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PERFORMANCE ANALYSIS OF C11 ENGINE COOLONG SYSTEM USING TAYLOR DYNAMOMETER

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ABSTRACT
The combustion of diesel fuel in a diesel engine will produce heat. A cooling system is required to regulate the engine's working temperature and sustain the engine's operating temperature. A cooling system is required to remove combustion-produced heat and maintain consistent engine temperature. The objective of an automobile's engine cooling system is not only to keep a cold temperature within the engine, but also to ensure that the engine functions effectively and cleanly by maintaining a temperature that is adequately warm. The objective of this study is to determine the performance of the cooling system utilizing the Taylor dynamometer. Either the effectiveness of the reconditioned components or the operation of the cooling system's individual components must be evaluated using performance testing. In this study, the descriptive method was used to explore an existing problem in order to produce improved results compared to previous research. They are achieving superior results to previous study. This research also includes direct interviews with technicians or supervisors to facilitate and ensure the retrieval of literature data and actual data, so making it easier to pinpoint the exact cause of the problem. To use a Taylor dynamometer to evaluate the operation of the cooling system, the temperature differential between the intake and outlet must be monitored. The difference in engine temperature has not reached an average of 11 degrees Fahrenheit. When the engine reaches its operating temperature, the coolant going through the tank on the dynamometer or radiator releases more heat, resulting in a difference. When testing the C11 engine water pump, the figure depicts the performance of the water pump as drastic fluctuations in coolant temperature when engine torque is increased.

KEYWORDS:
Cooling system, combustion system, engine, caterpillar, temperature.

INTRODUCTION

Combustion that occurs in a diesel engine using diesel fuel will produce heat. To stabilize the engine's working temperature, a cooling system is needed to maintain the engine's operating temperature. A cooling system is required to remove the heat produced by combustion and keep the engine temperature constant. The purpose of an automobile's engine cooling system is not only to maintain a cold temperature within the engine but also to maintain a temperature within the engine that is sufficiently heated to ensure the engine operates effectively and cleanly. Components of the system include a radiator, which is responsible for dissipating heat, a fan or fans, which are responsible for ensuring adequate airflow for radiator cooling, a thermostat valve, which is responsible for opening when the desired operating temperature is reached, and a water pump, which is also known as a coolant pump, which is responsible for circulating coolant through the engine, hoses, and other components.

Experiments were conducted to explore the effects of methanol and diesel fuel blends on compression ignition engine performance and exhaust emissions using a four-cylinder, four-stroke, direct injection, turbocharged diesel engine. Experiments were conducted to explore the effects of methanol and diesel fuel blends on compression ignition engine performance and exhaust emissions using a four-cylinder, four-stroke, direct injection, turbocharged diesel engine[1]. The urea injection system for a Renault V.I. (Véhicules

iJETRM
International Journal of Engineering Technology Research & Management

Industriels) diesel engine was calibrated on the engine test bench, considering the dynamic effects of the catalyst. The engine dynamometer was used to investigate engine performance characteristics, engine emissions, and the poisoning effects of oil additives on a three-way catalytic converter for two 5W-30 synthetic-base crankcase oils. One contained commercially available phosphorus, and the other had no phosphorus [3]. A diesel engine converted to a stoichiometric CNG engine was utilized to optimize things. The purpose of this paper is to discuss the enhancement of a naturally aspirated multi-cylinder engine's power output from 50 horsepower to 60 horsepower, as well as the upgrade of its emission norms from BS-III to BS-IV standards [4]. Several candidate oils were examined, some exceeding the initial objective of 3.9% EFEI. The oils were assessed using a chassis dynamometer in U.S. EPA mode [5]. Another study looked at the synthesis of a unique soluble hybrid nanocatalyst to reduce emissions from a diesel-biodiesel blend-powered DI engine, including nitrogen oxide compounds (NOx), carbon monoxide (CO), unburned hydrocarbons (HC), and soot [6]. On a light-duty truck with a 2.5L inter-cooled direct injection diesel engine, the performance of a chosen diesohol-biodiesel blend consisting of 84.00% (vol.) diesel, 0.25% hydrous ethanol, 4.75% anhydrous ethanol, and 11.00% biodiesel was tested [7].
This research aims to determine the cooling system's performance using the Taylor dynamometer test equipment. It is necessary to conduct performance tests to evaluate either the effectiveness of the reconditioned components or the functionality of the individual parts that make up the cooling system.

METHODOLOGY

In this study, the descriptive approach was utilized to investigate an existing problem to achieve superior outcomes to earlier studies. They are achieving excellent results over earlier research. This research also employs direct interviews with technicians or supervisors to facilitate and ensure the retrieval of literature data and actual data, making it simpler to determine the precise cause of the problem. Find clear information regarding the cause of the issues in the C11 engine cooling system. Ensure that this study is familiar with the methods followed while testing the C11 engine cooling system with a Taylor dynamometer until the system is deemed ready for use.
The engine specification used in this research is shown below.

