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DESIGN OF WAVE ENERGY CHAMBER FOR WAVE ENERGY POWER PLANT AT RUMMASSALA, GALLE

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Ocean waves are one of the world's most abundant sources of renewable energy. Wave energy is a concentrated form of solar energy being generated on the surface of the oceans by wind systems resulting from the differential heating of the earth. Consequently the energy density in the waves is substantially higher than either wind or solar power. It is only in the past 20 years, with the advances in the offshore technology and research into wave power conversion by several teams worldwide, that viable schemes have been designed and a few prototypes were built. JAPAN, NORWAY, UNITED KINGDOM, CHINA and INDIA are leading countries among them. The Cabinet of SRI LANKA has recently approved a demonstrational research sea-wave pilot power plant at Rummassala, Galle. And the Ministry of Science and Technology is funding this project. This 150 kW plant has been proposed by University of Peradeniya in order to demonstrate the credibility of wave power technology on commercial applications.

The south coast of Sri Lanka is well placed to receive wave energy being the wind ward shore of Indian Ocean. As it has estimated south coastal line swell wave energy resource is more than 3000 MW and more than the generating capacity of hydro and fossil fuel plants in Sri Lanka. Experiments have been conducted to find ways and means of tapping this energy. To tap this energy, a plant, which works on what is known as the Oscillating Water Column (OWC) principle has been selected. In these, wave energy is transmitted under the submerged lip of a steel or concrete chamber to force a piston like motion of a water column inside. This in turn forces the air above to move in and out through an air turbine coupled to a generator to produce an electrical output. The turbine is designed in such a way that it rotates in the same direction in spite of bi-directional airflow.

The design of the wave trapping devise, which is a steel chamber, is carried out at structures laboratory, faculty of engineering. This paper reveals the investigation of parameters such as wave impact loads, moments, in built reversing pressure due to trapped air, weight due to super structure and the hydrostatic forces due to rise of water column. The chamber must withstand the immense forces imposed during storms, yet efficiently convert the slow cyclic motion of waves into a useful energy source of electricity.

And also design of the appropriate structure to tap the sea waves with the help of finite element analysis methods. The structure is analyzed using a finite element package known as STAAD III. And then designed by both manually and in built design methods in STAAD III itself. The structure is analyzed to all possible combinations of above given forces and designed to the worst combination that would adversely affect the structural integrity and stability.