REMOTELY OPERATED VEHICLES (ROV)

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Introduction

Underwater ROVs (Remotely Operated Vehicles) are submersible, robotic systems, used to observe the depths of large bodies of water by operators from shore, or by divers in the water. They are common in deepwater industries such as offshore hydrocarbon extraction. They can be as small as a basketball to as big as a large SUV. The prices also vary greatly. They start at a few thousand dollars and can go up to millions of dollars. Underwater ROVs are used in a variety of industries: Search and Rescue, Military, Recreation and Discovery, Aquaculture, Marine Biology, Oil, Gas, Offshore Energy, Shipping, Submerged Infrastructure, and more. They allow operators to capture photo and video footage to inspect and monitor ports, harbours and vessels, bring innovation to pipe inspections, locate underwater targets and explore the depths of our oceans, lakes and rivers.

History of ROV

1950s

US Navy began experimenting with remotely controlled submersibles for underwater reconnaissance. The first successful ROV was developed in 1953 by the French inventor Dimitri Rebikoff. Rebikoff's ROV used a tether and an on-board camera to explore the depths of the ocean.

Royal Navy ROV (Cutlet)

1960s

Cable-Controlled Undersea Recovery Vehicle (CURV). Used by the US Navy to locate and retrieve torpedoes used in tests and training from the seafloor. Retrieved a hydrogen bomb that had been lost in the Mediterranean Sea of Palomares, Spain. Weighs roughly a ton and can operate depths of about 2,000 feet. Operated by a five-man crew on the surface. Controls it through a closed-circuit television network. Acoustic detection and positioning components are also involved.

CURV I

CURV II

1970s

Employed to rescue two-man crew of the submersible Pisces III, which had sunk off the coast of Ireland.

Enhanced from 10,000 to 20,000 feet of operation using technologies developed for the Remote Unmanned Work System (RUWS) and the Advanced Tethered Vehicle (ATV).

CURV III

Current

- Improved sensors
- Autonomous navigation systems
- Increased communication capabilities.
- Expected to grow in the future as more areas of the ocean are explored and studied.

Deep Trekker Revolution

Perry XLX EVO

Applications

Applications

Oil & Gas Exploration

Inspection of pipelines, underwater surveys, and monitoring of underwater infrastructure.

Search & Rescue

Operation of search and rescue in both freshwater and saltwater locations. Helpful in deep water where human divers may be unable to operate safely.

Aquaculture

Inspection and surveillance of fish farms. Observe the health and behaviour of fish.

Applications

Military

ROVs may also be used by the coast guard or naval forces to undertake port security and vessel inspection. They may use high-definition cameras, floodlights or sonar to check the hulls of vessels for contraband

Oceanography

Examine the ecosystems beneath the water and assemble samples. Also use for monitoring the environment

Main Components

Main Components

01

Hull Design

02

Propulsion

03

Navigation System & Control

04

Data Collection

05

Data Transmission

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Power Management

Hull Design

Advantages

- Large internal space for equipment and instrumentation
- High payload capacity
- Well-suited for heavy-duty tasks such as construction and maintenance

Box-shaped Hull

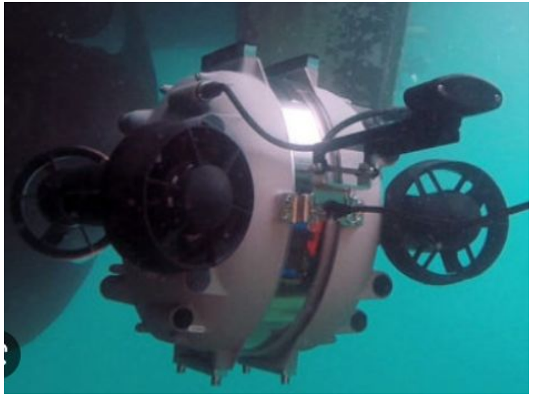
Disadvantages

- Limited maneuverability
- Increased drag due to larger size
- May be less stable in currents compared to other hull designs

Hull Design

Advantages

- High maneuverability
- Good stability in currents
- Compact size, making it easy to transport and launch



Spherical Hull

Disadvantages

- Limited internal space for equipment and instrumentation
- Reduced performance at deeper depths due to increased pressure on the spherical hull

Propulsion

Advantages

- Efficient and reliable
- Can be easily controlled for precise maneuvering
- Minimal maintenance required

Electric Thruster

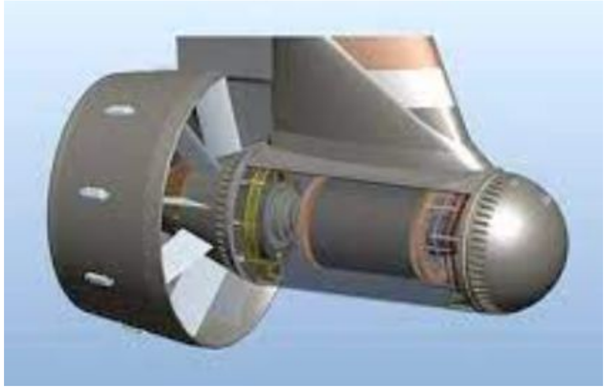
Disadvantages

- Requires a power source, which may limit operating time
- May produce electrical interference that can affect sensors and other equipment

