

***Performance Evaluation of a Natural Cooling System with Various Cooling Media in a Solar-Powered Fish Smoking System***

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***ABSTRACT***

*A natural cooling system is a device designed to reduce the temperature of a working fluid by utilizing a combination of natural material-based cooling media and ambient airflow. The operating principle relies on an evaporative cooling mechanism, in which the interaction between porous stones and air circulation enhances the heat dissipation process. The types of stones used include brick, pumice, zeolite, and scoria. The performance test results indicate that the implementation of the natural cooling system effectively reduces the temperature of the condenser cooling water in a solar-powered fish smoking system compared to operation without the natural cooling system. Among the eleven media variations tested, the optimal configuration was the combination of brick and scoria (A,A,D, D), which achieved a temperature reduction of up to 1,23 °C. The brick-only variation (A,A,A,A) ranked second with a temperature decrease of 1,11 °C, while the scoria-only variation (D,D,D,D) ranked third with a reduction of 1,06 °C. The effectiveness of the natural cooling system is influenced by the physical characteristics of the media, such as water absorption capacity, porosity, media thickness, and heat release capability, as well as environmental factors including wind speed, ambient temperature, and weather conditions during the testing period.*

***Keywords*** : *Natural Cooling System, Brick, Pumice, Zeolite, Scoria, Evaporative Cooling, System Effectiveness.*