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Increasing the Fuel Efficiency of Petrol Engines Using a Cost Effective Catalyst

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Abstract— Many researchers are working hard to increase the efficiency of vehicles as the cost of crude oil is going up day by day, globally. A simple method which shows drastic changes in the efficiency of vehicle has been set up. As proposed by the Nickel institute, nickel alloy foam could control the CO_2 emissions and increase the fuel consumption in engines. Hence nickel alloy helps to convert carbon monoxide and un-burnt hydrocarbons to carbon dioxide and water vapor. Nickel also increases the fuel efficiency in petrol engines and also decreases the CO_2 emission because the amount of un-burnt fuel is less. Experiment have been carried out to prove that a small amount of nickel is enough for a vehicle to get a fuel efficiency of 25 % greater than the fuel efficiency at normal conditions.

Keywords - nickel alloy, CO_2 emissions, fuel efficiency.

I. INTRODUCTION

1. 1. PROPERTIES OF NICKEL

Nickel is a silvery-white lustrous metal with a slight golden tinge. Nickel belongs to the transition metals and is hard and ductile. Because of nickel's slow rate of oxidation at room temperature, it is considered corrosion - resistant. As a compound, nickel has a number of uses, such as a catalyst for hydrogenation. It has a high melting point of 1455°Cand Boiling point of 2913° C.

1.2. APPLICATIONS OF NICKEL

The fraction of global nickel production presently used for various applications is as follows: 46 % for making nickel steels; 34 % in nonferrous alloys and super alloys; 14 % electroplating, and 6 % into other uses. Nickel is used in many industrial and consumer products, including stainless steel, alnico magnets, coinage ,rechargeable batteries, electric guitar strings, microphone capsules, and special alloys. It is also used for plating and as a green tint in glass. Nickel is preeminently an alloy metal, and its chief use is in the nickel steels and nickel cast irons, of which there are many varieties. It is also widely used in many other alloys, such as nickel brasses and bronzes, and alloys with copper, chromium, aluminum, lead, cobalt, silver, and gold. Its resistance to corrosion, nickel has been occasionally used historically as a substitute for decorative silver. Nickel was also occasionally used in some countries after 1859 as a cheap coinage metal but in the later years of the 20th century was largely replaced by cheaper stainless steel alloys, except notably in the United States.

Nickel is an excellent alloying agent for certain precious metals, and so used in the so-called fire assay, as a collector of platinum group elements (PGE). As such, nickel is capable of full collection of all 6 PGE elements from ores, in addition to partial collection of gold. High-throughput nickel mines may also engage in PGE recovery. Nickel mesh is used in gas diffusion electrodes for alkaline fuel cells. Nickel and its alloys are frequently used as catalysts for hydrogenation reactions. Raney nickel, a finely divided nickel-aluminum alloy, is one common form , however related catalysts are also often used, including related 'Raney-type' catalysts. Nickel is a naturally magneto-strictive material, meaning that, in the presence of a magnetic field, the material undergoes a small change in length. Nickel is used as a binder in the cemented tungsten carbide or hard metal industry and used in proportions of six to 12 % by weight. Nickel can make the tungsten carbide magnetic and adds corrosion-resistant properties to the cemented tungsten carbide parts, although the hardness is lower than those of parts made with cobalt binder. A large number of nickel compounds and alloys participate in chemical and metallurgical processes of great relevance. Nickel is also an essential component of alkaline storage systems, for both the more traditional and the new developments.

II. EXPERIMENTAL

A bar of nickel was purchased from the local market at XXX, coimbatore. The metal was crushed into pieces. Each piece approximately weighing about 0.1 g. The charecters of the metal and its properties are yet to be diognised. Fig.2.1 shows the photographic image of the piece of nickel which was used in the experiment.

Fig.2.1 Photographic image of Nickel

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The sample was then put into a nylon pellet and stiched in the ends. Nylon was used to avoid reaction of the metal with the pellet and for the free fllow of the hydrocarbon. Fig.2.2 shows the photographic image of the nylon pellet.

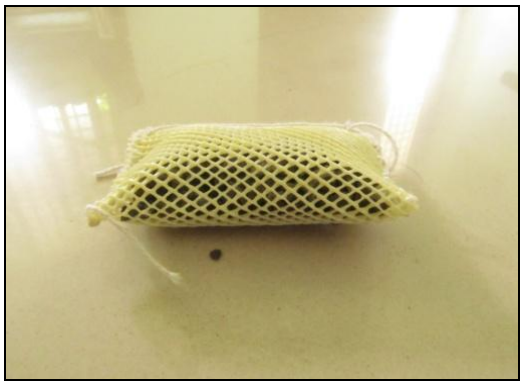

Fig.2.2 Photographic image of the nylon pellet.

III. RESULT AND DISCUSSIONS

The experiment was carried out in petrol engine. It was carried out in a Libero crusier motor bike manufactured by Yamaha motor company. The results are liable, since the test vehicle used is of good condition. Two test run were conducted with the vehicle to calculate the mileage of the vehicle. The test was conducted at normal conditions at an average speed of 45 kilometers per hour. The fuel efficiency testing meter was connected to the carburetor and the fuel supply from the fuel tank was cut off and the meter was filled with 100 ml of petrol and the odometer reading was noted. The vehicle was driven at medium traffic conditions till the 100ml of fuel was fully consumed. The odometer reading was noted and the fuel efficiency for 100ml of petrol was determined. This was repeated for two times to get a concordant value. Now the nickel pellet was introduced. The pellet was tied with a string and left free inside the testing meter, to avoid blocking of free flow of petrol to the engine. 100ml petrol was filled in it and driven at the same conditions. This was repeated two times to get concordant values. The fuel efficiency between the two conditions were determined and reported as shown in Table 3.1.

Experiment carried	TEST I (Km/100ML)	TEST II (Km/100ML)
Without Nickel	6.5	6.95
With Nickel	7.5	7.45

Table 3.1. Report of the fuel efficiency at vaious conditions.

3.1. Reason for fuel efficiency

As already reported by the Nickel institute, nickel alloy foam could control CO_2 emissions and increase the fuel consumption in diesel engines. The fuel consumption is decreased because nickel which is a catalyst reacts with diesel and speeds up the reaction. Hence the fuel consumption is decreased. It increases the fuel efficiency by 5 -10 %. The nickel alloy helps to convert carbon monoxide and un-burnt hydrocarbons to carbon dioxide and water vapor, diesel particulate filters trap soot particles, and so-called DeNOx units reduce oxides of nitrogen to their gaseous oxygen and nitrogen compounds. Likewise nickel also increases the fuel efficiency in petrol engines. In future, this work is to expanded in all types of petrol and diesel engines.

IV. CONCLUSIONS

Thus it is inferred from the above experiments that nickel when added to petrol as a catalyst increases the fuel efficiency of the engine. This can be practically to applied to road conditions by coating the fuel tank with nickel and insulating it properly from heat.

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