

# Energy Harvesting in Water Wave: The Review

**Prof. Mahadar S. D., Saurabh Shinde, Swapnil Makhare, Akash Deokar, Sachin Takale**

Department of Mechanical Engineering  
S. B. Patil College of Engineering, Indapur, Pune, India  
Savitribai Phule Pune University, Pune, India

**Abstract:** *With regards to small communities living in remote locations, particularly on the islands, there is limited amount of electricity available as they are not connected to the main power grid. As such, the energy demand is high and to cater for this there is a need to source out alternative ways of harnessing power to meet the demand. A wave energy generation devise is needed as it may provide sufficient power to cater for the local communities. There are several mechanism that are available that has gone into production to generate electricity. This project will focus on using the rack and pinion mechanism particularly. The design will be specifically made to operate on the near shore where the waves are relatively high but not high enough that it may cause damage to the device. The main objective of the device would be to generate electricity using the forces from the oncoming waves. This is the prototype model and if further research is carried out, this model has the potential to be used commercially*

**Keywords:** Water Wave, Energy Harvesting, Power Generation etc

## I. INTRODUCTION

Renewable energy is an evergreen subject in a world that is dominated by fossil fuels. A very hot topic that discussed by leaders all over the world because the idea of renewable energy implies that it is unlimited and sustainable. This is due to the reason that fossil fuels are very limited and will at some point finish. In addition to being finite in nature, fossil fuels are and have become detrimental to the environment, not to mention that they are very costly as it is imported from foreign countries. The use of renewable energy can come in different forms. This may be in the form of solar, wind, tide, rain and hydro (water). With each supply of energy, they do come with some advantages and disadvantages. In addition when there is a discussion about green energy, one of the main providers that come to mind is wave energy. This is because, unlike solar energy, wave energy is available at any time of the day or night.

Furthermore, there are numerous methods where electricity can be harvested from waves and these are evident on the different amounts of reports and journals that are published on it. The concept that is put under the spotlight here is the generation of electricity from ocean waves through rack and pinion mechanism.

The conceptual model will be made from locally available materials. The design would consist of rack and pinion system where the power output from each of the motion will be combined to give a total power output. The device will be tested at the nearshore location and numerical data will be recorded. The main objective of the device would be to provide cheap alternative to electricity access. The device would be designed in such a way that it would be made easy to handle and if parts are broken it should be easily interchangeable with new ones.

## II. LITERATURE SURVEY

Following is a list of researchers who has worked in area of Energy harvesting water wave:

**Vivekraj M. Solanki (2021)**, presented the ocean waves are huge, largely untapped energy recourse, and the potential for extracting energy from waves is considerable. Research in this area is driven by the need to meet renewable energy targets. But is relatively immature compared to other renewable energy technologies. This review introduces the general status of wave energy and evaluates the device type that represents current wave energy convertor technologies. Here, our research paper focusing to eliminates the existing limitations of wave energy converter methods, and also helps the potential of this method for generating electricity and this could be common way to producing electricity in future

**Francis Mwasilu and Jin-Woo Jung (2019)**, they studied the comprehensive review of the ocean wave technology and prospects of the wave energy penetration to cater to clean global energy demand. An ocean wave is a remarkable energy resource, but it presents a very small share in the global energy mix because of various challenges and limitations encountered to unleash its potential. This study evaluates intensively the complex barriers to the ocean energy technology deployment. The existing and prospective major wave energy projects are extensively examined to identify the learned lessons and optimize possible technological solutions to close the gap in the energy market. Furthermore, limiting and motivating factors to foster the global wave energy potential growth are deeply discussed to ignite new research directions and promising solutions. In particular, the wave energy converters as the underpinning enabling technology are fully investigated regarding their technical readiness, reliability, competitiveness and critical challenges. To complete the power equation, possible energy conversion stages, grid connection and integration issues are dealt with in a broad view of the wave energy power system. Eventually, this study aims at providing an updated ocean wave technology review and progress while introducing new research gap to fast-track contributions in the global energy mix.

