Methodology of underwater monitoring

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Abstract

Underwater monitoring covers mostly tasks performed without direct participation of man in water space. It aims at evaluation of underwater objects or the condition of the environment. The paper discusses the ways of performing monitoring with special regard to the use of remotely operated vehicles.

1 The range of monitoring and ways of its performing

The presence of man in underwater space is not indispensable due to the advanced technical appliances equipped with various instruments (for watching, measuring, recording and performing tasks). In case of investigating unknown objects or military remains which are strewn on sea bed in many regions the presence of man is even undesired because of threatening danger.

Underwater monitoring means investigation of water environment and objects in an orderly way with the use of specialized apparatus and it is widely applied to examine the abyss, [1]. The range of investigations [4] covers:

- physical-chemical properties of water,
- sediment,
- biological and geological investigations,
- conditions of underwater structures: hydro-technical constructions, pipelines and power cables as well as oil and gas mining equipment,
- working parts of underwater appliances including bed surface mining,
- submersed parts of floating objects.

According to the size of water region and expected results monitoring is performed with the use of:

- apparatus placed in buoys - stationary research of physical and chemical properties of water and air, monitoring of drifting oil spills, fig 1;
- towed systems - short and long distance biological, geological and hydrological investigations, fig. 2;

- remotely operated vehicles (ROVs) - short distance investigations of under-water structures and installations, stationary research of the environment condition, fig. 3;
- autonomous underwater vehicles (AUVs) - a wide scope of long distance research, fig. 4.

The monitoring data are collected in deck registers or transmitted to on-shore research centre. Stationary apparatus transmits data by radio (also satellite transmission). In case of ROVs the data are currently transmitted by cable line or stored on the deck. AUV's data are transmitted by radio after the vehicle has emerged according to mission schedule.
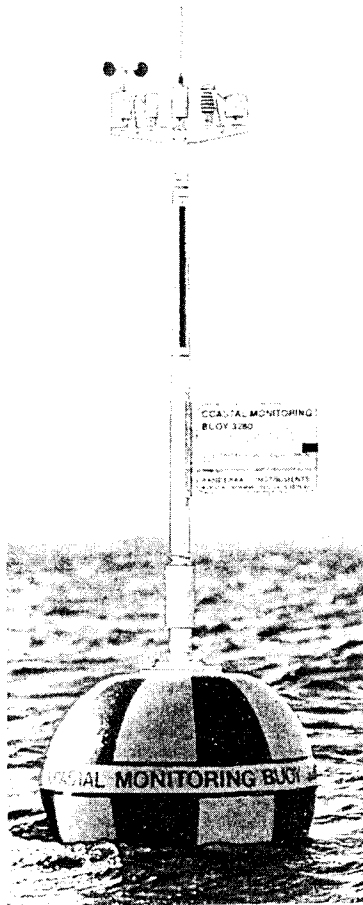

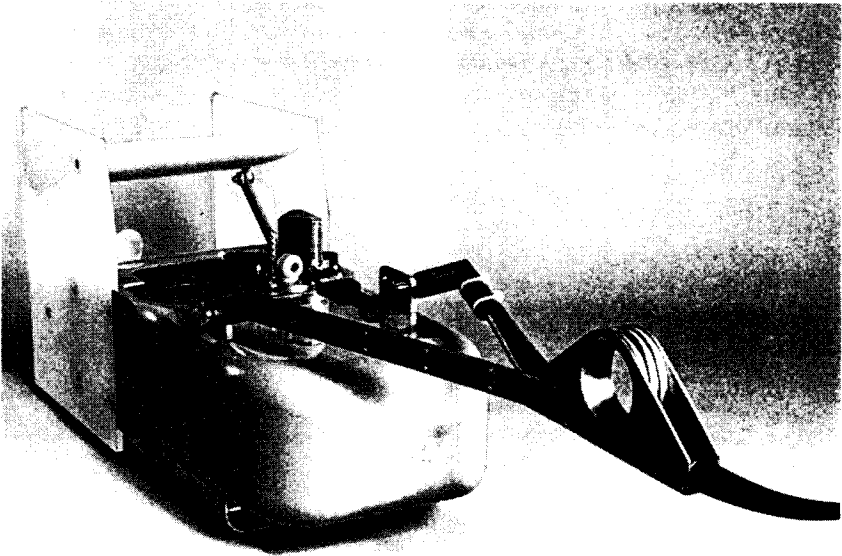Figure 1. Buoy for stationary water properties measurements, [6].

