

Exhaust Powered Cook Top Oven

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Abstract: The definition of the project is to use the vehicle heat which goes waste in environment. The motivation behind selecting this topic for the project was that there is the many accidents happen in around country while making meal inside the vehicle. So we wanted to develop a system which would run without any extra fuel which will give the output while making food. The heat which is required to make the food, the desired temperature can be achieved. The oven placement can be decided according to the design of the vehicle cab, size, and requirement. Making food while using this project it will be easier to make the food and save the money and fuel which. This project utilizes the heat which came from the exhaust of the vehicle which goes waste in the environment the aim of the project is to utilize the heat in some benefit and some essential way when heat is produced from the engine we just collect all the heat into one place by some adjusting walls and after relating that all the heat to a place we use our utensil over there then you cancel will be heated and after that it will be transported to a place where the food will be prepared. When there will be engine on idol such amount of the heat will be produced by exhaust manifold that is enough to prepare the any kind of food when we keep that in any utensils over there all the hit are collected in a place in a such a way that hit doesn't go waste in the environment.

Keywords: Exhaust, Heat, Environment, Utilization, Manifold.

I. INTRODUCTION

A lot of the vehicle which are running in India driver of that vehicle have to face some problem while driving the vehicle for long period of a time and for up to a long distance. Whenever a vehicle is driving in India for long distance the drivers of that particular vehicle like to prepare their own meals inside the vehicle. Which cause an extra is spent on their pocket while they have to spend that money in preparing food for their selves. In the procedure of preparing food by the drivers of the heavy vehicles or long distance running vehicles like trucks and buses they usually like to prepare their own food inside the vehicle. This method of preparing mail inside the vehicle also cause inconvenience for them and also cost an extra budget on their pocket while filling up the fuel for preparing of the food like gas or kerosene stove.

Not only after spending a budget on their mail preparing methods also they have to suffer from many accident and burn which happen during preparing the meal inside the vehicle in some cases that accident and severe damages cause death to the drivers and the cool drivers of the vehicle. With the same result this also cause a heavy loss today honor and driver family like death injury and vehicle damage. As we know that today's modern and new feature vehicles come along with the cold glove box or mini fridge system inside the vehicle, but the modern vehicle does not have any system for like a hot glove box system. This method of preparing meal inside the vehicle by using exhaust power cook top oven will also provide the procedure and the figures of preparing meal inside the vehicle as well as the option to make the consumable item food meals to make them warm and others substances which is required to make warm inside the vehicle, like the procedure goes with the cold glove box system inside the vehicle for making the things cold inside the vehicle.

If this picture of exhaust power cookbook oven will be modified to some upper level this will also work as a free inbuilt heater inside the vehicle which will warm up the vehicle whenever it is Large quantity of hot flue gases is generated from internal combustion engine etc. If same of this waste heat could be recovered, a considerable amount of primary fuel could be saved. It is depends upon mass flow rate of exhaust gas and temperature of exhaust gas. The internal combustion engine energy lost in waste gases cannot be fully recovered. However, much of the heat could be recovered and losses be minimized by adopting certain measures. There are different methods of the exhaust gas heat recovery namely for space heating, refrigeration and power generation. The mass flow rate of exhaust gas is the function of the engine size and speed, hence larger the engine size and higher the speed the exhaust gas heat is larger. So heat recovery system will be beneficial to the large engines comparatively to smaller engines

II. AIM & OBJECTIVE

The basic aim of this project is to reduce the rate of accident which happens due to making the mill inside the vehicles which cause fire and cause severe accident which cause burns and death to the people and drivers. This project is provide an inbuilt cook top system inside the vehicle with the help of which driver's and other person using the vehicle can prepare their own food inside the vehicle which will cost no extra fuel no extra course to them and which will be safe from other methods. This cook up oven will be easy to use and will be cost saving and which will take low time and low space for prepare the mail inside the vehicle it will also work as the hot global for heating the things inside the vehicle while the cold glove box feature is available in the vehicle but the hot glove box is not available this project will also full feel the requirement of the hot glove box inside the vehicle. While using this project the process of making food will be easier than usual. In the process of making food extra fuel will be not used which will save cause this project will provide the feature of hot glow box in the vehicles this project were work in any weather condition even vehicle is park or running the chances of accidents occurs due to the preparing mill and set the vehicle will be reduce another option like gas stove kerosene is to will be not require. Due to the small exhaust money full in a two wheeler the feature can be used as small hot glow box only because there is small exhaust manifold.