**Tianyu Zhang and Xinyu You (2019)**, they presented the to protect the environment, save energy and reduce emissions, and promote the utilization of wave energy, this paper reviews the development history of application generation technology, summarizes its development from two aspects of optimization and application of wave energy conversion devices, analyses the application examples of wave energy generation devices on ships. This paper summarizes the application trend of wave power generation devices on ships: wave power generation should be used as auxiliary and domestic electricity for ships and wave energy should be combined with other new energy sources. Wave energy application in marine power generation can effectively reduce emissions from ships, which is conducive to the sustainable development of human society.

**Loránd SZABÓ, and et. al., (2008)**, they presented the huge quantities of clean energy can be obtained from the waves of the oceans and seas. As wave energy extraction technology is currently in a preliminary state of development any new results in this field should be of real interest. A direct driven wave power conversion system to be placed in the Black Sea near the Romania shores was proposed and analyzed. The paper focuses on its linear generator, respectively on its power electronic and control system.

**Bingyong Guo and John V. Ringwood (2021)**, they developed the wave energy prototypes have been proposed for more than 100 years, they have still not reached full commercialization. The reasons for this are varied, but include the diversity of device operating principles, the variety of onshore/near shore/offshore deployment possibilities, the diversity of the wave climate at various potential wave energy sites, and the consequent lack of convergence in technology and consensus. This distributed effort has, in turn, lead to a slow rate of progression up the learning curve, with a significant number of wave energy company liquidations and technical setbacks dampening investor confidence. Although a number of reviews on wave energy technology are already in the published literature, such a dynamic environment merits an up-to-date analysis and this review examines the wave energy landscape from a technological, research and commercial perspective.

After doing the above literature survey it is decided that project work is to develop the fabrication of Energy harvesting water wave.

### III. PROBLEM IDENTIFICATION

- Mostly the current technology is consisting submerged or floating type structures. So they affected to limitations (like corrosion, fouling) hence the special type of material required, Also design, operation quite complex; so they're not economic feasible.
- Affecting the marine ecosystems.
- Generally located to deep sea, so the power distribution not reliable. In some of the cases chances of international conflict.
- The limitations of working principle, the continuous power output not achieve. (Depending on Flood tide and ebb tide, Air pressure difference.)

#### IV. CONCLUSION

These review summaries the historical and ongoing research and commercialisation efforts devoted to wave energy technology. Significant spatial and temporal variability in the wave power resource has a fundamental role in diversifying the development of successful wave energy converter concepts, with a need for a collective approach to common fundamental issues, such as modelling and control design, survivability, and performance metrics. Clearly, investor risk must be reduced by providing more certainty in national and international support programmes, focussing on common technological challenges, to reduce uncertainty and to examine limitations in supply chains and marine licensing arrangements, and maximisation of the potential of collaboration. Historical analysis has shown that survivability and installability are key metrics, which not only affect the economics and success of individual wave energy projects, but also play a large role in sector confidence and investability. With increasing emphasis on the provision of carbon-free energy, and a need to diversify the mix of renewable energy sources, wave energy is well poised to supplement, and complement, existing and more mature renewable energy technologies. The next decade will be crucial in deciding if wave energy can make the breakthrough needed to become a mainstream renewable energy technology.

#### REFERENCES

- [1]. Vivekraj M. Solanki, "Design and Development of Ocean Wave Energy Power Generation System", International Journal of Engineering Research & Technology, Vol. 10, Issue 03, 2021, Pp.: 91-92
- [2]. Francis Mwasilu and Jin-Woo Jung, "Potential for power generation from ocean wave renewable energy source: a comprehensive review on state-of-the-art technology and future prospects", IET Renewable Power Generation, Vol. 13, Issue 3, 2019, Pp.: 363-375
- [3]. Tianyu Zhang and Xinyu You, "Application of wave power generation technology", Earth and Environmental Science, 242, 2019, Pp.:1-4
- [4]. Loránd SZABÓ, Claudiu OPREA, Clement FEȘTILĂ and Éva DULF, "Study on a Wave Energy Based Power System", Proceedings of the 2008 International Conference on Electrical Machines
- [5]. Bingyong Guo and John V. Ringwood, "A review of wave energy technology from a research and commercial perspective", IET Renewable Power Generation, 2021, Pp.: 3065-3090