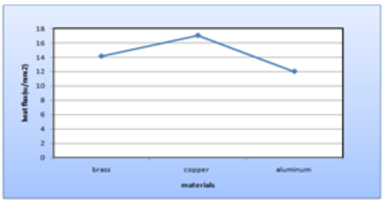
Mass Flow Rate Plot



Heat Transfer Rate Plot



Heat Flux Plot



IV. CONCLUSION

Engine is started by kick-start when gear is at neutral position. Ignition switch is provided on the board to stop the engine. When engine is started at neutral position of gearbox there will be no movement of carbon shaft. Run the engine for three minutes at neutral position and then shift the gear at the 4th speed. Adjust the RPM by accelerometer by locking nut and run the engine for ten minute at no load condition of Dynamometer.

In this project, a main jet of carburetor is designed and modeled in 3D modeling software PRO/ENGINEER. Since the design of main jet of carburetor is complex, and efficiency is directly related to material performance, material selection is of prime importance. In this project, different materials by performed thermal analysis on the main jet of carburetor for both the designs.

By observing the CFD analysis the pressure drop, velocity, mass flow rate and heat transfer rate values are increased by increasing the speed. Thermal analysis the heat flux value more than brass compare with aluminum and copper material.

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