

Performance of a Compressed Air Engine

N. Pavan Kumar¹, N. V. S. Shankar², V. S. S.N. Prasad Reddy³

¹P.G Student, Department of Mechanical Engineering, Godavari Institute of Engineering & Technology, Rajahmundry

²Associate Professor, Department of Mechanical Engineering, Swarnandhra College of Engineering & Technology, Narasapur

³Graduate, India

Abstract: The environmental pollution in the metropolitan cities is increasing mostly because of the increased number of fossil fuels powered vehicles. Compressed air driven engine is the one of the alternative for the IC engine. Main advantage of these engine is that no hydrocarbon fuel is required which means no combustion process is takes place, pollution is zero as well as it does not effect on global warming. In this project the SI engine is converted in to compressed air vehicle by changing the cam and valves. The performance of the engine is checked at various cylinder pressures and it is varied from 2 bar to 8 bar pressure at various gear ratios. From the results we are developed an application for the farmers and rural area people..

Keywords: CA engine, Performance, Emissions, Application

I. INTRODUCTION

Compressed air engine is an air powered engine using compressed air as a fuel. Instead of air fuel mixture burning in the cylinder to drive the piston by expansion of flue gases, Compressed air vehicle uses expansion of compressed air in the cylinder to drive the piston, CA Engine is nothing but opposite to the air compressor working.

When inlet valve opens pressurized air is entered in to the cylinder (Induction) and pushes the piston in downward motion, this will be the power stroke for the CA Engine. The exhaust valve opened the expanded air is released to the atmosphere it will be the exhaust stroke.

II. DEVELOPING CA ENGINE BY USING TRADITIONAL SI ENGINE

The regular SI Engine which has been utilized for the bikes will be used for the CA Engine. In SI engine cam shaft is designed according to the working process of suction, compression, expansion and exhaust. But in CA Engine combustion process is not required. Just in the suction stroke pressurized air is entered into the cylinder and directly participating in expansion process. Now according to the requirements of the CA Engine cam shaft design has been changed as shown in the diagram.



Fig1. CA Engine and Modified cam shaft

III.WORKING OF A CA ENGINE

the air is a working medium in CA Engine which is free of cost and plenty is available in nature. So no need of any costly and non renewable energy resources like petrol, diesel etc... The compressed air produced by the compressor is temporarily stored in a storage tank and which is utilized in where we required to run the engine. When suction stroke started inlet valve is opened by the designed time of the cam shaft. Now due to pressure difference in storage tank and combustion chamber compressed air is entered into the cylinder and apply the thrust force on the piston head. This is expansion stroke. Now exhaust valve is opened expanded air is released to the atmosphere. The CA Engine does not produce any pollution like convention engines and it doesnot cause for the

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Compressed Air Supply Efficiency Babu Joseph, California Energy Commission. Public Interest Energy Research, Southern California Edison Company, 2004 *Report on a Scheme for Supplying Compressed Air Motive Power in the Town of Birmingham ...* Thomas Alfred English, Carl Julius Hanssen, John Sturgeon, 1883 [Compressed Air Energy Storage Scoping Study for California](#) Robert B. Schainker, Abhi Rao, California Energy Commission. Public Interest Energy Research, Electric Power Research Institute, 2008 [Report on a Scheme for Supplying Compressed Air Motive Power in the Town of Birmingham](#) Thomas Alfred English, 2016-05-20 This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it This work was reproduced from the original artifact and remains as true to the original work as possible Therefore you will see the original copyright references library stamps as most of these works have been housed in our most important libraries around the world and other notations in the work This work is in the public domain in the United States of America and possibly other nations Within the United States you may freely copy and distribute this work as no entity individual or corporate has a copyright on the body of the work As a reproduction of a historical artifact this work may contain missing or blurred pages poor pictures errant marks etc Scholars believe and we concur that this work is important enough to be preserved reproduced and made generally available to the public We appreciate your support of the preservation process and thank you for being an important part of keeping this knowledge alive and relevant *Compressed Air System Retrofitting Project Improves Productivity at a Foundry (Cast Masters, Bowling Green, OH).* ,2002 This case study highlights International Truck and Engine Corporation s optimization project on the compressed air system that serves its foundry Indianapolis Casting Corporation Due to the project s implementation the system s efficiency was greatly improved allowing the foundry to operate with less compressor capacity which resulted in reduced energy consumption significant maintenance savings and more reliable production **The Transmission of Power by Compressed Air** Robert Zahner, 1878 **Compressed Air System Improvements at an Automotive Plant** ,2000 In 1998 the Ford Motor Company implemented a compressed air system improvement project at its Woodhaven Stamping plant in Woodhaven Michigan As a result of the system approach that it took towards improving the plant s compressed air system the plant was able to take an 800 hp air compressor offline shut down several high pressure satellite compressors and operate the remaining compressors more efficiently *Compressed Air System Improvement Project Saves Foundry Energy and Increases Production* ,2002 This case study highlights International Truck and Engine Corporation s optimization project on the compressed air system that serves its foundry Indianapolis Casting Corporation Due to the project s implementation the system s efficiency was greatly improved allowing the foundry to operate with less compressor capacity which resulted in reduced energy consumption significant maintenancesavings and more reliable production [Development of Compressed Air Powered Engine System Based on Subaru Ea71 Model](#) Chen Rui, 2013 This thesis deals with development of compressed

air powered engine system based on Subaru EA71 model The objective of this thesis is to make a reverse engineering and design of the engine model and make the computational analysis of the compressed air powered engine working model by using GT Power The thesis describes the compressed air technology that addresses the problems of exhaust gas pollution from vehicles as well as utilization of fossil fuel The development of the compressed air powered engine model starts with dismantling the original engine cleaning the engine with petrol and drawing all the components into Solidworks Then develop the engine into two working stages that working with gasoline for four cylinders in the first stage and working with compressed air for two cylinders in the second stage In this thesis the research focuses on the second stage Some components such as cylinder heads and cam profile are modified based on the new design After this a simulation by GT Power is run and computational analysis the performance of new compressed air powered engine The results indicated the engine performance predictions and key cylinder predictions The project achieves the objective of reducing the emission of carbon dioxide However the new model lacks the power output so that continuous research is needed to fully prove the viability of the technology of the compressed air powered engine

Department of Energy,1978 **Compressed Air Power** Compressed Air and Gas Institute,1950* *Compressed Air and Energy Use* Great Britain.

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