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Dedicated to the 150th Anniversary and
The 1st Congress of World Engineers and
Riga Polytechnical Institute / RTU Alumni

DIGEST

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Design and Manufacture Analysis of Underwater Remotely Operated Vehicle Hull

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Keywords **– underwater vehicle, parameters, construction, hull forms**

I. Introduction

In the beginning of new century with rise in variety of new high strength materials and modern radio equipment underwater vehicles have new expanded space for development. Underwater vehicles take us closer to still unknown Ocean, develops research for oil and gas industry, help in underwater cable laying operation etc.

II. Design Stage Plan

When modeling underwater vehicle there are many aspects to take into account: type of underwater vehicle, displacement, and main dimensions. After main characteristics are selected, details are précised. It is important to know all precautions to exploit vehicle safe and reliable. In comparison with ship it is difficult to provide damage stability for underwater vehicle even if small amount of water have entered hull. The paper deals with different forms of underwater vehicle and its characteristics and flow simulations during developing vehicle model. Parameters of underwater vehicle are: depth, basic equipment, autonomy, speed, special characteristics and equipment (see fig.1).

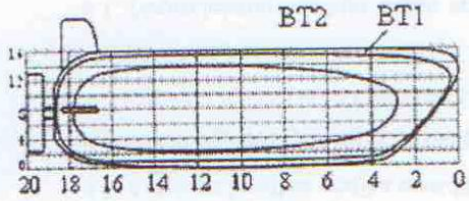

Fig. 1. Underwater Remotely operated vehicle (body plan)

III. Underwater Vehicle Tasks

Common research mission of underwater vehicle is to find better ways of observing and reporting on the interior of the ocean, its seafloors and coastal boundaries. A variety of sensors can be affixed in order to measure to measure the concentration of various compounds, the absorption or reflection of light. Research mission can not be separate nowadays from commercial mission.

Commercial mission of underwater vehicle mainly is performance of various missions in oil and gas industry. Surveys and inspection supporting offshore oil and gas facilities emplacement are intended to map all features that may impact the proposed structures. One of the common commercial applications is inspecting of pier underwater part and ship underwater hull (see fig.2). The next generation of these underwater vehicles was developed for purpose survey and intervention missions. The second commercial mission is ships underwater hull survey, port security, inspection of underwater pier constructions. These underwater vehicles should satisfy the following requirements: low cost, shallow water applications depth up to 20 meters, small weight and dimensions. Instead of sending diving teams to photograph the hull of a ship, survey inspector could release an underwater vehicle into water and will obtain a complete filming of ship underwater hull [1].

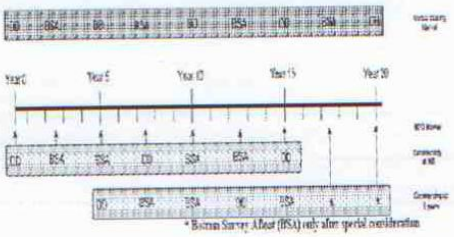

Fig. 2. Scheme of ship's hull underwater part survey [DetNorskeVeritas,2010]

IV. Underwater Vehicle Materials

The most reliable materials used in underwater vehicle building are steel, titan, aluminum and alloys, different composite materials and fiberglass. In construction can be used metals as cast ones and deformed ones (pressed materials, packed materials, etc). One of the most important characteristics when designing underwater vehicle is environmental hydrostatic impact during maintenance. There are many factors that influences floatation of this vehicle such as static, dynamic and fatigue stability, material, technology, construction concessions, etc

V. Conclusions

Authors have found three main difficulties which can arise during designing of underwater vehicle:

- Paneling and construction of underwater will be damaged in case of loosing floatation;
- Asymmetrical protuberances occur and lead to loss of overall floatation in case of loosing paneling in between two frames (for cylindrical underwater vehicle);
- Loss of stability – when axiametrical pockets in wave shape take place in between frames as a result of material tension.

VII. References

[1] Urbach A. Carjova K., Zavtkevics V., Design features of unmanned underwater vehicle (UUV) – Proceedings of 15th International Conference. Transport Means. 2011. p.193-196