



KRAB system for monitoring and protection of underwater environment

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ABSTRACT

The paper presents achievements at the Ship Research Institute of the Szczecin Technical University in the field of designing the equipment destined for the natural environment monitoring and protection. KRAB LC ROV SYSTEM is described, range of underwater applications is discussed, typical performed tasks are described as well.

INTRODUCTION

Industry water pollution, underwater offshore activities, exploitation of natural resources creates necessity of building the sophisticated systems destined for monitoring and protection of natural environment to avoid the risk of significant contamination of rivers, lakes and sea.

There was a universal monitoring system designed at the Ocean and Ship Technology Institute, which might also be regarded beneficial as far as environment protection is concerned.

UNDERWATER MONITORING SYSTEM

The classification of waters and their analysis, e.g. Głowiak [3], makes it necessary to have equipment for quick chemical analysis of water on the spot and to evaluate underwater and hydrotechnical structures which affect the aquatic habitat. The a/m purposes were grounds to design and develop an underwater monitoring system (UMS) at the Ocean & Ship Technology Institute, [1]. The system



338 Water Pollution

consists of: underwater vehicle (a carrier of equipment and apparatus) - the main part of the system, supply console, control panel, video overlay computer, research and sampling equipment in the vehicle, laboratory equipment.

Application

The UMS can be used in all underwater actions to monitor the aquatic habitat, to monitor the condition of equipment, its operation and hazard. It can be also used in many different tasks especially in research and observation of natural environment condition owing to relatively small dimensions and mass (it is serviced by two operators).

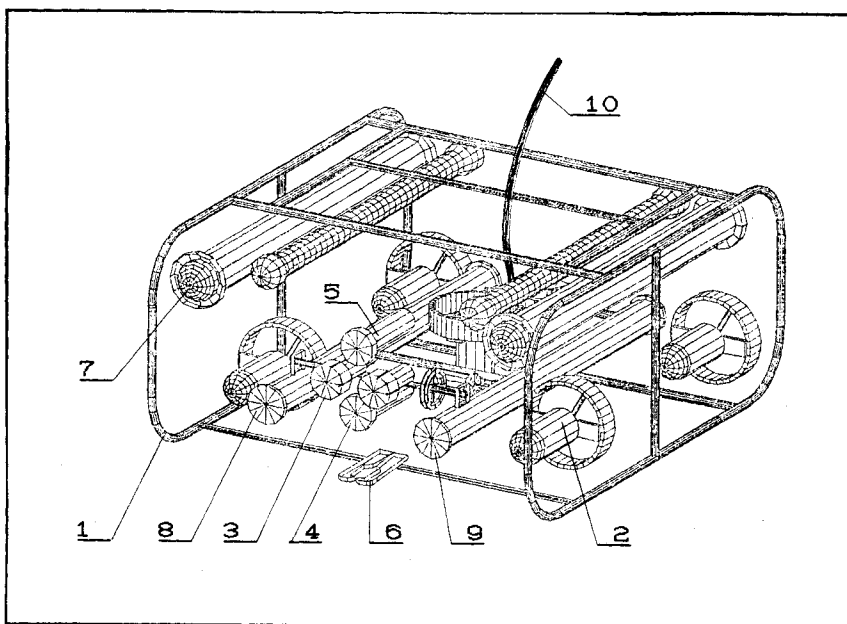


Fig. 1 KRAB LC ROV - a carrier of equipment and apparatus:

- | | |
|---------------------|------------------------|
| 1 - frame | 6 - manipulator |
| 2 - thruster | 7 - buoyancy unit |
| 3 - light | 8 - electronics vessel |
| 4 - b&w TV camera | 9 - sensors vessel |
| 5 - color TV camera | 10 - umbilical |

The vehicle carrying tv cameras and a lot of research equipment is a mobile source of immediate



information on aquatic habitat, and thus its main function and purpose is aquatic habitat monitoring. The investigation may be carried out in situ with a continuous recording of parameters or followed by lab tests where samples of water and deposits are analyzed.

The UMS can also be used in all underwater actions to monitor the condition of constructions, their operation and hazard. The fields of application are for example, [4, 5]:

- sea and inland transport: inspection and monitoring of quays, wet docks, fairways, underwater parts of hulls and other vessels,
- hydrotechnics: inspection and monitoring of water dams and flooded structures,
- underwater mining,
- marine and inland rescue: inspection of wrecks and emergency areas, monitoring of diving teams.

Specification

Technical data of the vehicle and UMS:

- vehicle mass: approx. 60 kgs
(depends on equipment),
- speed: 1.5 m/sec (forward),
- rotation speed: 70 deg/sec,
- diving depth: 150 m,
- continuous recording of aquatic habitat parameters such as: pH, temperature, content of oxygen and chemicals, other optional,
- video recording of events (time, depth, location),
- control team: 2 - transport,
1 - research & inspection.

The vehicle is equipped with:

- lighting - 2x250 W (controlled illumination),
- 2 tv cameras (color & mono - sensitivity 5 and 0.02 Lux),
- one-function manipulator,
- research equipment to measure pH, temperature, conductivity, turbidity, oxygen content and other optional.

The research equipment comprises sensors installed in the vehicle which send a signal through the umbilical or extra cables to video recording unit or a recorder. Containers for samples of deposits or water can also be mounted onto a vehicle. The size of sample is not limited as the vehicle can be used as the operating unit to attach ropes to pull samples or other objects by means for any suitable transportation.



340 Water Pollution

CONCLUSIONS

There is a tendency to apply remotely operated vehicles to perform underwater research and control, e.g. Given [2]. Among many ROVs low cost vehicles should become carriers of the sophisticated equipment depending on the performed tasks.

Trials performed at the Ocean and Ship Technology Institute confirm the great utility of above described system. There is also a great profit of UMS application, i.e.: it cuts on cost and economizes on expenditure by shortening the research time compared to traditional methods.

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