FABRICATION OF ROV DETECTING THE FOREIGN BODIES IN UNDER WATER

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ABSTRACT

Remotely operated underwater vehicles (ROVs) are remote control underwater robots driven by an individual on the surface. These robots are tethered by a series of wires that send signals between the operator and the ROV. All ROVs are equipped with a video camera, propulsion system, and lights. Other equipment is added depending on the specifications required. These include a manipulator arm, water sampler, instruments that measure clarity, light penetration, temperature, and depth. Team Aquabot intends to recreate such ROV in order to fulfil a specific mission involving four separate tasks.

Keywords: *under water vehicle, camera, armoured cable, water proof technology, servo motors.*

I. INTRODUCTION

A remotely operated underwater vehicle (ROV) is a tethered underwater mobile device. This meaning is different from remote control vehicles operating on under water. ROVs are unoccupied, highly manoeuvrable, and operated by a crew either aboard a vessel/floating platform or underwater. They are common in deep water industries such as offshore hydrocarbon extraction. They are linked to a host ship by a neutrally buoyant tether or, often when working in rough conditions or in deeper water, a load-carrying umbilical cable is used along with a tether management system (TMS). The TMS is either a garage-like device which contains the ROV during lowering through the splash zone or, on larger work-class ROVs, a separate assembly which sits on top of the ROV. The purpose of the TMS is to lengthen and shorten the tether so the effect of cable drag where there are underwater currents is minimized. The umbilical cable is an armoured cable that contains a group of electrical conductors and fibber optics that carry electric power, video, and data signals between the operator and the TMS. Where used, the TMS then relays the signals and power for the ROV down the tether cable. Once at the ROV, the electric power is distributed between the components of the ROV. However, in high-power applications, most of the electric power drives a high-power electric motor which drives a using motor. The pump is then used for propulsion and to power equipment such as torque tools and manipulator arms where electric motors would be too difficult to implement subsea. Most ROVs are equipped with at least a video camera and lights. Additional equipment is commonly added to expand the vehicle's capabilities. These may include sonars, magnetometers, a still camera, a manipulator or cutting arm, water samplers, and instruments that measure water clarity, water temperature, water density, sound velocity, light penetration, and temperature. Also optical-stero cameras have been mounted on ROVs in order to improve the pilots' perception of the underwater scenario.

II. Major Components

ROV uses motors and propellers to move itself through water. Such combination of motor and propellers are called thrusters. Thrusters with cowling on them and specially shaped blades to conform to the inside of the cowling are called Nozzles. Propellers have certain characteristics to them, which indicate what should be the right combination for the task and size of the ROV. These characteristics are as follows:

- Hub: the centre section of the propeller
- Blade Fillet: the radii defined by the transition of the blade faces into the hub.
- Pressure Face: the forward face of the propeller blade.
- Leading Edge: the blade edge adjacent to the forward end of the propeller hub.
- Trailing Edge: the blade edge adjacent to the back end of the propeller hub.
- Blade Tip: the blade edge on the outermost radius of the propeller.
- Emitter Holes: holes drilled into a channel near the leading edge. .
- Two sets of numbers describe the size of the propeller to be used. These numbers specify the diameter and the pitch.
- The diameter will always be first and then the pitch.
- Diameter: distance from the centre of the hub to the tip of the blade times two.
- Pitch: Pitch is defined as the theoretical forward movement of a propeller during one revolution.
- **Design**

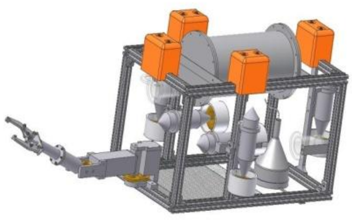

Fig.1 Design model

The design would be to make it in the shape of a box. This setup follows the traditional design of ROVs. The whole system would be enclosed in a cage with foam on the top, weights on the bottom and all the electronics in the middle of the ROV such as Figure 2. Having a box setup allows the components to be fixed on the cage, which makes it easier to construct and increases stability.

