

# Applications and Research Challenges of Underwater Communication Devices\_A Review

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## Abstract:

*Underwater Communication contributes to marine activities in collecting underwater data and monitoring the underwater environment. Underwater sensor devices will be useful in various applications such as oceanographic data collection, pollution monitoring, tactical surveillance applications. Despite underwater communication provides an enormous amount of information about an ocean's environmental conditions, it faces numerous challenges. The challenges can be technical or research problems like low bandwidth and propagation delay, which need to be solved. Aside from these constraints, the main problem is the battery life of an underwater device used to power up the device. The batteries are very complicated to recharge and substitute in the underwater environment. In this paper, we present the literature survey on various applications and constraints of underwater devices.*

## Introduction:

The research on underwater communication techniques plays a vital role in the exploration of the aquatic environment. As the technology increased rapidly, the underwater communication became the most growing field since it finds application in many fields like pollution monitoring, offshore exploration, scientific data collection, national security, etc. The marine environment can impact the communication channels in underwater communication. It can even be affected by noise, low bandwidth, power source, and severe underwater circumstances. Therefore, the underwater communication channel displays severe attenuation, frequency distortion, constrained bandwidth, etc. Hence, underwater communication is considered the most complicated technique. Aside from all these challenges energy requirement for the power up the device is the most difficult constrained. The underwater device will function until there is a power supply to the device else it will stop functioning. Therefore, designing an energy-efficient underwater device is challenging. This paper gives a detailed

survey on existing methods of energy supply to power up the devices.

## Literature Survey:

**[1].“Underwater Acoustic Sensor Networks: Research Challenges”.** This paper examined various features of underwater communication. In this paper, the author explained various architectures and characteristics of underwater devices and the main challenges for developing efficient networking solutions. But this paper failed to discuss the energy-efficient solution to the network.

**[2]. “Research Challenges and Applications for Underwater Sensor Networks”** This paper explored the applications and challenges of underwater devices. The author featured the potential applications to offshore oilfields for seismic monitoring and underwater robotics. The author described the preliminary design on short-range acoustic communication hardware.

**[3].“Underwater Sensor Networks: Applications, Advances, and Challenges”** In this paper, the author examined several fundamental key aspects of underwater communication. The author also mentioned the applications of underwater communication. The main difficulty for the development of network efficiency is mentioned in this paper.

**[4]. “Multi-Source Energy Harvesting System for Underwater Wireless Sensor Networks”** This paper mainly focuses on the multisource energy harvesting techniques since the main challenge in underwater communication is the power supply to the sensor node. The analytical expressions are proposed in this paper. According to this paper, a multisource harvesting system utilizes MFC and acoustic piezoelectric harvesting.

**[5].“Underwater sensor network applications: A comprehensive survey”.** According to this paper underwater device is a blend of wireless technology with very small micromechanical sensor technology.



Underwater sensor nodes are distributed under the water to sense quality, humidity, temperature, and pressure. These sensed data can be used for a variety of applications for human benefit. According to this paper, underwater communication is done with nodes transmitting data to buoyant gateway nodes that send data to the nearest coastal and controlling station. This paper also explains the architecture, classification, and applications of UWSN.

**[6].“A survey on underwater Acoustic sensor network routing protocols”.** In this paper, the author explains about applications of UASN in ocean exploration, the importance of designing routing protocol, and the classification of routing protocols. This paper also introduces the intelligent algorithm-based UASN routing protocols and explains the energy consumption, propagation delay, and mobility of underwater devices.

**[7].“A survey on application and research challenges of underwater wireless sensor node”** In this paper, the author investigated the applications of underwater communication and various challenges the underwater device faced.

**[8].“Battery lifetime estimation and optimization for underwater sensor networks”.** In this paper, the author mentions military and civilian applications of underwater communication and the challenges by underwater communication networks such as cost and battery lifetime in terms of different parameters like internode distance, transmission frequency, frequency of data updates, and the number of nodes per cluster.

**[9].“A survey on current underwater acoustic sensor network applications”.** In this paper, the author mentions various fields of applications of underwater sensor networks. This paper’s main objective is to have set of autonomous devices in a network to self-organize and get adopted to the deep-sea environment.

**[10]. “Survey on Energy harvesting systems for underwater devices”** In this paper, the author explained the various applications and challenges of underwater devices and mentioned the energy harvesting techniques for underwater devices.

**[11].“Underwater wireless sensor networks: A review of recent issues and challenges”.** In this paper, the author mainly focuses on improving the

better utilization of resources available underwater. The author also mentions the effect of temperature on acoustic communication.

### Conclusion:

Underwater communication is a fast-growing domain due to its numerous applications in exploring and controlling the deep ocean. We explained the various applications and challenges the underwater device faced and the methods of energy supply sources to the underwater devices to increase the device’s lifetime.

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