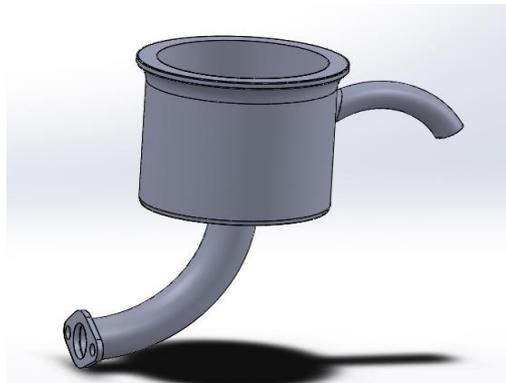
III. LITERATURE REVIEW

Many research works have been conducted in the past in order to find a solution for the problem of utilization of exhaust heat which is got out from the vehicle exhaust of combustion gases which contain allots of heat inside them. They play a proper role in the growth of global warming and another source which is required to provide the heat and finding substitute for them. Exhaust gases contain temperature up to 100°C to 800°C. This is the much amount of the temperature which can be processed according to their use the management of a heat in the such of a way that we can utilize the heat according to our use and we can use them further. It will be the good substitute of a heat source which we will obtain from the vehicles engine whenever they are in running condition at the same time without giving any extra source we can obtain heat from there exhaust and utilization of that hit in a proper way can we bring a new change in the daily life of automobiles user. Recent trend about the best ways of using the deployable sources of energy in to useful work in order to reduce the rate of consumption of fossil fuel as well as pollution. Out of all the available sources, the internal combustion engines are the major consumer of fossil fuel around the globe. Out of the total heat supplied to the engine in the form of fuel, approximately, 30 to 40% is converted into useful mechanical work. The remaining heat is expelled to the environment through exhaust gases and engine cooling systems, resulting in to entropy rise and serious environmental pollution, so it is required to utilized waste heat into useful work. The recovery and utilization of waste heat not only conserves fuel, usually fossil fuel but also reduces the amount of waste heat and greenhouse gases damped to environment. It is imperative that serious and concrete effort should be launched for conserving this energy through exhaust heat recovery techniques. Such a waste heat recovery would ultimately reduce the overall energy requirement and also the impact on global warming.

The Internal Combustion Engine has been a primary power source for automobiles and automotives over the past century. Presently, high fuel costs and concerns about foreign oil dependence have resulted in increasingly complex engine designs to decrease fuel consumption. For example, engine manufacturers have implemented techniques such as enhanced fuel-air mixing, turbo-charging, and variable valve timing in order to increase thermal efficiency. However, around 60-70% of the fuel energy is still lost as waste heat through the coolant or the exhaust. Moreover, increasingly stringent emissions regulations are causing engine manufacturers to limit combustion temperatures and pressures lowering potential efficiency gains. Waste heat is heat, which is generated in a process by way of fuel combustion or chemical reaction, and then “dumped” into the environment even though it could still be reused for some useful and economic purpose. This heat depends in part on the temperature of the waste heat gases and mass flow rate of exhaust gas. Waste heat losses arise both from equipment inefficiencies and from thermodynamic limitations on equipment and processes. For example, consider internal combustion engine approximately 30 to 40% is converted into useful mechanical work. The remaining heat is expelled to the environment through exhaust gases and engine cooling systems. It means approximately 60 to 70% energy losses as a waste heat through exhaust (30% as engine cooling system and 30 to 40% as environment through exhaust gas). Exhaust gases immediately leaving the engine can have temperatures as high as 842-1112°F [450-600°C]. Consequently, these gases have high heat content, carrying away as exhaust emission. Efforts can be made to design more energy efficient reverberatory engine with better heat transfer and lower exhaust temperatures; however, the laws of thermodynamics place a lower limit on the temperature of exhaust gases.

