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Assessment of Traffic Safety Using Biodiesel Fuel: An Investigation Conducted in Hong Kong

YANG MAOLIN[1], DR MOHAMMAD NIZAMUDDIN INAMDAR[2a], DR NUR SYAZA BINTI RASHDI[3b]

[1] PhD. Research Scholar in Engineering, Lincoln University College, Malaysia
[2, 3] Professor in Lincoln University College, Malaysia
Contact Details: [a]nizamuddin@lincoln.edu.my, [b]nursyazana@lincoln.edu.my

Abstract

As a result of the "Because of the impending implementation of new emission regulations, the car industry is working hard to perfect new engine management systems and pollution control technology. This concept was inspired by the European Regulation for Heavy-Duty Diesel Vehicle Emission Limits, which was issued in 1992. (Euro-I). The Euro-II standard was introduced in 1996, and the Euro-III standard was implemented in 1999. As new energy sources and technologies become available, more stringent standards are expected to be implemented in 2005 (Euro-IV) and 2008. (Euro-V). Poor vehicle maintenance is a common source of excess emissions from automobiles. Inspection and maintenance (I&M) programmes are the most reliable way to identify high emitters in a fleet of currently operational vehicles. Additionally, civic and vocational education are Essential for promoting safe driving practices and increasing employment rates. "Automobile maintenance and repair shop." Over in Japan and the United States,"Diesel vehicles, whether new or old, are subject to similar restrictions in the majority of US states, but testing procedures differ. HKEPD has mandated that all vehicles in Hong Kong meet an emission and noise standard. In addition to preventing smoke spread, "Projects in Instruction and Management" includes annual emission inspection and testing. Emissions from currently operating cars, trucks, and buses are tracked and analyzed. These mandated rules do more than just reduce pollution from automobile exhaust systems; they also help save money by encouraging more efficient car design "combustion."

Keywords: Emissions, Exhaust Systems, And Pollution Control Technology

INTRODUCTION

Hong Kong is home to approximately 7 million people and has a population density of over 500,000 automobiles. Hong Kong has few natural resources and imports the majority of its raw materials and consumer goods from other countries, including China. Because of its strategic location at the crossroads of Asia and the Pacific, as well as its proximity to China, Singapore's airports and container terminals can handle more than 200 million metric tonnes of cargo each year. Since the 1980s, the transportation sector's rapid growth has had a significant impact on fossil

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fuel consumption, road network expansion, and infrastructure development. Vehicle emissions are a major source of air pollutants in Hong Kong, as well as in other developed cities around the world, and they have serious consequences. for both human and environmental health. For example, particulate matter (PM) and nitrogen oxides (NOx) cause respiratory illnesses in humans as well as environmental degradation. The public is concerned about air pollution because densely packed streets and high-rise structures in metropolitan areas impede air circulation and ventilation. Vehicle emissions trap air contaminants, which can accumulate to lethal levels due to inefficient circulation and ventilation. The Hong Kong Special Administrative Region (HKSAR) Government has implemented a number of measures in recent years to reduce the impact of automotive emissions and hazardous emissions. These policies included a tax break on clean fuels, incentives for exhaust after treatment equipment, and stricter emission regulations. Several pilot projects have received low-emission technology regulations. There was widespread support, and the results were positive. Despite this, most of them have failed to improve energy efficiency or reduce fuel consumption in any "meaningful" way. As a result, they have little influence on Hong Kong's air quality and energy efficiency.

Literature Review

As of today, gasoline and diesel are the most commonly used motor fuels, and annual petroleum consumption has increased significantly over the last several decades. This trend is likely to continue. A variety of new fuels have been developed in response to growing concern about fossil fuel depletion, natural resource conservation, and environmental preservation. However, only a few are approved for widespread use. Biodiesel has been widely used in Europe and the United States for over a decade and is becoming increasingly popular. Vegetable oils, animal fats, and even previously used lipids are all viable feedstocks. Additionally, "biodiesel" can help diversify energy sources and reduce air pollution. As greenhouse gas emissions. Although biodiesel and petroleum "diesel" are used interchangeably, their physical and chemical properties differ significantly. These changes have a direct impact on engine performance, exhaust emissions, and fuel efficiency. Several studies have been conducted on biodiesel, but the vast majority of them have been conducted using an engine dynamometer, which does not accurately reflect the actual emissions of an in-service vehicle fleet under varying power requirements. Roadworthiness has become a "critical factor in determining whether or not biodiesel is introduced into the local fuel market." In reality, dynamometer testing does not reveal the effects of biodiesel on engine component compatibility and durability. Previous research has shown that biodiesel has a negative impact on engine performance. Examples include attacking specific types of elastomers, loosening deposits, and diluting engine oil, among other issues. Despite the fact that biodiesel has inherent drawbacks, they can be mitigated by improving the quality of the biodiesel and using

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appropriate materials to replace the affected sections of the fuel system. As a result, biodiesel can still be used by the general public without risk of harm.

