Journal of Basic and Applied Engineering Research
Print ISSN: 2350-0077; Online ISSN: 2350-0255; Volume 1, Number 2; October, 2014 pp. 6-8

http://www.krishisanskriti.org/jbaer.html

Turbo charging-using HHO Kit

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Abstract:** When people talk about race cars or high-performance sports cars, the topic of* turbochargers *usually comes up. Turbochargers also appear on large diesel engines. A turbo can significantly boost an engine's horsepower without significantly increasing its weight, which is the huge benefit that makes turbo so popular Engine downsizing – achieving equivalent power output from smaller and more fuel efficient engines will drive co2 reduction turbo technology in both diesel and gasoline power trains will allow this evolution to occur turbo diesels allow a 20-40% increase in fuel economy over conventional gasoline powered vehicle ,and turbo gasoline engines can allow a 10-20% increase in fuel economy over similarly sized non-boosted engines with equivalent performance in the use, we can expect to see a noticeable increase in the number of turbo diesels with markedly higher economy and co2 emissions.

1. INTRODUCTION

At the start of this project, the team collectively had no experience working with engines or turbochargers. Given these starting conditions, the following plan was developed to accomplish the stated goals. The first step was to acquire a running naturally aspirated engine and test it for necessary data. The next step was to use this data along with the results of the Team's research to completely design a turbocharged system that met the stated objectives. Once the design was complete, all the necessary components were to be purchased or machined. The actual system would then be assembled and tested.

1.1 Internal combustion engine

The internal combustion engine is the powerhouse of a variety of machines and equipment ranging from small lawn equipment to large aircraft or boats. Given the focus of this paper, the most important machine powered by an internal combustion engine is the automobile. The engine literally provides the driving force of the car while also directly or indirectly powering just about every other mechanical and electrical system in the modern automobile. While there are several types of internal combustion engines that cover therefore mentioned large range of applications, they all basically do the same thing. They all convert the chemical energy stored in a fuel of some kind into mechanical energy, which can then be converted into electrical energy. The three most common types of internal combustion are the 4-stroke gasoline engine, the 2-stroke gasoline engine, and the diesel engine.

1.2 Forced Induction

In automotive applications, forced induction quite literally means to force air into the engine. Under standard atmospheric conditions, the engine will naturally consume a volume of air equal to its engine displacement each time it completes its 4-stroke cycle and is said to be naturally aspirated. When some form of forced induction is added, the engine will be forced to consume a volume of air greater than its engine displacement each time it completes its 4-stroke cycle. While this may seem trivial, it is very significant and can result in large power gains for the engine. It should be stated plainly that the chemical energy is found entirely within the fuel, and thus the power generated by the engine is directly related to how much fuel is in the cylinders during the power stroke. However, simply flooding the cylinder with gasoline will not result in more power but will manage to seriously damage the engine. Forced induction systems make use of a compressor to force more air into the cylinders of the engine. In order to maintain a proper afr, the ecu tells the fuel injectors to spray more fuel into the cylinders, resulting in more power. The compressor is able to force more air into the cylinders by increasing the pressure of the ambient air before it enters the intake ports. With a constant cylinder volume, a lot more air can fit into the cylinder at 20psi than at atmospheric pressure, 14.7psi. An unavoidable thermodynamic result of increasing the air's pressure is to also increase its temperature. The compressor thus raises both the pressure and the temperature of the air.

1.3 Turbo charges

As stated in the previous section, a turbocharger is a device that uses engine exhaust gases to power a compressor that increases the pressure of the air entering the engine, which results in more power from the engine. Air enters the compressor from the left, is compressed and then directed to the intake valve of the cylinder. Exhaust exits the exhaust valve of the cylinder, spins the turbine and is expelled. The three major pieces of a turbocharger introduced in the previous section are the compressor, bearings section and turbine. Each of these sections has an important function and deserves further attention. It is also important to recognize in any discussion of turbo charging that turbo charging an engine involves more than just slapping a turbocharger on to the engine. An entire system must be developed for the turbocharger, including a means of temperature and pressure control.

1.4 Turbo charger

The intake system consists of everything from the air filter to the intake ports on the engine. This includes the compressor, manifold and throttles bodies. The job of the intake system is to connect all of these components with hoses or pipes. The intercooler is a heat exchanger that is included to remove the unwanted heat added to the intake air by the compressor. It is impossible to prevent the compressor from adding heat to the air as it compresses it, though the amount of heat added can be limited by choosing a properly sized compressor. It is undesirable to just allow the hot intake air to go straight to the engine as it can reduce power gains and lead to engine knocking. An intercooler is thus included in the system to remove the heat added by the compressor. The heat is removed via cross flow of a cooling fluid, either air or water. The air is then free to flow to the engine with a lower temperature but still higher than atmospheric pressure.

