PRACTICE 2
ENGINE TYPES AND SUBSYSTEMS OF THE INTERNAL COMBUSTION ENGINE

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Abstract—
The development of car air conditioning goes back to the 1930s when luxury car models adopted the first unfiltered systems. In the 1950s, the inventor and engineer Hans Freudenberg observed the necessity of cabin air filters and launched their design to combat dust and pollen. It wasn't until the 1970s that manufacturers realized clean air could affect passenger well-being and thus made them a standard part of every vehicle. There has been an evolution in the types of filters used in vehicles to keep dust, pollen, bacteria, and even insects out of the air conditioning system. Although they are not as effective as high-quality filters and air purifiers, these work well against allergies and odors, providing a more pleasant experience during driving while contributing to healthy breathing.

Keywords —intake filter, cabin air filter, air quality, contaminants, allergies.

I. INTRODUCTION

Though automobiles were introduced in the 18th century, it was not until around the 1930s when the initial air conditioning systems became operational on vehicles. The air conditioners were originally intended for luxury cars and did not include any filtration for incoming air.

The cabin air filter was an unfamiliar concept up until the 1950s. One engineer named Hans Freudenberg made a simple observation, and that was the fact that his clothes were getting dirtier whenever he was driving. He associated this with the unfiltered air gaining entry into the car's cabin. It was this awakening that led to the fabrication of the first cabin air filters, which were initially designed solely to arrest dust and pollen.

During the decade of the 1970s, automakers started realizing how much clean air can matter to passengers' health and comfort and soon started including cabin air filters as a standard feature on various models of cars. However, at the initial stage, these were relatively crude filters, but they constituted a marked improvement compared to no filtration at all.

Over the years, the cabin air filter has undergone many developments. The advanced filters currently in use are usually constructed of pleated paper or activated carbon, and they have the capability of trapping a significant array of contaminants, including.

Dust
Pollen
Spores of molds
Smoke
Bacteria
Insects

Air purifiers are high-end filters that can even help control odors and improve air quality for those with allergies.

The evolution of air intake filters in automobiles has provided a significant contribution to enhancing the ease and well-being of drivers and their companions. By ensuring that dangerous impurities do not infiltrate the system, these filters result in a cleaner, and thus healthier breathing atmosphere within the car.

II. GENERAL OBJECTIVE

- The objective is to acquire a deep understanding of automotive engines, focusing specifically on identifying the type of engine, the number of cylinders, the engine layout, the type of cooling system, and any special characteristics present. Additionally, we aim to recognize and study in detail a 4-stroke engine system assigned by the professor, with a specific focus on the intake system. This objective seeks to provide students with a comprehensive understanding of automotive engines, with an emphasis on the intake system, preparing them to analyze and solve problems related to this crucial component of automotive machinery.

III. SPECIFIC OBJECTIVES

- Identify and classify the type of engine present in the assigned vehicle, including relevant details such as the number of cylinders.
- Examine and categorize the type of cooling system employed by the engine to regulate temperature.
- Investigate any special characteristics or unique features inherent to the assigned engine, highlighting elements that distinguish it from standard configurations.
- Focus specifically on a 4-stroke engine system, with a concentration on the intake system.
- Gain a comprehensive understanding of the components and functioning of the intake system, including air intake mechanisms and associated elements.
- Develop the ability to troubleshoot and solve problems related to the intake system, fostering practical skills in diagnosing issues and proposing solutions.

IV. ANALYZING AND EXAMINING

The system assigned for the study was the vehicle's intake system, which in the first instance it was observed that it was a V6 type engine, which was determined based on the number of pistons that the engine had per side.

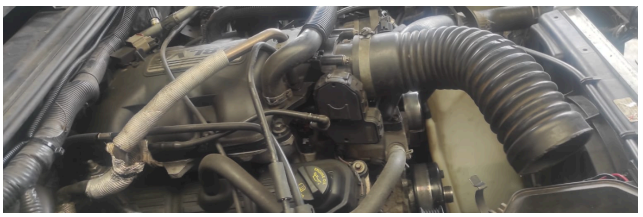

Figure 1.In the previous figure you can see the hose belonging to the intake system, which guides the air to the engine for later use.

The system to be analyzed was simple because the disassembled intake system was quickly noticed, which consisted of a tube which was connected directly to the engine for air intake, while at the other end was the filter whose function is that the air enters as pure as possible to the engine to perform the following cycles correctly.

