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PROTOTYPE OF NEO- HEAT EXCHANGER FROM EXCHAUST GAS MOTOR DIESEL

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ABSTRACT

The use of diesel motor may be to increase with the development of the medium industry in the last time. The energy crisis that befell the world industry still felt until this time while increasing energy consumption resulting in the ability of the electric power supplied by PLN still limited which culminated with the drop current (byar-pet) electricity. More information from this development diesel motor sales continues to increase and growing fast. Along with the luster of diesel engine appears in the new issue is the increasing air pollution coming out of diesel engines that have a negative impact on the surrounding environment. Heat exhausts gas from diesel motor still not useable diesel as an alternative energy source for heat boiler and other uses. This research done for exploiting the exhaust from diesel engines with prototyping appliance heat exchanger(heat exchanger) shaped double tubes 1 pass shell 2 pass tubes.
The Neo-heat exchanger consists of a tube with a diameter of the jug 0.426 ft, long 1.48 ft. The diameter of the tube is 0,032 ft, the length of the 1,148 ft .The total length of the tube 22,956 ft. The measurement was conducted with record gas temperature and heat out from diesel. The results of this study found that the hot gas that comes out of the motor fuel is 183,608 F, hot gas that comes out of the prototype HE was 145,382F with energy fraction of heat 27.44 percent and heat efficiency of 67.5% in accordance with standard conditions.

Keywords: pipe shell and tube, heat exhaust gas, air, heat of efficiency

1. INTRODUCTION

The energy crisis that occurred at the beginning of the 1970 has encouraged the energy experts to search for replacement solutions renewable energy. This is very deeply touched until this time, the supply of electricity by the PLN is still limited to the fulfillment of the supply of energy for the national strategic industry. The fulfillment of the needs of other energy industries such as small and medium industry and the community is still not the fulfillment of optimally. As a result the industries of small and medium industry take advantage of diesel engine as generators for the purpose of limited. In line with the luster of diesel engine development of late felt the energy wasted from diesel engines and air pollution from the exhaust have a negative impact on the surrounding environment in addition to the noise that continue to provide the atmosphere uncomfortable with bad manners.

To optimize the use of energy dispose of diesel has provided new opportunities for researchers to develop energy saving aspects in power plant industry chemical industry and industry transportation both conservation, diversification and intensification of. Energy conservation steps on the motor vehicle to give a positive impact on the reduction of fuel consumption especially fuel oil, reduce fuel consumption can be done in several ways among others the development of engineering and the building blocks of machinery energy conversion in order to energy conservation and development of industrial engineering and machine .

Efforts to reduce fuel consumption on the motor fuel (Internal Combustion Engine) done with technical improvements through the development of engineering and the building blocks of motor/engine. First with the approach of the process of minimize the running resistance as acceleration resistance, aerodynamic package

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resistance. Both with the optimization approach energy conversion namely maximize the usage of the energy stored in the fuel as the building blocks of the fuel channel income/expenditure of fuel and usage of heat that is lost can be used again with the use of heat exchanger (heat exchanger). In addition to the exhaust heat insulation usage will have benefits minimize costs on the heating process also minimize thermal pollution with the revelation of the environmental air temperature stack. Exhaust Gas from the combustion process between fuel vs the air in the space of the motor fuel to burn in this one only diesel heat produced from the combustion process is not fully into energy mechanical approximately 30 % rest wasted caused by burning not perfect, cooling, friction, exhaust that still have the heat and high temperatures. With regard to this research was done to take advantage of the stack on diesel motor with prototyping appliance heat exchanger using shell and tubes that modified

The heat exchanger is a tool used to move the heat from the system to the other system without mass movement and can function as the heating element as well as the heat sink .usually cooling or heating medium is water. Zainuddin (2005). While according to Farid (2012) the flow rate of fluid or number Reynolds and thick rib affect the rate of heat transfer in the ribbed square channel, and the greater the flow rate of fluid the greater the heat transfer rate, also the larger thick rib more heat transfer rate.

Natipulu (2005) stated that if water debit enter made constant, while diesel engine round changed the higher so that the temperature of gas into heat exchanger also higher then obtained the water out the higher, if diesel engine round constant, so that the incoming gas temperature of heat exchanger considered constant high water debit and obtained water temperatures out the lower, if water debit constant while temperature gas into more up then the effectiveness is also a growing up. The rate of heat dissipation the average water mixture is greater than the rate of heat dissipation the average for fluid 100 % water. (Hariadi, 201).

Kaprawi (2007) stated that the position of the tube square against the flow of had an effect on the movement of the heat, the position of the tube with one corner facets quarters directed have flow heat transfer better than with the tube which is one of the wall mounted perpendicular to the flow of the variation of the two corners of the wall of the square with the width of the wall of the same affect the great heat transfer, any changes slant angle 15 o then changes heat transfer 1.5 %
Nicolas Tihulu (2010) stated that with the speed of 0,011 s/d 0,037 m/s and the incoming heat fluid 363 temperatures 0 K produce characteristic heat transfer the numbers Reynolds, numbers Nussel, garments making coefficient, comprehensive heat transfer coefficient and optimum heat transfer rate at the speed of 0,037 m/s optimal effectiveness.