Statement of the Problem

Concerns about the introduction of biodiesel into Hong Kong's fuel market prompted an investigation into biodiesel fuel as a motor fuel. The study's main goal is to investigate biodiesel fuel mixes and their effects on vehicle exhaust emissions and roadworthiness. Data on engine performance, exhaust emissions, and engine durability were gathered through a series of chassis dynamometer tests on a local in-service motor vehicle fleet. The compatibility of rubber elastomers with various biodiesel mixes and operation periods was also investigated in an accelerated laboratory simulation. Gasoline hoses were evaluated based on measurement variation and physical property deterioration.

Study Objective

the study aims to conduct an accelerated laboratory simulation to assess the compatibility of rubber elastomers with various biodiesel blends and operating periods.
Research Questions

• What is the impact of biodiesel fuels and blends on vehicle exhaust emissions?

Research Methodology

It was decided to "start with an ultralow sulphur diesel (ULSD)," which is made from petroleum and contains only 0.01 percent sulphur by weight. Using Ultra Low Sulphur Diesel Diesel (ULSD) instead of low sulphur diesel (0.035 percent sulphur) results in an immediate reduction in PM and Sulfur Oxide emissions. Because of these advantages, ULSD is a preferable option for congested city traffic. The HKSAR Government assisted in the implementation of ULSD in 2000. Tax breaks were granted to promote the fuel. Today, ULSD is Hong Kong's only statutory motor diesel fuel, and it is widely available at all of the city's fueling stations.
Biodiesel A, Biodiesel B, and Biodiesel C are the three, Biodiesel fuels were tested in this study. Europe imported Biodiesel A and C, but Biodiesel B was produced locally. With the exception of the second biodiesel, all three were produced from waste lipids. All of the fuels underwent a full fuel analysis to confirm that they met the Hong Kong biodiesel criteria.

RESEARCH DESIGN:

The Clayton "Industries model ECCT500108 chassis dynamometer has an air-cooled eddy current power absorption unit (PAU) with a maximum horsepower capacity of 500 at 50 mph. Smoke opacity of tailpipe emissions was measured with two opacity meters: the SPX Dieseltune model DX230 (for dynamometer testing) and the Lucas model YDA309 (for on-road emission testing).

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Engine speed was monitored using engine tachometers AVL model 490 (for the dynamometer test) and Lucas type YDA133 (for the on-road emission test). CO and NOx emissions were measured using a chemical cell combustion analyzer (Richard Oliver Ltd. model IGD Tocsin 310), while HC emissions were measured with a Beckman Industrial Model 400A FID non-heated HC analyzer.

Vehicle performance "can be tested in-house using a chassis dynamometer."

The emission testing system is completely automated. A computer console is used to control the system, which simulates precise and repeatable driving paths. Allows the vehicle to be tested in a predetermined way. Since 1999, the HKSAR government has used cutting-edge technology to administer the "Smoky" Vehicle Control Program, and over 100,000 cars have been tested using this method.

DATA ANALYSIS

As part of a comprehensive testing program, it was suggested that firefighters change the fuel at a nearby fire station while emissions were measured using a chassis dynamometer. The entire procedure was carried out in a test run to validate and evaluate the proposed technique. After discovering tyre slippage during the start-up run, the initial dynamometer testing procedure was replaced with two-power steady-speed tests to better simulate real-world driving conditions. Two different power set-points, 20% and 50% of rated engine output, were used to simulate operations with varying workloads.

Due to the time and effort required, this testing could not be "finished in a single day" because "inter-day and" day-to-day variations were assessed to ensure the validity of the test methods. the instrument's stability.

CONCLUSION

Extensive research was conducted to see if biodiesel could be used as a motor fuel in Hong Kong. Roadside emissions and durability tests revealed that biodiesel fuel did not rapidly degrade the engine system. The physical properties of biodiesel blends were investigated using four different fuel hoses and three criteria: dimension, tensile, and bursting tests.

Limitations of the Study

Creating "biofuels" in the current market is difficult, despite their numerous benefits. There is currently a modest level of interest and capital investment in biofuel production, but this is sufficient to meet demand. Monoculture, as opposed to cultivating a wide variety of plants in a farmer's fields, is the practice of growing the same crop year after year. While cultivating the same crops year after year may be more profitable for farmers, it can deplete the soil of nutrients that crop rotation replenishes. Crops require fertilizer to thrive and produce biofuels. Fertilizers have

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the potential to harm the environment and pollute nearby water supplies.Fertilizers contain nitrogen and phosphorus, which are applied to crops. They have the potential to wash away from the soil and into surrounding waterways such as rivers, lakes, and ponds.

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