The robotic arm and weights would be placed on a plate at the bottom of the cage followed by dividing the foam into four sections and placing them in specific locations above the whole ROV to achieve the desired buoyancy. The camera together with the four thrusters would be placed around the outside of the

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cage to balance each other out (the camera is located directly above the robotic arm). All electrical components would be at the centre, housed in a cylindrical body for their protection. The materials being considered to this design are the same as Design Alternative.

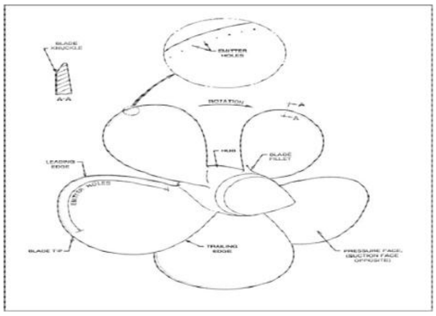

Fig.2 Propulsion Fan

Sony SN555

CAMCCR25

- **Camera**

The camera for the ROV has not been chosen, but there are several candidates listed below with their individual advantages and disadvantages. The main objective for the camera is to operate at 12 volts, with a high resolution, and low Lux light sensitivity rating. The lower the Lux rating, the better the camera can function in low-light situations. Since the ROV will be descending to depths of about 80 feet, the light will definitely be a factor. The ROV will have built in lights, but the lower Lux rating cameras will benefit from this the most.

III. ROV APPLICATIONS

1) Diver Observation–act as a dive buddy to ensure diver safety and provide assistance.
2) Platform Inspection–from visual inspection to using instruments to monitor the effects of corrosion, fouling, locating cracks, estimating biologic fouling, etc.
3) Pipeline Inspection–follow underwater pipelines to check for leaks, determine overall health of the pipeline and insure the installation is acceptable.
4) Surveys–both visual and acoustic surveys are necessary prior to installing pipelines, cables and most offshore installations.

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5) Drilling Support–everything from visual inspection, monitoring installation, operational support and repair when necessary were using multiple manipulators.
6) Construction Support–a natural follow-on to drilling support. The tasks here can become more complex with the use of manipulators and powered tools and cutters.

IV. CONCLUSION

For the purpose of this project, a relationship between buoyancy, materials, propulsion, and size needs to be determined. There is currently some consideration of a neutrally buoyant ROV compared to a variable ballast tank. The fact that a neutrally buoyant ROV can be directed in all axes with the proper placement of thrusters currently makes this option more appealing and cost effective. A variable ballast tank would also hinder performance because it would be another variable to control while attempting to complete the competition tasks at hand.

REFRENCES

[1] Yannick Allard, Elisa Shahbazian, "Unmanned Underwater Vehicle (UUV) Information Study OODA Technologies Inc.4891 Grosvenor Montr´eal (Qc),H3W 2M2 514.476.4773.

[2] Brian Lien, "Design your own Underwater Remotely Operated Vehicle" West coast Words ISBN: 9780968161005.

[3] Ottar L. Oseny, Rolf-Inge Sandvikz, Jørgen Berge Trygstady, Vegard Rogney, and HouxiangZhangz. "A Novel Low Cost ROV for Aquaculture Application" Software and Intelligent Control Engineering Laboratory.

[4] Gabriel Martos, Ashley Abreu, Sahivy Gonzalez, "Remotely Operated Underwater Vehicle"
EML 4905 Senior Design Project, A B.S. THESIS, September 21, 2013.

[5] Rahimuddin, Hasnawiya HasanARivai, "Design of Omni Directional Remotely Operated Vehicle". International Conference on Nuclear Technologies and Sciences (ICoNETS 2017) Conf. Series **962** (2018) 012017 doi :10.1088/1742-6596/962/1/012017.

[6] Romano Capocci, Gerard Dooly, Edin Omerdi's "Inspection-Class Remotely Operated Vehicles- A Review. Journal of Marine Science and Engineering, Mobile and Marine Robotics Research Centre, University of Limerick, Castletroy, Limerick V94 T9PX, Ireland

[7] Bharat Kungwani1, Noopoor Misal, "Design and Fabrication of A Low Cost Submersible ROV for Survey of Lakes". International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056.