The speed of the fluid flow affect the movement of the heat of the higher the speed of the flow of fluid cause increased the value of the heat transfer coefficient garments making, tube fins have heat transfer which is higher compared to the tube that has not fins so that can streamline energy (Putu Wijaya Artificial, 2008).

Raharjo Tirto Atmojo (2002) stated with a stream of water on the tube spiral in the exhaust channel can improve enthalpy from water and the use of copper pipe as heat exchanger can reach efficiency up to 69,5 %.

Fouling on heat exchanger equipment will cause an additional cost subject creation, increased costs maintenance, production loss and loss of energy and in anticipation of fouling surface heat transfer must be in the zoom. (Yopi Handoyo, Ahsan, 2012).

Zainudin (2005) stated that the effectiveness of heat exchanger influenced by the amount of heat absorbed fluid mass flow rate of the cold water and the temperature of the hot air out the effectiveness of 81,75% on the burden of 30 Kw revolutions 2000 Rpm ,hot air temperature between 89,06 s/d 119,45 on this condition is the optimum working exchanger.

The process of transfer of heat if the heat flows from the high temperature to the lower temperature usually called garments making: the process of transfer of heat that occurs between the solid surface with the fluid that flows in the surrounding media using either fluid (liquid / gas) called conductive material is placed. The process with the transfer of heat by

electromagnetic radiation emitted by an object because the temperature is usually called the radiation

The ability to transfer of heat on the appliance heat exchanger (AN APK) in weighted down by several factors including : the type of media flow, conduction coefficient heat insulation total (U), surface Transfer of heat (A), and different effective temperatures the average (. Massive heat insulation which absorbed

Q = U. A. ( ),
where
U = coefficient transfer of heat Btu/hour ft^2
A = surface area Transfer of heat
= logarithmic mean temperature difference (0 F).

Fluid temperatures on the appliance heat exchanger not constant on each situation and is calculated based on the difference in temperature of the incoming and outgoing fluid called LMTD.

Garments making movement in the forced the tube on the combustion process in diesel, exhaust will be issued through the tube muffler, so that the Transfer of heat is by force in the order of the tube. Reynolds Number (Re) from the water flow can be tuned with equation:

Re =
where :

Re = Reynold Number
V = Speed (ft / s)
D = Diameter (ft)
μ = Viscosity (lb/ft.s)

The appliance heat exchanger used to operate on the situation does not change occurs so that the pace of the heat movement phase According To (Yopi, 2012) can be calculated from the equation ::

Q = m . Cp . (To – Ti)

Where :

To= water temperature out ( )
It = incoming water temperature ( )
m = mass of fluid lb
Cp = Hot Type (Btu / lb)

= mg. Cpg. (Thi – Tho)

Where :
mg = mass of the exhaust flow
Cpg. = hot specific
Thi = input temperatures
Tho = output temperatures

2. METHODOLOGY/ EXPERIMENTAL

research method used is pure experimental research method is aimed at getting n characteristic rate of transfer of heat from the heat exchanger tube and the tube and the fraction of heat energy to the structure of the tube the triangle and fluid flow in opposite directions. Now the variables are used differentiated on the free variable flow speed (V), temperature (T) the media flow and variable bound namely characteristic heat exchanger tube and the tube. The Media used in this research is the flowing water in the exhaust pipe and flows from diesel engines through the Heat Exchanger tubes. The installation of the research can be seen in the picture consists of : 1 . Diesel Engine 2. The sink hot water collector 3. Heat exchanger 4. The source of water 5 . Measuring the temperature of the exhaust channel (T) 6. The measurement of the temperature of the water channel (t).

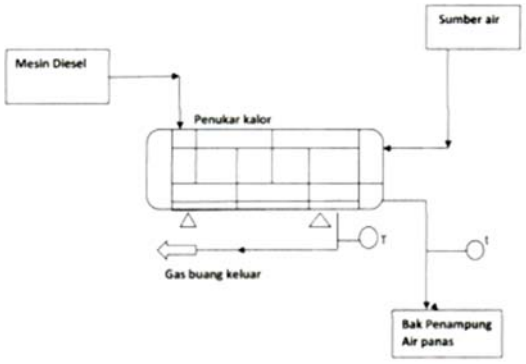

Figure.1 Testing Installation

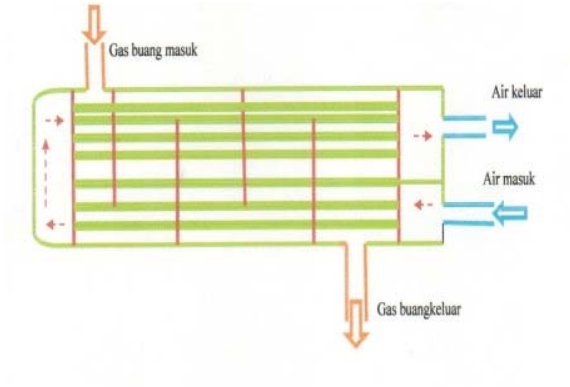

Figure.2 heat exchanger Shell and Tubes

Diesel used for driving the first Kubota brand and his exhaust used or heating water with the Motor power: 10 HP, and Audible 2000 Rpm.; The appliance heat exchanger (HE) design 1 shell pass 2 tubes pass the diameter of 0,426 ft and order of the tube brass.; the measuring cup to measure the hot water that is produced and measured the volume of the oil that is used by diesel; water tank to shelter in hot water; Thermometer. Used 2 fruit thermometer, 1 fruit to measure the exhaust temperature after passing through the heat exchanger, 1 fruit again used to measure the temperature of the water after through heat exchanger; tap water; Stop watch used to measure the amount of time needed

