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SUMMARY OF DOCTORAL THESIS

Thesis title: **A study on the engine performance and emission characteristics of gasoline engine using dimethylfuran-based blends**

Major: Mechanical Engineering

Code: 9520116

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Science supervisors: 1. Assoc.Prof.Dr. Hoang Anh Tuan

2. Assoc.Prof.Dr. Tran Quang Vinh

Training Institution: Ho Chi Minh City University of Transport

1. Research aim

a) Theoretical aim:

- An overview study of the production process, physicochemical properties and applicability of 2.5-dimethylfuran on on internal combustion engines (especially SI engines) to determine the reasearch gap, scope and plan.

- The theoretical basis study of combustion and emission of SI engines using DMF as fuel to examine the technical parameters and emissions of the engine when using DMF-gasoline blends on a gasoline engine.

b) Experimental aim:

- Using AVL Boost software to build a simulation model of the SI engine's working process when using DMF blends to evaluate its performance parameters and emission characteristics.

- Experimental study on SI engines to compare with simulation results as well as evaluate factors affecting technical characteristics and emissions when using DMF blends.

2. Objectives and scopes

a) Objectives:

- Fuel: RON95 gasoline and DMF.

- Engine: spark ignition engines.

b) Scopes:

The scope of the study is a typical generation of gasoline engines on popular cars with a power range of 50 to 100 kW. Simulation and experimental studies were conducted with fuels: RON95 gasoline and blends such as 10DMF, 20DMF and 30DMF (corresponding to the proportions of DMF in the blend of 10%, 20% and 30% by volume with RON95 gasoline, respectively) to evaluate the power characteristics, fuel consumption and emissions (NOx, HC and CO) according to the load and speed characteristics of the engine.

3. Thesis contributions

- A detailed overview of DMF's application for internal combustion engines, especially in gasoline engines.

- Research on technical characteristics and emissions of gasoline engines when using DMF-RON95 gasoline blends in different mixing ratios (10%-30%) in order to fully evaluate these characteristics of engine when using DMF as fuel.

- Using the combination of simulation and experimental to compare the results of these two research methods.

4. Achievable results, scientific and practical significance

With the proposed aims, this thesis has focused on studying the theoretical basis of combustion and emission formation of SI engines when using DMF as fuel, building a simulation model of the working process of the engine by using AVL Boost software to evaluate the performance and emission characteristics of SI engines when using DMF blends. The simulation results are verified by experiments conducted on the engine test bench placed in the laboratory. The simulation and experimental results have been verified as the basis for evaluating the factors affecting the technical characteristics and emissions of the engine when using DMF fuel blends.

The specified results and scientific and practical significance:

a) Scientific meaning:

- Contributing to build a theoretical basis for converting traditional gasoline engines to use DMF as fuel, at the same time, serve as a basis for improving the performances and emissions of gasoline engines when using DMF.

- Contributing to technical assessments when using DMF as an alternative fuel for gasoline engines.

b) Practical significance:

- Contributing to expand the possibility of diversifying fuel sources used for gasoline engines.

- Contributing to improving the technical parameters and emissions of the engine when switching to using DMF-gasoline blends in a reasonable mixing ratio.

5. Thesis structure

This thesis includes parts as follows:

Introduction

Chapter 1. Overview of research issues

Chapter 2. Calculation theoretical basis of technical parameters and emission characteristic of engine using dmf as fuel

Chapter 3. Simulation study of gasoline engine using dmf-gasoline blends

Chapter 4. Experimental study

Conclusions and recommendations

Ho Chi Minh City, September 25th, 2021

Science supervisors		**PhD. Candidate**
		
Assoc.Prof.Dr. Hoang Anh Tuan	**Assoc.Prof.Dr. Tran Quang Vinh**	**Nguyen Danh Chan**