IV. COMPONENTS USED**1. Exhaust Powered Cook Top Oven 3D modeling**

This is the main part of "Exhaust Power Cook Top Oven". It is the close chamber where exhaust gases will be in from the combustion chamber of the vehicle and they will revolve around the cook top oven area due to which the hot is useable surface be acquire in later that surface will be used as the cook top oven area. Where we can put the utensil and other items in which we would like to prepare our meals. Design of the cook top oven is in that way in which the three spherical sided will be hot and later that will use to heat up the spherical surface of the utensil. Lower this part of the oven will be the most hated surface which will hit the utensil bottom surface due to which as like gas stove the utensil will be hated from all the side and bottom and that will help in preparing the male inside the cook top oven section. the design and structure of exhaust cook top oven utilization the heat which comes through the exhaust pipe. The exhaust pipes of the vehicle to hit the utensil after hitting the utensil the heat it utilizes in preparing the food inside the exhaust power to open the heat inside the exhaust power cook top oven is adjusted with the help of two way split as the heat knob which control the heat which is required to prepare the food.

**Fig. 1: Exhaust Powered Cook Top Oven 3D model****2. Steel pipes**

Steel pipes will we use to design the exhaust manifold and the cook top oven manifold where the split award and adjuster will be placed. In the designing of the splitter valve and exhaust manifold where it will be required, this will give turn, round and another shaping in which there is requirement of the placement of the cook top oven. This will work as the path of the exhaust gases which will bring to the cook top oven area. With the help of the steel pipe we can place the cook top oven wherever it is required and according to the different vehicle cabin sizes and different vehicle shape steel pipe rail help exhaust gases to revolve around the cook top oven. Due to use of the Steel utensil the welding of the steel pipes will be easier that this will easily welded in the main utensil cook top and letter it is will easier to turning and shaping and this will carry the heat faster as much as possible this is this will be low in the weight and capability is high. Steel pipes will be used to design exhaust path of the cook top oven. Waste heat from a heat engine or power plant is rejected to the environment either through a heat exchanger or directly through the expulsion of the hot working fluid. In an internal combustion engine, both of these are used.

**Figure 3: Steel pipe****Figure 4: Steel pipe manifold**

3. Two way splitter valve

The two way splitter valve will work as heat adjuster. Its working is same as the gas knob, according to which we adjust the required heat in the gas stove. In cook top oven it will work as the heat adjuster which will adjust the heat coming from the exhaust of the vehicle and going to the cook top oven area. It will split the exhaust manifold in two ways from which one way will go out to the atmosphere and another way will go to the cook top oven section and later that will be out in the atmosphere. Due to the two separate valve we can control the what amount of the exhaust gases will go out in the atmosphere and what amount of the hot gases will go inside the cook top oven area. If there is lesser heat required in the cook top area the cook top valve will be adjusted according to need an another wall which is for out in the atmosphere that will be fully open. If the heat will be required in the cook top oven area in at full intensity than the gases which are going out directly from the out valve that will be fully closed and the gases which are going to the cook top oven area will be fully open by this process we can control the heat in the cook top oven with the help of splitter valve.

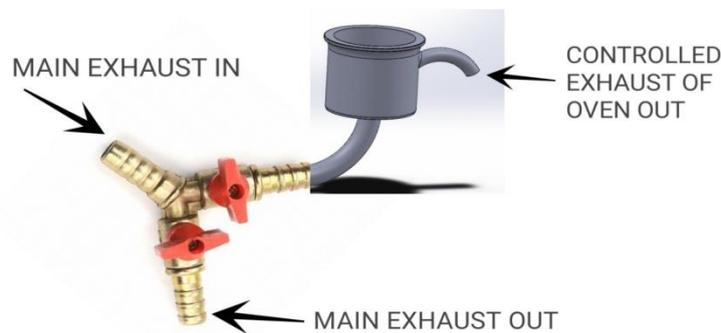


Figure 5: Two way splitter valve

4. Steel round bottom utensil

Round bottom utensil made up of Steel will be required to give the proper exhaust power cook top oven chamber design in which we will keep our utensil. This round bottom utensil will be used to create the closed hollow chamber where the gas will revolve around that. There will be the joint of the manifold will be done from which the gas will enter in the hollow section area and later after leaving of the three spherical sided and one bottom side hot for the purpose of keeping utensil over there and at later it will came out from the exhaust of the vehicle due to which we will acquired the hot surface where we will keep our utensil. The main purpose of using utensil made up of steel is that we are using the exhaust manifold made up of Steel both the material of same property will be held at easily together and later we will use that utensil designed area for keeping our utensil. Two difference sizes of the utensil will be welded together by leaving a hollow area inside them and where the gases will revolve around them and later they will came out after leaving hot surface before them. Items warm whatever the material we will keep there that will become warmer or hot.



