

## ON Ph.D. TECHNICAL DISSERTATION INFORMATION

**Dissertation title:** “A study on the effect of vegetable oil - diesel fuel mixture on fuel injection, mixing, combustion and performance of marine diesel engines”

**Major:** Marine Machinery Operation and Maintenance

**Code:** 9520116

**Ph.D. candidate** Nguyen Duc Hanh

**Supervisors:** 1. Assoc.Prof.DSc. Dang Van Uy  
2. Assoc.Prof. Nguyen Dai An

**Education Institution:** Vietnam Maritime University

### 1. Research aim

- To study the effect of pure palm oil - diesel fuel in different percentages on spraying characteristics, mixture formation in the combustion chamber, and some features of 6LU32 marine diesel engines.

- To propose appropriate adjustment solutions for energy efficiency of research engines and marine diesel engines in general when using the above mixture fuel as an alternative fuel.

### 2. Research object and scope

#### Research objects:

- The fuel injection system of the main diesel engine Hanshin 6LU32.
- Diesel (DO) mixed with vegetable oil (palm oil).

#### The scopes of this study:

- Study the effect of the characteristics of DO, PO10, PO20, PO30 and PO100 types of fuel on the characteristics of fuel injection, mixing - combustion of fuel air mixture in the main combustion engine of diesel engine Hanshin 6LU32 in the laboratory; Determine the type of PO and spray parameters to meet economic and environmental targets.

- **Theoretical approaches:** To study the changes of macro properties (primary decay length, jet length and spray cone angle), microscopic properties (average diameter of atomized fuel particles) and injection parameters when using mixed fuels compared to using diesel oil.

- **Practical approaches:** To determine the spray parameters (Early spray angle, injection pressure) corresponding to the percentage of palm oil in a mixture

with diesel oil to achieve economic ( $g_c$ ) and environment ( $NO_x$ ) targets on the main diesel engines of Hanshin 6LU32 ship in the towing tank at Vietnam Maritime University.

### 3. Research methods

General research method, incorporating theoretical, simulated and verified experimental research.

### 4. Contributions of PhD. Thesis

The dissertation shows the following key contributions:

- Work out the method of calculating fuel injection parameters and injection time, ignition time, delay fire time variations corresponding to the the ratio of palm oil in the mixture with diesel oil;

- Conduct experiments on the main diesel engine Hanshin 6LU32 at 40% and 60% loading results on fuel injection, especially the results of measuring the pressure in the cylinder and images taken in the combustion chamber by Visio Scope equipment camera, to compare and evaluate the reliability of calculation results;

- Develop a new method for adjusting fuel systems based on the "Response Surface" theory with a two-objective optimization function first applied to marine diesel engines when using alternative fuels (mixture of vegetable oil fuel - diesel).

### 5. Structure of dissertation

The dissertation includes six parts: Introduction, main content composed of four chapters, conclusion and recommendation, list of related publications, references, and appendix.

*Hai Phong, April 17<sup>th</sup> 2020*

**Supervisor:**

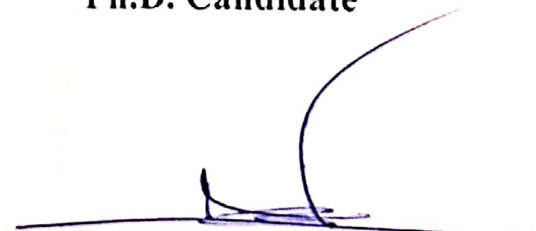
**Ph.D. Candidate**



1. Assoc. Prof. DSc.  
Dang Van Uy



2. Assoc. Prof.  
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**Nguyen Duc Hanh**