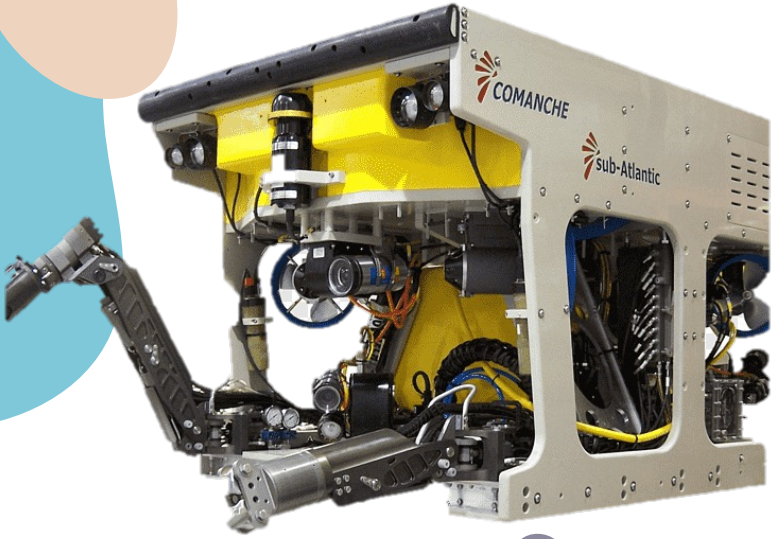

REMOTELY OPERATED VEHICLES

Robotic Hardware Systems

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01

HISTORY

Remotely Operated Vehicles

INTRODUCTION

Remotely Operated Vehicles (ROVs) have revolutionized the way we explore and interact with the underwater world. These machines, which are essentially underwater robots, have been developed and refined over the past several decades through a combination of mechanical engineering, electrical engineering, and computer science.

HISTORY

	DESCRIPTION
1950s–1960s	US Navy develops early ROVs for deep-sea salvage operations.
1970s	Oceaneering and Perry Submarines develop more sophisticated ROVs for underwater construction and inspection.
1980s–1990s	Schilling Robotics and Deep Sea Systems develop ROVs with advanced control systems for greater autonomy and precise control.
Recent Years	Development of unmanned underwater vehicles (UUVs) push the boundaries of ROV technology and allow for autonomous operations. ROVs and UUVs used in industries such as scientific research, marine biology, oil and gas exploration, and underwater construction.

02

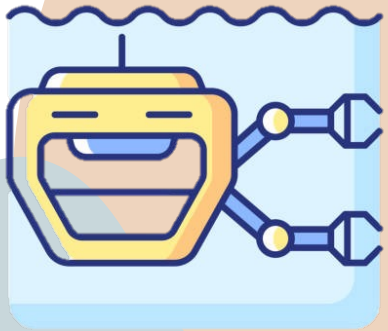
MAIN COMPONENTS

Remotely Operated Vehicles

1# CONTROL SYSTEM

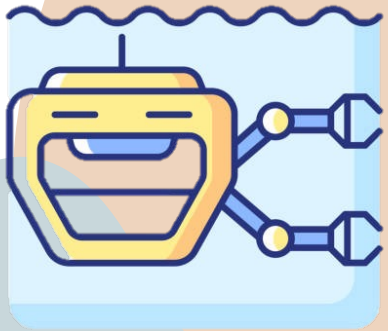
- It is a vital component of an ROV, providing operators with the ability to control the vehicle's movements and functions. The control system typically consists of a set of joysticks, buttons, and switches, which the operator can use to maneuver the ROV.

- The system is responsible for converting the operator's commands into actions performed by the ROV. The operator can control the ROV's speed, direction, and maneuverability, as well as activate its sensors, manipulators, and other systems.



