



SENIOR DESIGN ORGANIZATION SYNOPSIS-SPRING 2014

RADIAL COMPRESSOR

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In the last decade fuel consumption has been a key factor for every car company, mainly because many new technologies are making cars more efficient. Improving this efficiency is something that needs to be worked on and future companies need to thrive for. Each year car's efficiencies in terms of gasoline consumption and the effect they have on the atmosphere of our planet is being scrutinized more and more. This goal can be met by optimizing a piece of technology that is currently available today. The technology that is being used today is turbocharger technology, and the way that we can optimize this technology to better the efficiency of our cars is by increasing the pressure difference from a specific system that is being used by more cars each day.

This technology is based on an old principle which follows the use of turbines, turbines can be driven by radial energy or axial, axial is used in aircraft, but radial has many applications. One of the many uses is by taking energy from one of the most energetic points of a car, exhaust gases, which has thermal energy and carry speed, making it a very good source of energy to turn a turbine. Just a turbine won't be enough to improve a car's efficiency. For that you need a compressor to be able to compress as much air as it can and force it into the combustion chamber to allow a more efficient and better ratio of air and gasoline in the cylinder. When more air is forced into the combustion chamber less fuel is needed to produce a detonation of equal or greater magnitude. In producing a more powerful detonation inside the cylinder, and more power per unit volume is created it improves efficiency in terms of handling how much fuel is being used and for a car to have the same power it need not use so much fuel as before and improving that efficiency is ultimately the main goal.

A compressor can have an infinite amount of designs, they can differ from where the energy is taken from, they differ in the blades that are used on the compressor side. For this study the design that will be mostly focused on and optimized will be the design of the compressor partition. Energy will be taken from the exhaust gases of a car, so this compressor will be driven by the turbine which is getting high temperature and high velocity air. In order to make the compressor turn and creating the pressure difference required to pump it into the cylinder our testing phase will require an electric motor to spin the compressor side of the turbocharger and to test our finished product.

The design of the compressor will include 10 blades, along with a modified compressor housing. These features are a significant improvement over the current market, which only carries around 7 blades for some brands and use simply designed compressors for commercial use. Improving this pressure difference with a design that can be used commercially, will result on more cars using this systems, along with improved fuel efficiency and more power output per unit volume.