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REVIEW

Impact of internal combustion engine overheating on lubricating oil degradation

Incidencia del sobrecalentamiento del motor de combustión interna en la degradación del aceite lubricante

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ABSTRACT

Introduction: overheating of an internal combustion engine in the operation of radiators, coolant conductors and water conductors is highly relevant at the present time.
Objective: to characterize aspects related to the overheating of the internal combustion engine.
Method: a review of the available bibliography in databases such as SciELO, Scopus and ClinicalKey was carried out, from which a total of 11 related articles were consulted, empirical methods such as logical history and analysis and synthesis were used.
Results: the growing concern about climate change and the adoption of increasingly strict policies on greenhouse gas emissions. The overheating of internal combustion engines is very relevant in research and technological innovation. The overheating of an internal combustion engine is a common problem that can cause deterioration of the lubricating oil. It is very important that the engine works at the correct temperature
Conclusions: overheating of the combustion engine is a problem that, in order to avoid it, factors such as the correct temperature, the cooling system and the type of oil used must be taken into account, which allows its consequences on the correct operation of the engine.

Keywords: Overheating; Internal Combustion Engine; Lubricating Oil.

RESUMEN

Introducción: el sobrecalentamiento de un motor a combustión interna en el funcionamiento de radiadores, conductores de refrigerantes y conductores de agua es altamente relevante en los momentos actuales.
Objetivo: caracterizar aspectos relacionados con el sobrecalentamiento del motor de combustión interna.
Método: se realizó una revisión de la bibliografía disponible en bases de datos como SciELO, Scopus y ClinicalKey de las cuales se consultaron un total de 11 artículos relacionados, se utilizaron métodos empíricos como el histórico lógico y de análisis y síntesis.
Resultados: la creciente preocupación por el cambio climático y la adopción de políticas cada vez más estrictas sobre emisiones de gases de efecto invernadero. El sobrecalentamiento de los motores a combustión interna es muy relevante en la investigación y la innovación tecnológica. El sobrecalentamiento de un motor de combustión interna es un problema común que puede provocar el deterioro del aceite lubricante. Es muy importante que el motor trabaje a la temperatura correcta.
Conclusiones: el sobrecalentamiento del motor de combustión es un problema que para evitarlo se deben tener en cuenta factores como la temperatura correcta, el sistema de refrigeración y el tipo de aceite utilizado lo que permite sus consecuencias en el correcto funcionamiento del motor.

Palabras clave: Sobrecalentamiento; Motor de Combustión Interna; Aceite Lubricante.

INTRODUCTION

The optimal functioning of the engine is found in a specific temperature range. The vehicle's cooling system temperature exceeds normal operating limits. In the case of a 2011 Mazda BT-50, the engine is experiencing higher than recommended temperatures, leading to severe damage if not appropriately addressed.[1]

Studies have been carried out on the importance of radiators in dissipating the heat generated by the engine. These investigations have shown that radiator malfunctions, such as the accumulation of dirt or the obstruction of fins, can significantly reduce their cooling capacity. In addition, it has been proven that the choice of materials with good thermal properties, as well as the optimal design of the radiator structure, improves the efficiency of the cooling system.[1]

Research has analyzed the coolant lines, also known as hoses, that carry the coolant between the radiator and the engine. It has been found that wear or a leak in these hoses can cause a loss of coolant and, consequently, an increase in engine temperature. For this reason, inspection and preventive maintenance techniques, such as the periodic replacement of hoses, have been proposed to avoid overheating situations.[2]

Overheating an internal combustion engine is a common problem that can cause deterioration of the lubricating oil. However, research on the effects of this phenomenon on oil degradation is limited.[3] Therefore, it is necessary to analyze the effect of overheating of internal combustion engines on the degradation of lubricating oil. To do this, laboratory tests will be conducted, exposing the lubricating oil to different working temperatures.

Overheating internal combustion engines is a common automobile problem with increasing urbanization and traffic congestion. Coolant and water pumps, as well as radiators, play a key role in regulating engine temperature. Understanding how these components work and preventing malfunctioning is essential to ensure optimal vehicle performance and avoid costly repairs. In addition, there have been significant advances in automotive technology, such as using more efficient engines and more sophisticated cooling systems in recent years. Knowing how engine overheating occurs and how to remedy it is essential to take full advantage of these new technologies and ensure efficient and long-lasting vehicle operation.

This information can be used to develop new lubricants that are more resistant to overheating, provide new and valuable information on the effect of engine overheating on lubricant degradation, improve the efficiency and longevity of internal combustion engines, and help engine manufacturers design engines that are more resistant to overheating and therefore require less maintenance.

Given the above, this article aims to characterize aspects related to internal combustion engine overheating.

METHOD

The available literature was reviewed using articles retrieved from SciELO, Scopus, and ClinicalKey databases. Filters were used to select articles in English and Spanish, and empirical methods such as logical history, lysis, and synthesis were used to compile and understand the information obtained. The terms "overheating," "internal combustion engine," and "lubricating oil" were used as keywords in the article. A total of 11 references were selected that addressed different considerations related to overheating of internal combustion engines.

RESULTS

The issue of overheating an internal combustion engine in the operation of radiators, coolant pipes, and water pipes is highly relevant for several reasons. Firstly, with the growing concern about climate change and the adoption of increasingly strict policies on greenhouse gas emissions, it is essential to understand how to prevent engine overheating. Overheating can increase polluting gas emissions and contribute to global warming, which has a considerable impact on the environment and human health, criteria which several authors agree with.[4,5,6,7,8] Understanding how cooling systems work and preventing engine overheating is vital.