Figure 6: Steel round bottom utensil



5. Engine

Engine is the main part of this whole system for performing this all the task. Engine will be required to provide the exhaust gases heat to this the entire task to complete. Engine will exhaust the heat after combustion chamber the whatever the exhausted gases which will be exhausted by the engine they will bring to cook top oven area with the help of steel pipe manifold later after that existing from the split over the exhausted gas will be brought to the cook top oven area and cook top oven area will heat up the surface where we will keep our utensil and later exhaust gases will be out from the both of the walls direct out and control out from the cook top oven. For the performing of this experiment we have used a engine of a motorcycle of 100cc. Produce the enough amount of from there exhaust to prepare the meal in the cook top oven. Used in this project is capable to produce the temperature up to 200°C to 300°C. Exhaust heat which is got out from the vehicle exhaust of combustion gases which contain allots of heat inside them. They play a proper role in the growth of global warming and another source which is required to provide the heat and finding substitute for them. Exhaust gases contain temperature up to 100°C to 800°C. This is the much amount of the temperature which can be processed according to their use.

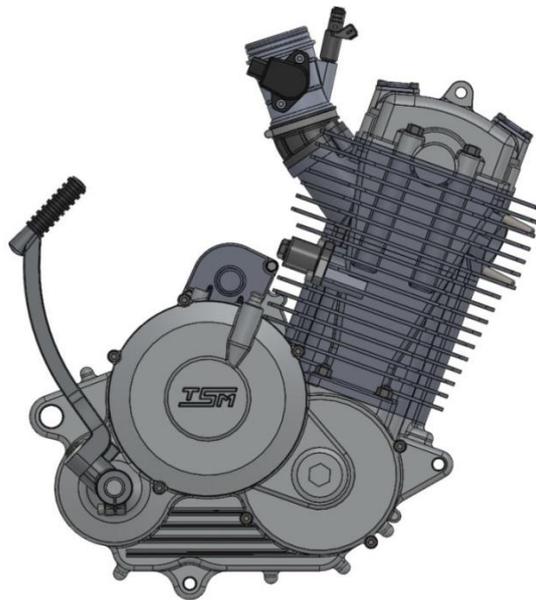


Fig. 7: Engine

6. Frame

Frame act as the stand and link between all the components. This will hold all the parts in one place. Engine and other parts will be mounted on frame. For the practical purpose of the exhaust power cook top oven engine carburetor, fuel tank, ECR device and other parts will be mounted together on the frame and the process will start. Frame will work as the stator medium which would proceed the all the workings of the project at the similar place where all among of them would be process together and their working will be phenomenal as well. At the initial starting position all the component which are mounted on the frame will be required to be bind together to work as well according to their system of work. Some machining work has been performed to make the stand. In which at the selection of the rod has done. Later the rod has cutting and welding action has performed on that. In which the rod of specific length and size has been cut and weld together to make stand.

**Fig. 8: Frame**

7. Final Project “Exhaust Powered Cook Top Oven”

While making food inside that this will only use the waste exhaust gases heat to where the food inside the vehicle this will be very beneficial for the vehicle running for long distance from one place to another place. If the vehicle has the long cabin feature will also provide the facility of kitchen inside that. The project is beneficial for long running vehicles as well as cars and other vehicles who required hot glow box or cook top oven basically cook top oven can be used in long running vehicle only but hot glow box can be also used in cars and other vehicles to once of the food meals and other things. inside these time taken by the system was less sorter than traditional gas system. In the case either we wear using gas or exhaust power cook top oven, meals will take their usual time to be cooked. In general it can give the higher temperature than gas stove system. It can provide up to 4X temperature then gas stove.