2# POWER SYSTEM

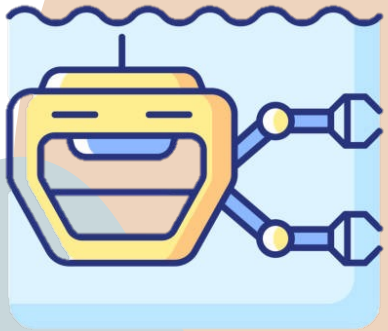
- The power system is a critical component that provides the necessary energy to operate the ROV. This system typically consists of a set of batteries, generators, or fuel cells that supply power to the ROV's motors, lights, and other systems.
- The power system's efficiency and capacity are crucial factors to consider when designing an ROV, as it must operate for extended periods without requiring frequent maintenance or recharging.
- Power management is a critical aspect of ROV design, as it ensures that the vehicle's systems are running optimally, while also maximizing battery life.



3# PROPULSION SYSTEM

- This component is responsible for moving the ROV through the water or other medium. The propulsion system typically consists of a set of thrusters, propellers, or jets that the operator can control. These systems enable the ROV to move in any direction, rotate, and adjust its orientation as needed.

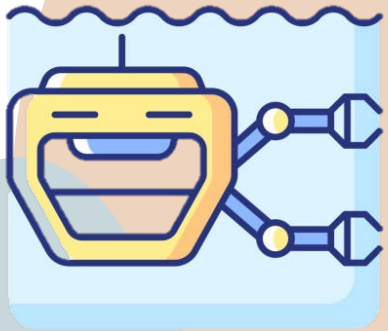
- The propulsion system's design must be carefully considered to ensure that it is powerful enough to move the ROV efficiently while also being compact and energy-efficient.



4# SENSORS

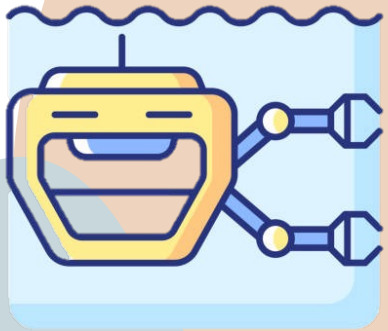
- sensors play a vital role in ROV functionality, providing data about the vehicle's environment and the objects it encounters. Sensors can collect data about water temperature, pressure, and depth, as well as provide information about the ROV's position and orientation.

- They can also collect data about the organisms and objects encountered, such as identifying a particular species of fish or coral. Sensor data is critical to ROV operation, as it allows the operator to make informed decisions about how to proceed and adjust the ROV's functions as needed.



5# MANIPULATORS

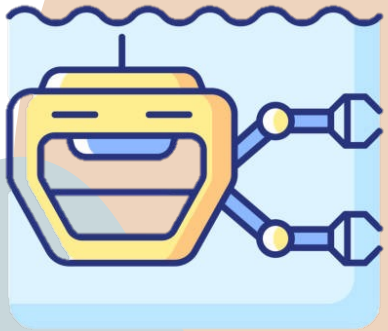
- It enables the vehicle to interact with its environment. Manipulators can be used to grab, cut, or drill objects, as well as take samples of soil, water, or other materials. Manipulators are typically controlled by the operator and must be designed to be precise and responsive to the operator's commands.



6# COMMUNICATION SYSTEMS

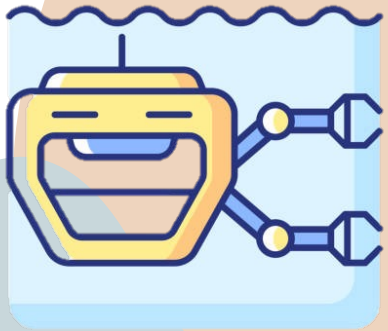
- Communication systems are also a crucial component, transmitting data and video signals between the ROV and the operator. Communication systems typically consist of antennas, cables, or other wireless communication devices, enabling real-time data and video transmission.

- The communication system's reliability and speed are essential factors to consider when designing an ROV, as they can affect the operator's ability to control the vehicle and receive data.



7# NAVIGATION SYSTEMS

- Navigation systems are used to determine the ROV's position and orientation, typically consisting of GPS, inertial sensors, and other positioning technologies.
- Navigation systems are essential for ROV operations, allowing operators to track the vehicle's movements and adjust its course as needed.
- Navigation systems must be highly accurate and reliable, as small errors in position or orientation can lead to significant deviations from the intended path.



