# Renewable Energy Solutions: Enhancing Marine Life Growth by Optimizing Sunlight Penetration Using Fibre Optic Daylighting System

**By**

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**Abstract** The study of marine life depends heavily on man-made cultivations site such as coral reefs nursery and algaculture in tanks, where it involves extracting marine life from the sea, growing them in various controlled environment and then using it for research purposes. However, mos' the sites rely on artificial light for lighting purposes to assist the growt marine life. The purpose of this research is to investigate the potential of

a Fibre Optic Daylighting System (FODS) as a sustainable lighting solution by using natural light and improving its penetration to this cultivations site, instead of artificial lights. An optical fibre system prototype has been developed for this experiment, comprising of a Fresnel lens for light capture, a single plastic optical fibre (POF) as the transmitter, and a side-emitting fibres as the diffuser. A pilot scale test has been conducted from 9:00 AM to 4:00 PM in Kuantan, Pahang, Malaysia. The analysis considered hourly weather conditions to accurately represent the overall climatic conditions and determine the performance of the FODS for illumination. During fair weather, the transmitter fibre can transmit up to 53 lux in illuminance output. This study then analysed several parameters that impacted the FODS output for further optimization. Lastly, a post-improvement validation test was conducted to ensure the FODS suitability for underwater lighting. The optimized FODS resulted in a significantly improved illuminance output of up to 12350 lux which is equivalent to 229 & micro;mol/m(2)/s. The illuminance output achieved is highly satisfactory, demonstrating the readiness of the FODS for future studies, including its deployment in underwater lighting tests and the analysis of its impact on marine life growth. This study significantly supports the idea of transmitting natural sunlight to be used as a renewable energy source for lighting purposes in marine life cultivation site. Using FODS instead of artificial light will not only be economical and great for the environment, it can also positively impact the growth of marine life itself as natural sunlight will always be the best lighting solutions for living organisms.

**Keywords**

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