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3. RESULTS AND DISCUSSION

(Results should be clear and concise) The test aims to determine the tensile stress and tensile strain based on true technical. Mechanical Specimen used was Universal Testing Machining RAT-30P type cap 30 Tf

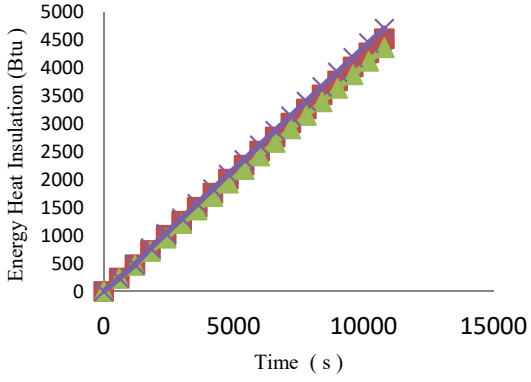

Figure 3. The relationship between time and energy heat insulation

Based on explanation and calculation of heat energy is absorbed by the water during the experiment is shown in the picture Figure 3 above seen that heat energy is absorbed by the water during the observations showed increases in linier according to the function of the trial observation time while energy rate of heat hot water and picture 5.4 seen that heat energy is absorbed by the union of the time to reach the correct steady conditions after 50 minutes on the state of heat energy from an average of 4 times of observation was 0,392 Btu/s. In the time of the first ten minutes temperature increase the average water from 75,211 become hot water the average with temperature 145,382 and heat absorption rate increased significantly shown in picture 4 this happens because the condition has not been achieving the steady condition and hose observation time measurement is still too long to get a better pic then before reached steady conditions need to be shortened time observation recording appliance heat exchanger

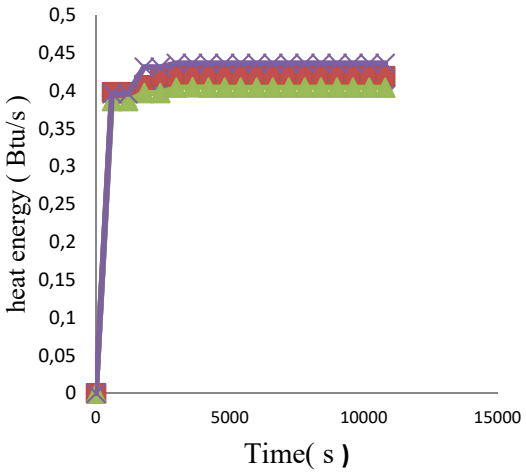

Figure.4. the relationship of time and energy heat

The heat energy fraction of Exhaust stack from the counting result shows the energy by significant enough water if in compare with the energy heat insulation in older siblings by exhaust the result can be seen on the Figure. 5 The results of the calculation of the Fraction of visible exhaust the average fraction 0,27444 (27,44) means there is increasing efficiency energy utilization heat insulation materials and

fuel diesel engines that do not use the appliance heat exchanger.

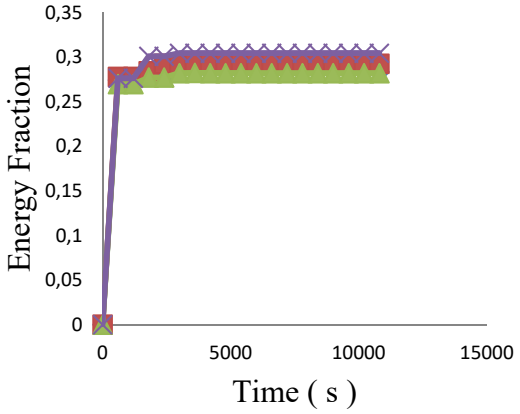

Figure.5. the relationship of time and the energy fraction

4. CONCLUSION

Analysis has been conducted based on the aim of the research , then can be concluded as follows :in this test is based on 4 times the experiment namely 1,2,3 experiment and 4, each trial during 10800 s (3hours) and every 600 s recorded the temperature of gas and water out of the exchanger. Water heated can reach the average temperatures 145,22 water on temperature can be used for various needs such as hot water at the Hotel, Appliance hair , as the initial water warming for more information means is in the form of energy savings fuel to heat up the water to achieve a higher temperature again and then can be used for washing remember fat and soap and other dirt more easily diluted with hot water. The fraction of heat energy is absorbed by the water of exhaust heat energy the average on this research by 0,27444 (27,44) which means can energy savings that is adequate economic information.

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