Overheating of internal combustion engines is very relevant in research and technological innovation. Studies on this topic can lead to improvements in engine cooling systems and the creation of new materials and technologies that are more efficient in temperature control. This research can contribute to the development of cleaner and more sustainable engines and the advancement of the automotive industry.[9]

The tubes that carry the coolant inside the engine are the water pipes. Research has shown that the accumulation of sediment and minerals inside these pipes can obstruct water flow, causing a deficit in the cooling process and overheating. Therefore, cleaning and purging techniques for the water system have been proposed to maintain its proper functioning.[10]

Overheating an internal combustion engine is a common problem that can cause deterioration of the lubricating oil. Internal combustion engines operate at very high temperatures, and lubricants protect the engine's metal parts from wear and corrosion. However, if the engine overheats, the oil will lose its protective properties and cause damage to the engine.[11]

Overheating of the engine will cause several phenomena that damage the lubricating oil, such as:

- Oil oxidation occurs when the oil is exposed to high temperatures.

- The oil decomposes at high temperatures and pressures.
- The formation of sludge and deposits can clog the oil passages and reduce oil flow.

Degradation of lubricants can cause the following problems:

- Wear and tear of the engine's metal parts will shorten its useful life.
- Corrosion of the engine's metal parts can also shorten its useful life.
- Loss of engine power affecting the vehicle's performance.

The problem of engine overheating due to damage to the lubricating oil is relevant, as it can significantly affect the efficiency and longevity of the internal combustion engine. The problem of engine overheating is severe in the area under study due to the climatic conditions. Temperatures in this area are high throughout the year, which can increase the risk of engine overheating.[11]

The internal combustion engine can generate power and transform chemical energy into mechanical energy. The amount of polluting particles in the oil throughout its useful life will also be analyzed. An advantage of the internal combustion engine is its energy benefit over steam engines. The internal combustion engine also has a radiator, which allows the coolant to circulate and has a stable working temperature.[1]

The function of the lubricating oil is to reduce excessive wear on the parts and to prevent and protect the engine from corrosion. Engine lubricants can collect any contaminants, and contamination in the oil also occurs due to the use of foreign substances called contaminants. Engine overheating is caused by an increase in coolant temperature, which leads to a decrease in power.

The engine must work at the correct temperature. Otherwise, it can suffer a major breakdown due to overheating. We will tell you the causes and how to avoid them as much as possible. Using the wrong oil Using an oil that does not correspond to the manufacturer's specifications can also lead to engine overheating.[1] One technique to avoid engine overheating is regular maintenance or engine checks.[11]

Optimal engine performance is within a specific temperature range. Below are some key points about engine temperature and its operation:

Standard Operating Temperature: Most engines operate efficiently at a normal temperature of approximately 190 to 220 degrees Fahrenheit (87 to 104 degrees Celsius). This range allows the lubricating oil to reach its ideal viscosity and the engine to operate efficiently.

Cooling: The cooling system, which includes the radiator, the water pump, and the thermostat, helps to keep the engine within this temperature range. The coolant circulates through the engine and the radiator, dissipating the heat generated during combustion.

Overheating: Overheating the engine can be harmful and lead to severe damage. It can be caused by problems in the cooling system, such as leaks, thermostat malfunction, faulty fans, or lack of coolant.

Initial warm-up: It is normal for the engine temperature to rise after a cold start. This is because the engine needs time to reach its normal operating temperature. Driving moderately until the engine reaches its optimum temperature is advisable during this time.

Coolant, also known as antifreeze or refrigerant, is crucial for the engine cooling system of a vehicle, including the 2011 Mazda BT50. Here is some information about coolant and its performance in high temperatures:[1]

Coolant Composition: Coolant is usually a mixture of water and antifreeze chemicals. The mixture helps to prevent the water from freezing in icy conditions and prevents the engine from overheating in hot conditions.

High-Temperature Performance: Modern coolants are formulated to withstand high temperatures and protect the engine from overheating. In addition to protecting against freezing in winter, these fluids have additives that help dissipate heat in extreme heat conditions.

Change Intervals: Following the vehicle manufacturer's recommendations for coolant change intervals is essential. Over time, the additives in the coolant can be depleted, affecting its ability to protect the engine from heat and cold.

Oil Type: In general, many modern engines, including those in the Mazda BT-50, use multigrade oils that meet the manufacturer's recommended specifications. These can be something like a 5W-30 or 10W-30 oil. The viscosity of the oil can affect its performance in different climatic conditions.

High-Temperature Performance: Multigrade oils are formulated to provide stable performance across various temperatures, including high temperatures. Modern oils contain additives and viscosity index improvers that maintain adequate viscosity even at elevated temperatures. This is crucial to ensure the proper engine lubrication, even in extreme heat.

Oil Change Intervals: Although modern oils can withstand high temperatures, following the manufacturer's recommendations for oil change intervals is essential. Changing the oil according to the recommended maintenance schedule helps maintain engine performance and prolong its useful life.[10]

CONCLUSIONS

Overheating of the combustion engine is a problem that can be avoided by considering factors such as the

correct temperature, the cooling system, and the type of oil used, which has consequences for the proper functioning of the engine.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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