2. OXY- HYDROGEN (HHO) KIT

It supplements a smaller turbo charger and engine tandem. This system creates hydrogen (h2), oxygen (o2) gas on demand from a water medium to mix with the air and fuel in the combustion chamber for a better performance. Hydrogen when compressed and introduced to an internal combustion chamber releases more energy than ethanol based mixes, maintains the overall power of the car raises the cetane level of the fuel ,preventing knocking ,making the engine quieter. It lowers overall engine temperature slightly. Hydrogen is the most common element in the universe, and its molecule (h2) has the highest energy content per unit weight of any known fuel, but it never occurs by itself on earth, as it always combines with other elements such as oxygen (to form water as molecule) or carbon (to form hydrocarbons and coal). Thus, it needs to be produced and for this reason it is not a primary source, but only an energy carrier, which could be used in combination with electricity in an innovative overall energy system.

2.1 Hydrogen on demand system

A supplemental hydroxy system, otherwise known as hydrogen on demand system consists of a fuel pre-heater assembly, (optional) a hho electrolyzer, otherwise known as hho generator and an ecu (vehicle computer) compensation method. When the system is used with fuel additives such as xylene and acetone, along with positive driving habits, it can produce dramatic results in fuel economy, and absolutely huge drops in harmful emissions. Horsepower is also drastically increased if the air/fuel ratio is not modified, because hho gas is very combustible, much like nitrous oxide used in racing cars. Even without any extra fuel additives these hydrogen on demand systems will increase the miles you are able to travel per gallon of gasoline or diesel. A fuel preheater is a simple device, usually assembled of a heat conducting metal such as brass, copper, nickel or aluminum. It is placed on the radiator hose of the vehicle and wrapped in a thermal blanket. It uses otherwise wasted heat to preheat the gasoline before it reaches the fuel injection manifold or carburetor. This helps expand the dense gasoline molecules, making them closer to full vaporization temperature by the time the fuel reaches the combustion chamber and makes it easier to mix with the hho gas from your hho generator. Electrolyzer: this is the heart of the system. Commonly called a hho generator. Most people are using hho dry cell for their hho generators as they have proved to be much more efficient at producing the desired amount of hho gas. A hho generator uses the process of electrolysis to change water into hydroxy gas. (Oxyhydrogen gas) it consists of electrodes that produce hho gas when submerged in water made conductive with electrolyte, such as potassium hydroxide (koh). Electrical current from the vehicle's battery is then applied. A substantial amount of hydroxy gas must be produced by hydrogen on demand system to make the combustion process more efficient. The standard of gas production is measured in liters per minute. (lpm) 1 lpm is considered baseline for a functional supplemental hydrogen electrolyzer. The hydroxy gas output of the electrolyzer is routed to the vehicle's air intake and vacuum intake manifold. The smaller molecules of the hydroxy gas strike the larger pre-heated gasoline molecules, breaking down the covalent bonds even further and atomizing the gasoline, while adding a combustible catalyst. We use electrolysis method to generate oxy-hydrogen gas which is introduced into the combustion chamber only on demand. As of now vehicles cannot be run on hydrogen fuel solely as it demands separate service stations for filling in hydrogen gas and storage of hydrogen as a gas on automobiles is not safe either. Hence, injection of small amount of hho gas with diesel oil is carried out in the project.

3. SPECIFIC FUEL CONSUMPTION

Table 1. Specific Fuel Consumption

S.no	Cycle	Time taken (seconds)	Fuel consumption (cubic centimeters)
1	Ci	5.675	1cc
2	Hho	6.865	1cc

Since the hho cycle produces a greater engine speed than that being produced in a ci cycle it gives an increased power output for equivalent fuel consumption or better, which needed to be measured for proving its advantage over existing conventional engines. This was done with the help of a dynamometer.

4. CONCLUSION

The highly ambitious plan to run a diesel engine with a turbocharger and hho kit installed was successfully achieved. This concept which was achieved and displayed was one of the simplest ways to explain the concept as those done in research and development cell of major automobile companies had far more sophisticated engines and equipments and advanced testing machines. It was clearly concluded that hho kit used in ci engines can be used in a si engine as well and it can be ignited provided all the conditions needed for it were maintained. There was a visible increase in the speed and also the noise of the engine produced which were far greater than its normal ci operation for which it is designed. It was also concluded that turbo charging gave a better power output and at the same time the piston forces in the cylinder being large could easily damage the cylinder walls. For this reason engine was operated only about 10 seconds. Vibrations in the engine proved to be the major hurdle in calculation of fuel consumptions. Vibration was arrested wherever possible by means of dampening elements such as rubber washers. The benefits of turbo charging and hho kit showed in a relatively simple manner. It was realized that by eliminating further vibrations and by using sophisticated instruments such as sensors to control parameters such as inlet temperature and air fuel mixture, a better fuel consumption could have been achieved. However due to cost considerations they such instruments could not be used.

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