DESIGN OF COMPRESSED AIR POWERED MOTORBIKE ENGINE: A technology to control global warming, if implemented widely

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Emissions from the combustion of fuels in vehicular transport are a major source of air pollution and are becoming a cause of concern in urban areas. Typical engines burn gasoline to run vehicles and emit carbon dioxide, carbon monoxide and water vapor in the form of exhaust gases. But what if there were a way to run an engine with a source that's not only cleaner than hydrocarbon fuels but also more abundant? The answer is YES: By using the compressed air.

Fig. 1: Computerized Prototype of Compressed Air driven Motor Bike Model

The detailed work of novel design of turbine type air engine that can run motorcycle as shown in Fig. 1, was published in the May' 2010 issue of the Journal of Renewable and Sustainable Energy*, along with a developed mathematical model of a small air turbine that would run on compressed air .

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The use of compressed air for running an air turbine is more environmentally friendly than typical engines because there is no combustion involved in producing shaft work. Additionally, the abundance of air makes the resource readily available when needed.

The analysis of a small capacity air turbine with vane type rotor is carried out. The air turbine is designed to receive compressed air through an inlet port. Once compressed air enters into the turbine and creates impact and also expands inside the rotor vanes. This expansion of high pressure air produces rotational torque causing the rotor to rotate with a series of impingement and expansions with each revolution. Expanded air is then released into the atmosphere through an exit port as shown in Fig. 2.

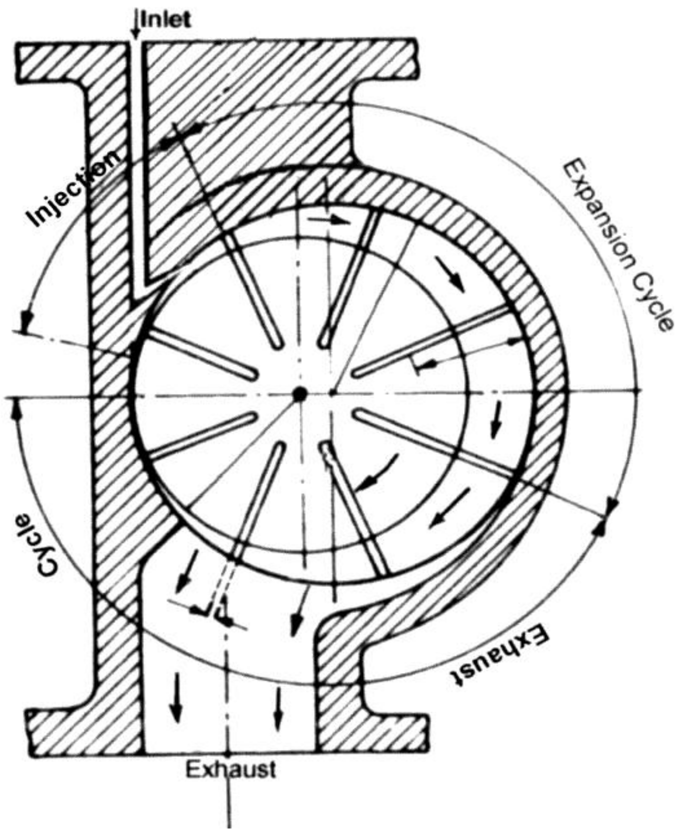

Fig. 2: Air Turbine Conceptual Model

The Mathematical model and its experimental validations in the paper shows that the flow work has significant contribution in total work output and varies from 1.5% to 16.3% at different pressures, 2–6 bar, and injection angles, 30°–60°. The total shaft work is found to be maximum at vane angle θ = 36° (ten vanes) when injection angle is kept at 60°, and it reduces at vane angle θ = 45° (eight vanes) when injection angle is kept at 45° and further goes down at vane angle θ = 60° (six vanes) when injection angle is 30°, if injection pressure is maintained at 6 bar and speed of rotation at 2500 rpm.

