ID 456

# Design and Implementation of Operational Level Arduino-Based Marine Two Stroke Engine Simulator

HGS Hikkaduwa[1#], KMPK Senarathne[2], DVP Wijethunga[1], MCH Chandrasiri[1], LAKR Athukorala[1], LBND Rajasekara[1], SADR Maduwantha[1], RGYK Rajapaksha[1], and JPKD Amarathunga[1]

[1]Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka
[2]Naval Headquarters, Sri Lanka Navy, Sri Lanka

[#]hikkaduwahgs@kdu.ac.lk

The maritime industry relies on the operation of a complex machine; the ship's engine is a critical component. Understanding the starting and stopping procedures of a ship engine is essential for the safe and efficient operation of vessels. This paper presents the design and development of a switchboard simulation system, aimed at providing a practical and interactive means of comprehending the intricate starting and stopping procedures of two-stroke marine diesel ship engines. The proposed simulation system leverages the capabilities of Arduino microcontrollers, digital and analog sensors, neo-pixels, and a user-friendly graphical interface to replicate the control and monitoring mechanisms found in actual ship engine rooms, creating a realistic environment for operational-level training of marine engineers before taking appointments onboard ships. The system allows users to interact with various switches, indicators, and instruments, providing an immersive learning experience. The microcontrollers are responsible for processing user inputs and generating appropriate responses, while controllers monitor the status of the simulator. The graphical interface displays the switchboard layout and provides real-time feedback on the engine's condition, ensuring that users can practice and learn in a safe and controlled environment. The designed switchboard simulation system allows users to explore and understand the sequential procedures involved in starting and stopping a ship engine, including the activation of key systems such as the fuel system, cooling system, compressed air system, fuel, lubricating, starting air, cooling and steam systems including electrical power. Users can practice troubleshooting and emergency procedures, thus enhancing their preparedness for real-world scenarios. In conclusion, the implementation of an operational-level engine simulation using Arduino technology provides an effective and engaging method for teaching and learning the complex starting and stopping procedures of ship engines. This technology bridges the gap between theoretical knowledge and practical experience, making it an invaluable tool for maritime education and training.

**Keywords**: *two-stroke engines, operational level marine engine simulator, marine propulsion systems*