Figure. 2. Towed vehicle for wide range of short
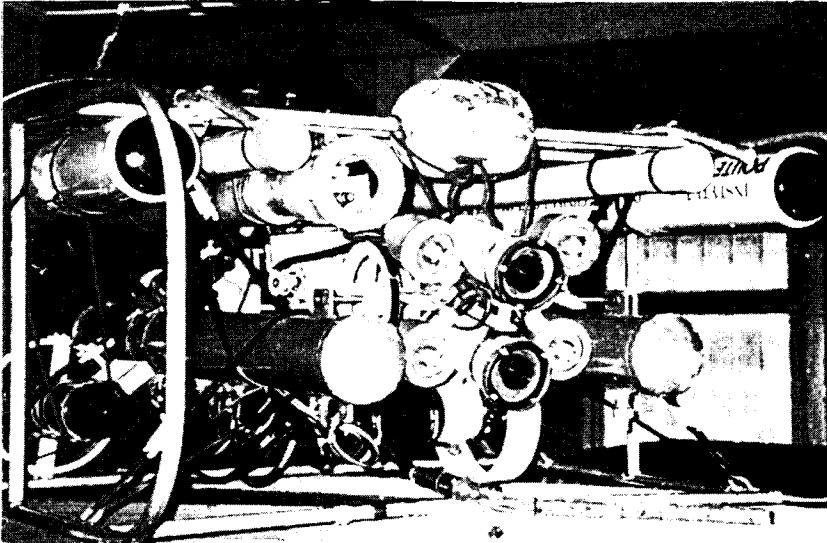and long distance monitoring, [5].

Figure 3. Remotely operated vehicle equipped with measuring sonde
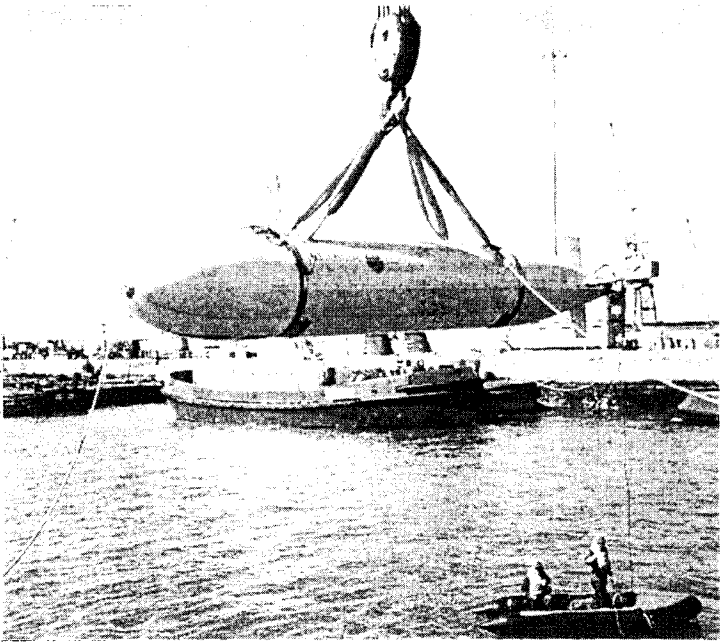for short distance monitoring, [3].

Figure 4. Autonomous underwater vehicle for long distance monitoring, [7].

2 Schedule of the monitoring research procedure applying ROV

The research requires appropriate schedule which depends on natural conditions and the scope of operations to be completed according to the demand, in particular :

- preliminary location on the grounds of reports of appropriate authorities, positioning of the area concerned,
- marking areas with bed located transponders,
- short-base positioning,
- vessel anchoring, locating system control cabin,
- preliminary area inspection with tv viewing or magnetometric transmission,
- locating objects, inspection with video recording,
- monitoring object or environment, recording environmental measurements,
- sampling,
- co-operation with diver teams, if necessary, data transmission, tooling or object transportation by means of a manipulator or airbags, transportation of auxiliary ropes and cables,
- permanent marking of site,
- final documentation,
- sample analysis (on-shore lab),
- presentation of the research results.

3 Final remarks

Experiences of the Ocean and Ship Technology Institute confirms usefulness of ROV for water monitoring, [2,3].

Inspection of oil rig structure at the depth of 80 m allowed to evaluate the condition of construction and oil well. Archaeological research made possible to localize and penetrate ship wrecks. Observations of water intake for Szczecin confirmed the expected condition of the pipeline and intake.

All the above mentioned tasks were performed with the use of ROV being in the possession of the institute, which is equipped with vision and navigation apparatus, manipulator, water sampler and sonde measuring the environment condition.

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