“EXPERIMENTAL ANALYSIS & IMPROVEMENT OF COMPRESSED AIR POWERED VEHICLE”

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ABSTRACT

• The fossil fuel engines which were good enough for us before 30-40 years but now they are one of the sources of contributor of global warming and pollution with fossil fuel crises. The Air Powered Vehicle is an eco-friendly vehicle which works on compressed air. An Air Powered vehicle uses air as a fuel. An Air Powered Vehicle uses the expansion of compressed air to drive the pistons of an engine. An Air Driven Engine is a pneumatic actuator that creates useful work by expanding compressed air. There is no mixing of fuel with air as there is no combustion.
INTRODUCTION

• The Compressed Air Powered Vehicle works on the principle of the Compressed Air Technology (CAT).

• Principle:
  – Compressed normal air in a cylinder the air would hold some energy within it. This energy can be utilized for useful purposes. When this compressed air expands, the energy is released to do work.
HISTORY

THE PARSEY’S COMPRESSED-AIR LOCOMOTIVE OF 1847
THE MÉKARSKI SYSTEM
PORTER’S PNEUMATIC LOCOMOTIVE
LOUIS’S COMPRESSED AIR SYSTEM
7 LEE BARTON WILLIAMS’S INVENTION
GEORGE MILLER’S AIR CAR
COMPRESSED AIR TECHNOLOGY
COMPONENTS OF COMPRESSED AIR TECHNOLOGY

• AIR ENGINE

• AIR COMPRESSOR

• AIR STORAGE TANK
PRINCIPLE OF AIR ENGINE

Inlet Stroke

In this stroke the inlet valve is open and outlet valve is closed so the compressed air enters and moves the piston downward and gives the power output at the engine shaft.

Outlet Stroke

In this stroke Inlet Valve Closed and Output Valve is open so the used Air removes from Cylinder by the output valve to the Atmosphere.
EXPERIMENTAL SETUP
AIR STORAGE TANK

• The storage tank may be made of:
  – Steel
  – Aluminium
  – Carbon fiber
  – Kevlar
COMPONENTS

• The experimental setup is consist of following components
  – Engine
  – Compressor
  – Storage tank
  – Piping System
  – Control Valves
THE AIR COMPRESSOR
THE ENGINE
ENGINE HEAD

Empty Space for cam shaft

Cam Shaft
CAM SHAFT

Designed cam shaft for Air Engine

Modified Cam Shaft for Air Engine
CAM PROFILE

- Intake Stroke
- Exhaust Stroke

Angle of Rotation of cam shaft

Height in mm

Intake Stroke
Exhaust Stroke
Intake Stroke
Exhaust Stroke

AIR POWERED VEHICLE

SRPCE
PRESSURE GAUGE
HOSE COLLAR

MATERIAL: BRASS

FIG. NOT TO SCALE
CONTROL VALVES

NON RETURN VALVE

STEEL GLOBE VALVE

STEEL BALL VALVE

Fig. 4(q) Steel Ball Valve Image
POLY PIPES FOR AIR SYSTEM
Pressure Regulator

Adjustment screw
Neoprene diaphragm
O-ring
Gas inlet
Gas outlet
THE PIPE SYSTEM

- Engine
- Thaded Flange with hose
- Brass T
- Non Return Valve
- Engine Inlet
- Steel Globe Valve
- Line From Compressor
- Pressure Gauge
- Modified Threaded Coupling
- Cylinder
RESULTS AND ANALYSIS
Engine Speed v/s Pressure

Pressure vs. Speed of the air engine
Driving Shaft Speed v/s Pressure

![Graph showing the relationship between driving shaft speed and pressure. The x-axis represents pressure, while the y-axis represents RPM. The graph illustrates how RPM increases with pressure until it plateaus at higher pressures.]
Break Rope Dynamometer
Brake Power

• Brake power ‘BP’ = \( \left( \frac{2\pi N}{60} \right) \times \left[ \frac{D+d}{2} \right] \times [w_1 - w_2] \times g \) \[w\]

Where:

- \( w_1 \) = weight added in kg,
- \( w_2 \) = load shown in spring balance in kg,
- \( N \) = speed in RPM,
- \( d \) = diameter of rope in mm = 10mm,
- \( D \) = diameter of brake drum in mm = 500mm
- \( g \) = gravitational constant = 9.81.
Torque v/s Pressure

![Graph showing the relationship between torque and pressure. The x-axis represents pressure ranging from 2.5 to 8, while the y-axis represents torque ranging from 0 to 25. The line graph shows an increase in torque as the pressure increases.](image-url)
Brake Power Vs Pressure

BP

Brake Power

Pressure

2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8
Finalizing the Vehicle
Engine Fitting
Transmission system
Assembled Vehicle
Back Side View
Compressed Gas/Air Use and Operation

• Reduce the pressure of a compressed gas through a manufacturer's specified regulator attached to the cylinder valve.
• Open cylinder valves slowly with valve outlet directed away from all personnel.
• Never direct compressed air or other gases toward the body.
• Close the main cylinder valve as soon as it is no longer necessary to have it open.
• Before you remove the regulator make sure that the cylinder valve is closed.
REUSE OF WASTE PRESSURE AND IMPROVEMENT IN FUEL EFFICIENCY
Air Heater
Air motor
The Dynamo
• Connection of shafts of Air motor and Dynamo
Battery
Assembly of Battery and Heater
Assembly of Air Motor and Dynamo
ADVANTAGES

- Economical
- Pollution free
- Better Fuel efficiency
- Better comfort
- Less Maintenance
- Low Cost
DISADVANTAGES

- Less power is produced
- Air pumping stations are less in number
APPLICATIONS

• THREE WHEELER
• MOTORCYCLES
• MOPEDS
• CARS
• BUSES
• LOCOMOTIVES
• TRAMS
DEVELOPERS & MANUFACTURERS OF COMPRESSED AIR ENGINE / COMPRESSED AIR VEHICLES

• MDI (Motor Development International)
• TATA motors
• Air Car Factories SA
• NISSAN
• Ford
• Kia
• Energies corporation (a south Korean company)
• Engine air (an Australian company)
• HONDA
• Mercury
CONCLUSION

• We were able to successfully complete the design and modification of the Petrol Vehicle in to the Compressed air vehicle.

• The Air Vehicle provides an effective use and applied to the transportation light vehicles. It’s speed, range and the power are limited now, so further research could provide more effective results.

• This project can be directly utilized in the market to modify IC Engine bikes in to the Air bikes in effective cost. Since a number of operations can be performed in a single and simple unit. It is efficient and economical.

• We can say that the cost of the modification is very less and the effective results can be achieved.
• As we know that in IC engines higher pressures and temperatures are maintained as compared to air driven engine so that in IC engines heavy metal alloys are used but for air driven engine light alloys can be used.

• The weight of the engine can be reduced by using aluminium and more light metals. Also the new modified engine and chassis, cast from light alloys can be lighter which will design for the air engine.

• The use of heater and reuse of exhaust air improves the efficiency of the vehicle.

• This project is a successful one because we have stared the 4 Stroke petrol vehicle is running only on compressed air.
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Please Ask Your Questions...