**Figure 9: Exhaust Powered Cook Top Oven**

V. WORKING

This device utilizes the heat which comes from the vehicles exhaust system and uses it in making food by the help of exhaust power cook top oven. When vehicle is in start position the hot exhaust gases go through the exhaust pipeline the design and structure of exhaust cook top oven utilization the heat which comes through the exhaust pipes of the vehicle to hit the utensil after hitting the utensil the heat it utilizes in preparing the food inside the exhaust power to open the heat inside the exhaust power cook top oven is adjusted with the help of two way split as the heat knob which control the heat which is required to prepare the food rest of the exhaust gases released into the atmosphere the gases which are utilized for making food are also released after utilising that. When vehicle is in running condition that will prepare enough heat to prepare food inside the exhaust power cook top oven. Food can be prepared when vehicle is in running condition on the road or vehicle is in the park condition in both the situation food can be prepared when vehicle will be in the running condition one extra person will be required for preparing the food and another person will drive the vehicle. The main pathways for heat rejection in the internal combustion engine that are potential candidates for WHR include the hot exhaust gases discharged from the tailpipe, the engine coolant radiator, as well as the EGR and charge air coolers. In many cases, the goal of WHR is to generate additional work. Higher quality heat sources allow a larger portion of the waste heat to be converted to work. The “quality” of a particular heat source for the purpose of WHR depends to a large degree on its temperature. The higher the temperature of the medium, the higher its entropy, which allows a larger portion of the heat to be converted to useful work (i.e., the efficiency is higher or its exergy is higher). For instance, a WHR system driven by heat from the EGR cooler in a high pressure EGR loop can be expected to have a higher efficiency than a similar system that recovers heat from the tailpipe exhaust gases.

VI. CONCLUSION

By using this project we can use exhaust gases which basically goes waste in the environment we can use that exhaust gases heat to prepare meal and food inside the vehicles that exhaust gases can be also used for providing the feature of hot glove box inside the vehicle as we know the hot glove box feature is not available in the vehicle but using this method we can give the feature of hot glove box feature in this vehicle and the meals foods and other things like milk and it can be warm and heated inside there. This exhaust power cook top oven will use the heat from the engines exhaust manifold and transformed them to preparing food inside the vehicle this will replace the process of making meals inside the vehicle by using gas stove or kerosene stove this will be very beneficial for drivers and the vehicle owners who runs they are vehicle on very long road this will not require any extra fuel or extra cost while making food inside that this will only use the waste exhaust gases heat to where the food inside the vehicle this will be very beneficial for the vehicle running for long distance from one place to another place. If the vehicle has the long cabin feature will also provide the facility of kitchen inside that. The project is beneficial for long running vehicles as well as cars and other vehicles who required hot glow box or cook top oven basically cook top oven can be used in long running vehicle only but hot glow box can be also used in cars and other vehicles to once of the food meals and other things. When there will be engine on idol such amount of the heat will be produced by exhaust manifold that is enough to prepare the any kind of food when we keep that in any utensils over there all the hit are collected in a place in a such a way that hit doesn't go waste in the environment at that time this project will work in any weather condition and even vehicle is parked of running.

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REFERENCES

- [1] Tanczos K, Torok A, “The linkage of climate change and energy consumption of Hungary in the road transportation sector”, *Transport*, Vol. 22, No. 2, 2007, pp. 134-138.
- [2] Baltranas et. al., “Modelling of motor transport exhaust gas influence on the atmosphere”, *Journal of Environmental Engineering and Landscape Management*, Vilnius: Technika, Vol. 16, No. 2, 2008, pp. 65-75.
- [3] Saulius et. al., “Analysis of exhaust gas composition of internal combustion engines using liquefied petroleum gas”, *Journal of Environmental Engineering and Landscape Management.*, Vilnius: Technika, Vol. 14, No. 1, 2006, pp 16-23.
- [4] Hugues L. Taloma, Asfaw Beyene, “Heat recovery from automotive engine”, *Applied Thermal Engineering*, Vol. 29, Issues 2-3, 2009, pp. 439-444, doi:10.1016/j.applthermaleng.2008.03.021
- [5] F.J. DiSalvo, “Thermoelectric cooling and power generation”, *Science* Vol. 285, 1999, pp. 705-706.



- [6] Office of Energy Efficiency and Renewable Energy DOE: Innovative Waste Heat Recovery and Novel Cooling Systems Program: Automotive Waste Heat recovery, (accessed April 2010).
- [7] Cywar et. al., “Seebeck Measurement Setup”, Project Report, 2009
- [8] Juostas, Janulevičius, “Evaluating working quality of tractors by their harmful impact on the environment”, Journal of Environmental Engineering and Landscape Management, Vilnius: Technika, Vol 17., Nr. 2, 2009, pp. 106-113.
- [9] Green Car Congress, “Exhaust Gas to Electricity for Reductions in Fuel Consumption”, 21 September 2005.
- [10] M. Hatazawa et al., “Performance of a thermoacoustic sound wave generator driven with waste heat of automobile gasoline engine”, Transactions of the Japan Society of Mechanical Engineers, Vol. 70 (689), 2004, pp. 292–299. Part B