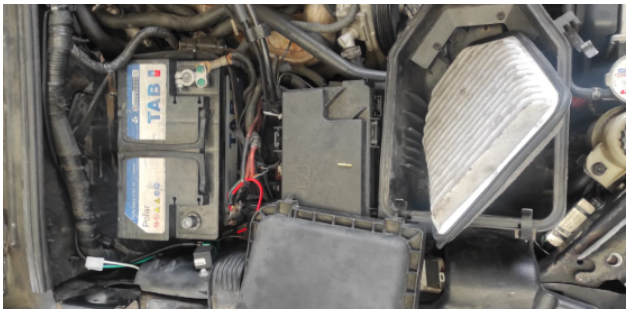

Figure 2.The previous figure shows the filter that the intake system has to obtain clean incoming air, which is white in color.

At the same time, the last image shows in more detail the filtering equipment that the vehicle uses to send the air to the engine, thus generating the subsequent movement.

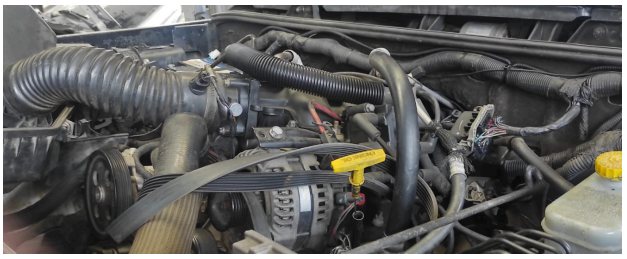

Figure 3. The previous figure shows the elements identified in addition to those that make up the intake system, several of which were visualized in the material.

Additionally, different components that made up the vehicle were found, of which several were visualized in the material, among these it was possible to identify the oil inlet, the water pump, the flow meter, the block, the cylinders, pistons, the damper (which was welded, which is considered incorrect as it could generate vibrations in the car), the flywheel, the cooling system and how it circulates through the vehicle, among others.

Figure 4. The previous figure shows the bearings with which the engine operates based on the damper connected by belts.

Supporting what was visualized in the vehicle in a practical way with what was learned in a theoretical way, it can be said that the intake system of a 4-stroke engine is essential for the efficient operation of the engine. First, the process begins with the opening of the intake valve during the intake timing. This allows the fuel-air mixture to enter the combustion chamber from the intake manifold, where it has previously been mixed and atomized. This mixture is controlled by the carburetor or fuel injection system, depending on the engine design. Once the mixture enters the combustion chamber, the intake valve closes, sealing the combustion chamber. Then, during the compression stroke, the piston compresses the fuel-air mixture, which increases its temperature and pressure, preparing it for ignition.

Then, during the combustion stroke, the spark plug ignites the compressed air-fuel mixture, generating a controlled explosion (combustion) that pushes the piston downward. This motion converts the chemical energy of the fuel into mechanical energy, which drives the movement of the crankshaft. Meanwhile, the exhaust valve remains closed, ensuring that the pressure generated by combustion drives the piston downward, rather than escaping through the exhaust. Finally, during the exhaust stroke, the exhaust valve opens, allowing the exhaust gasses to exit the combustion chamber and be expelled into the vehicle's exhaust system. This intake and exhaust process is continuously repeated in a four-stroke cycle to keep the engine running.

V. CONCLUSIONS

The study of automotive engines, with a specific focus on identifying engine characteristics and delving into the intricacies of the 4-stroke engine's intake system, has provided valuable insights and skills for aspiring automotive engineers. Through a systematic examination of engine type, cylinder count, layout, cooling system, and unique features, students have established a solid foundation in understanding the complexities of modern vehicle propulsion systems.

The study's emphasis on integrating theory with practical application underscores the importance of a holistic approach in engineering education. The ability to apply theoretical knowledge to real-world scenarios enhances students' problem-solving skills and positions them for success in both academic and professional pursuits.

As students move forward, this study serves as a springboard for more advanced studies and practical applications within the automotive engineering discipline. The acquired knowledge not only meets the demands of the automotive industry but also instills a mindset of continuous learning and adaptability, vital for success in an ever-evolving technological landscape. In conclusion, the study has laid a robust foundation, empowering students with the knowledge, skills, and confidence to excel in the exciting and challenging field of automotive engineering.