

The Design and Development of Waterproof Thruster for Unmanned Underwater Vehicle

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Abstract

The thruster is an important part of underwater vehicle. Therefore, the design consideration in terms of waterproof performance is mainly focused. This paper thus demonstrated the design and development of a well-protected thruster for an unmanned underwater vehicle. To seal the motor actuator, the thruster casing is coupled with the magnetic-fielded generation devices, attached on the propeller shaft and thruster casing. By applying the coupling technique, there is no physical contact through the motor shaft, while transmitted power from the motor to the propeller. In order to enhance the thrust efficiency, the nonmetallic material was used for coupling mechanism to resolve the eddy-current problem. Also the iron tube covered is developed to increase power transmission efficiency. The test results showed that the motor current was reduced by 157 % and the slipping torque was increased by 77.56 %. The horizontal and vertical forces were measured using load cell. The results from experiment presented that the maximum forward and backward forces are 13.83 N and 7.01 N, while the maximum submersible and floating forces are 11.55 N and 5.66 N. Finally, for the system test by assembling a pair of horizontal thruster and an accelerometer on the small underwater vehicle, the PID controller was applied for yaw tracking control. The experimental results showed that the thruster is well operated for a small underwater vehicle.

Keywords: unmanned underwater vehicles; thruster; PID control; UUV

1. Introduction

The Underwater Vehicle (UV) is the robot operated underwater. According to the mission, UV names are such as Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs), and Unmanned Underwater Vehicles (UUVs). The UV can be categorized