1.	Brand	:	Caterpillar
2.	Engine Model	:	C11
3.	Unit	:	Motor Grader 14 M
4.	Engine Serial Number	:	TXE004454
5.	Machine Serial Number	:	R9J00396
6.	Machine Arrangments	:	2269770
7.	Type of Combustion Chamber	:	Direct Injection
8.	Ignition system	:	Electric Unit Injector
9.	Jumlah Cylinder	:	6 Cylinder
10.	Type Cylinder Block	:	In-Line
11.	Firing Order	:	1-5-3-6-2-4
12.	High Idle	:	2150 $\pm$ 40 rpm
13.	Low Idle	:	800 $\pm$ 10 rpm
14.	Coolant	:	Supplement Coolant Additive (40 Liter)

Several procedures are required to test the performance of the engine cooling system using a Taylor dynamometer, including connecting water lines to the dynamometer test instrument. The next is to perform a cooling system leak test. This is necessary because the performance enhancement process will not deliver adequate outcomes if a performance disruption occurs. After that, you will need to attach the Taylor dynamometer's drive shaft to the engine that will be tested. Move the engine mount to the mounting floor and connect the kidney looping line before testing. The level must exceed the turbo return line and the valve train. Next, the cooling system's performance will be evaluated by activating the dyno water supply.

RESULTS

In testing the cooling system's performance using a Taylor dynamometer, the parameter that is varied is engine speed to see its effect on coolant pressure. Figure 1 shows the effect of engine speed on coolant pressure. The higher the rotation speed of the engine, the more the coolant pressure increases. This is because the gear on the

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water pump is connected to the engine rotation (crankshaft) through the idle gear. The peak pressure is 38 psi when the engine is spinning at 2148 rpm.

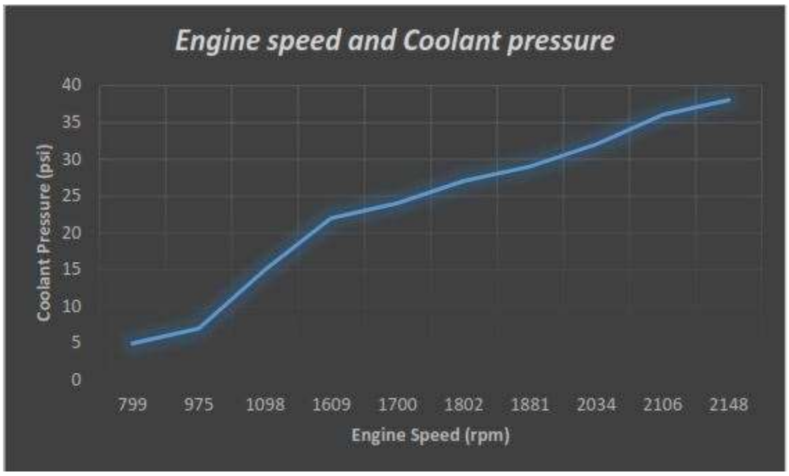

Fig. 1 The Effect of Engine Speed on Coolant Pressure

In order to verify the operation of the cooling system using a Taylor dynamometer, the difference in temperature between the inlet and outlet must be measured. The difference in temperature when the engine is operating has not reached an average of 11 F. The difference occurs because when the engine operating temperature has been reached, the coolant passing through the tank on the dynamometer or radiator so that the coolant releases more heat. When testing the C11 engine water pump, the results of the performance of the water pump are depicted in the figure as far-reaching temperature changes in the coolant temperature when the engine torque is increased. This occurs because the engine rotation becomes heavier, which slows engine rotation and raises engine temperature. hence reducing engine rotation speed and increasing engine temperature. engine temperature. In addition, there is a significant change in the coolant pressure with engine speed; as engine speed increases, so does the coolant pressure. This is because the rotation of the gear water pump is connected to the crankshaft via the idler gear, so the magnitude of the coolant pressure is affected by engine speed.

CONCLUSION

Based on the results of testing the performance of the C11 engine cooling system by using a Taylor dynamometer, coolant Pressure adjusts to the amount of engine speed, the higher the the engine speed value, the pressure also goes up according to the test results. Torque given to the engine affects coolant temperature, the greater the load given, the engine temperature also increases according to the test results. the greater the load given, the greater the engine temperature. Coolant temperature operation in accordance with the specifications of the engine temperature operation which refers to the Caterpilar Service Information System (SIS) 178°F - 183°F.

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