Vaned rotor type air turbines are most often used in applications requiring low to medium power outputs. The turbine detailed in the paper is designed to output 4 kW (or 5.1 HP) of power and can be fitted on a motorcycle. In developing countries where light vehicles are a major source of public transport, such technology could be employed to cut emissions substantially. The test setup is shown in Fig. 3 and Fig. 4.

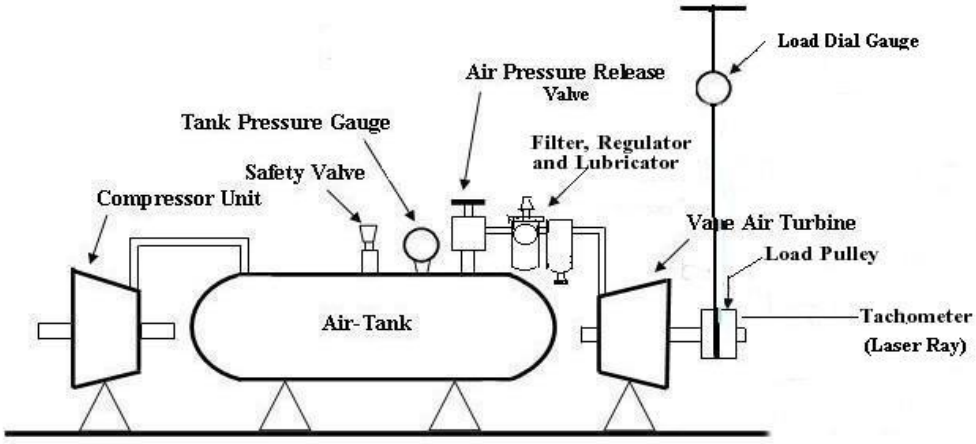

Fig. 3: Experimental Test Setup

In developing countries like India, China etc., the major source of emission is light vehicles and its contribution is around 77.8 percent. In view of zero pollution in this technology, 50 to 60 percent of present emissions can be reduced.

Fig. 4: Actual Air Turbine under Test

The proposed air turbine, combined with a compressed air cylinder for storage of working fluid, could replace the internal combustion engines currently fitted on motorcycles as shown in Fig. 1. Once filled with compressed air (with a pressure of 20 bar), the proposed air turbine and air tank could run a motorcycle for up to 40 minutes. Sizing, shaping and fitting of higher capacity air tanks to store sufficient air for longer runs, however, pose major hurdles.

For now, a person utilizing such a vehicle will need to stop around every 30 Km (19 miles) to re-fill their tank with compressed air. The desired infrastructure of compressed air filling stations will be needed and may be created upon successful implementation of this compressed air technology. The ultimate goal is to use renewable resources like solar and wind energy to compress the air and run not just light vehicles but also domestic appliances.

From the above study, it is concluded that if this technology is implemented widely in developing countries, it can curb 50% to 60% emission and ultimately could check the global warming issue up to great extent.

(***Source:** The article, "**Study of the influence of vane angle on shaft output of a multi-vane air turbine**" was published on May 6, 2010 in the *Journal of Renewable and Sustainable Energy, American Institute of Physics, New York*. See: ***http://jrse.aip.org/resource/1/jrsebh/v2/i3/p033101_s1***)

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Area of specialization is *Unconventional Manufacturing Processes*, *Industrial Engineering, Thermodynamics and Automobiles* and research field is in *Sustainable Energy Resources, Environment and Development of zero pollution air engines.*

He is **member of Editorial Boards** and **Reviewer** of leading International Journals such as: IMechE, UK, Elsevier, Journal of Mechanical Engineering, Korea; Academic Journals, Africa; World Academics of Science, Engineering and Technology, Turkey; ASME, USA etc. and reviewed more than 100- papers.

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He has **guided 4-Ph.D.** students and **8-M.Tech**.dissertations and holds one patent.

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