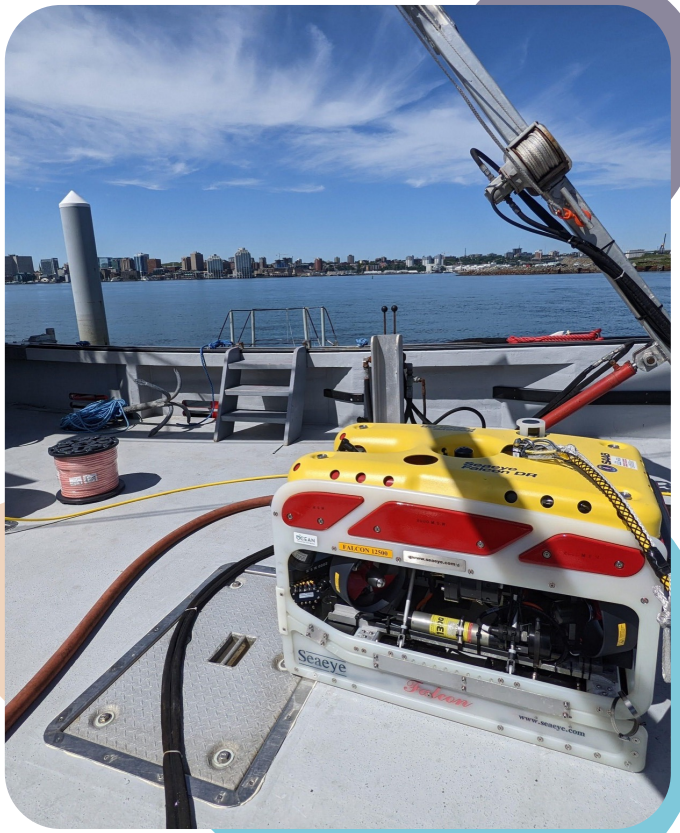
03

ADVANTAGES & LIMITATIONS

Remotely Operated Vehicles

WHY?

While ROVs offer many advantages over traditional underwater vehicles, they also have their limitations. It is important to consider these factors when planning and executing ROV operations to ensure optimal performance and safety.



ADVANTAGES & LIMITATIONS

- Improved Safety
- Cost-effectiveness
- High-level Manoeuvrability
- Enhanced Precision and Control
- Able to Operate in Extreme Depths
- Able to Perform Hazardous Tasks

- Limited Autonomy
- Reliance on Surface Support
- Limited Payload Capacity
- Limited Range
- Limited Visibility
- Susceptible to Equipment Malfunctions

04

APPLICATIONS IN INDUSTRY

Remotely Operated Vehicles

APPLICATION #1

Offshore Oil and Gas Exploration

ROVs are widely used in offshore oil and gas exploration and production operations. They are used to perform a variety of tasks, including subsea inspection, repair, and maintenance of pipelines, wellheads, and other offshore structures. ROVs are also used to deploy and recover equipment, such as drilling rigs and subsea cameras.

APPLICATION #2

Underwater Construction

ROVs are used in underwater construction activities, such as the installation of pipelines, cables, and other subsea infrastructure. They are also used for the maintenance and repair of underwater structures, such as dams, bridges, and offshore wind farms.

APPLICATION #3

Marine Research

ROVs are used extensively in marine research activities, including the study of marine ecosystems, oceanography, and marine biology. They are used to collect samples of water, sediment, and marine life, as well as to monitor and study underwater environments that are difficult or dangerous for humans to access. ROVs are also used in the exploration of underwater caves and other hard-to-reach areas.

CONCLUSIONS

Remotely operated vehicles (ROVs) have revolutionized underwater exploration and operations. These machines allow us to conduct dangerous and complex tasks that were previously impossible for human divers. ROVs have numerous applications, from scientific research to military operations and the oil and gas industry. As technology continues to advance, we can expect even more capable and sophisticated ROVs to make an even greater impact on our understanding of the ocean and its resources.