Propulsion

Advantages

- Improved maneuverability
- Increased efficiency
- Reduced noise
- Improved safety



Jet Duct Thruster

Disadvantages

- Higher cost
- Increased weight
- Reduced speed
- Increased complexity

Propulsion

Advantages

- High power and speed capabilities
- Well-suited for heavy-duty tasks
- Can be operated at greater depths than electric thrusters

Hydraulic Thruster

Disadvantages

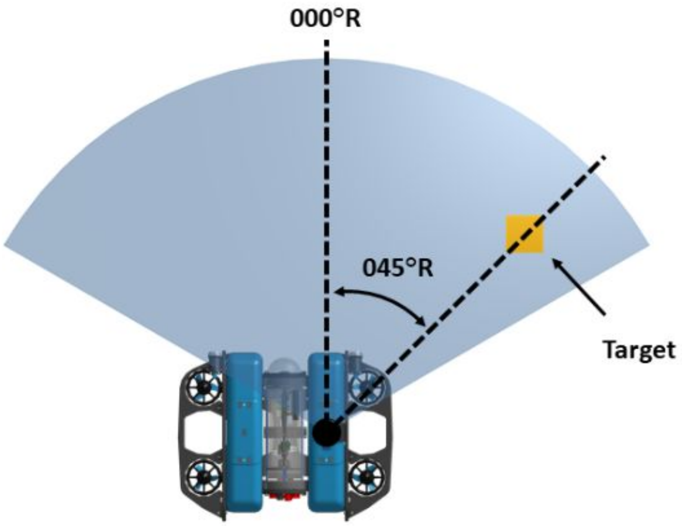
- More complex and expensive than electric thrusters
- Require a hydraulic power source, which may increase weight and complexity

Navigation System & Control

ROV Control Console

- Large video screen which is divided to give simultaneous monitoring
- Computer with waterproof keyboard for on-screen video information overlays
- Hard disk recorder with mini CD or memory stick output
- On-screen depth recording
- On-screen GPS from inbuilt receiver

Navigation System & Control



Scanning Sonar

- Acoustic imagery and returns from scanning sonars can be difficult to understand.
- This guide will help in interpreting displayed sonar images and some best practices and techniques for when they are mounted on ROVs.

Navigation System & Control

Joystick & Manipulator

- This allows the operator to control the ROV's movements, such as forward/backward, left/right, up/down.
- These allow the operator to manipulate objects with the ROV.

Data Collection

Sensor

Equipped with various sensors, including a depth sensor, altimeter, and compass, which provide data on the ROV's position and orientation.

Sonar

The use of an ROV equipped with sonar provides recovery teams with a tool that allows them to safely and efficiently search large areas of water.

Camera

High-definition camera that records still photos and video of the environment around the ROV. To get a better view of the area, the camera can be remotely tilted and panned.

Light

Equipped with high-intensity LED lights that illuminate the surrounding area, allowing the camera to capture clear images and video.

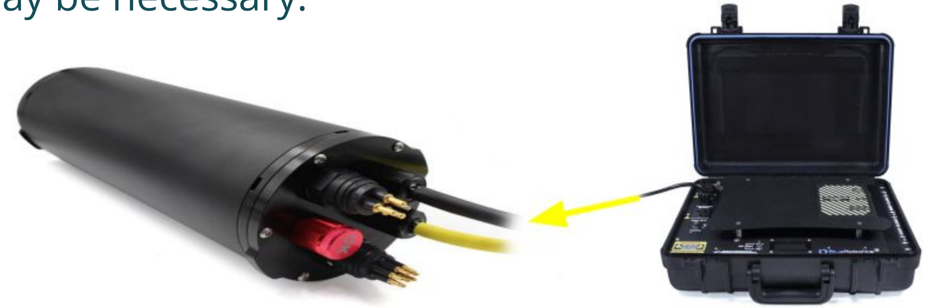
Data Transmission

Tether Cable

The tether cable allows the ROV to make excursions at depth for a distance of 500 feet (150 m) or more from the point of the clump weight. Some refer to the TMS as the entire system of cage or 'top hat' deployment, tether management, vehicle protection, and junction point for the surface/vehicle link.

Power Management

A remotely operated vehicle (ROV), a tether management system (TMS), and an umbilical that is functionally connected to the TMS external electrical power interface and the TMS-to-ROV umbilical interface make up a power management system. The system can be set up to offer electrical power management that transfers some or all of the electrical power needed for ROV propulsion and tooling to the ROV and/or TMS, maximises available power, and prioritises loads across all systems. Additionally, power management that incorporates variable frequency drives and intelligent power routing to subsystems may be necessary.



Power Supply Unit

Thank You!!