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CREATIVE CORNERS

Hybrid Solar-Heat Pump Dryer for Marine Products

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The primary economic activity around Kuala Pahang in Pekan focuses on fisheries and processed marine-based products, mainly the dried salted fish and seafood. As such, the region hub can potentially become a processed marine product in Pahang due to its strategic location and continuous supply of fresh raw seafood materials. A market study conducted by Research and Markets for the Asia-Pacific shows the industry has vast potential to expand. The region's dried fish and seafood market registered a positive annual growth with the sales value amounting to USD 8,604.39 million in 2017 alone. Thus far, the dried marine products have been mainly produced using the conventional open drying method. The disadvantages of such a method are that of unhygienic conditions (exposure to dust, animals, and foreign objects) as well the excessive, unregulated solar radiation exposure (ultraviolet and longwave infrared), which leads to the destruction of almost the entire products' nutrients. As such, the technique significantly reduces the market value of the products.

To counter these drawbacks, especially for Kuala Pahang dried-product industry, a hybrid solar-heat pump dryer for marine produces is developed by Ts Dr. Amir Abdul Razak from the Energy Sustainability Focus Group (ESFG), of FTKMA for industries around Kuala Pahang. The specialised air-based thermal dryer can be utilized

to dry marine products. It can be operated under two working modes: solar mode and heat pump mode. The dryer system uses an indirect solar drying principle in an enclosed space, capable of drying products in a more hygienic environment, while retaining maximum nutrient contents, its natural colour; and higher product yield value as it can operate during any solar irradiance level including at night time. The dryer employs a cross-matrix absorber solar air collector for the solar mode and a 1 kW integrated heat pump for heat pump mode when operating under low solar irradiance conditions. It has a fully enclosed food-grade stainless steel drying chamber with a drying capacity of up to 50 kg of marine produce at one time. The drying of preprocessed dried fish using the system can achieve up to 20 % of total moisture in 2 days, under fully solar mode drying during intermittent weather conditions, while working in the heat pump mode, in nearly 15 to 20 hours to achieve a similar moisture level. With this hybrid solar-heat pump dryer system, the community around could potentially increase the quality and yield of their dried marine products which translates into the betterment of their bioeconomic status.

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Figure 3. Hybrid solar-heat pump dryer developed at UMP