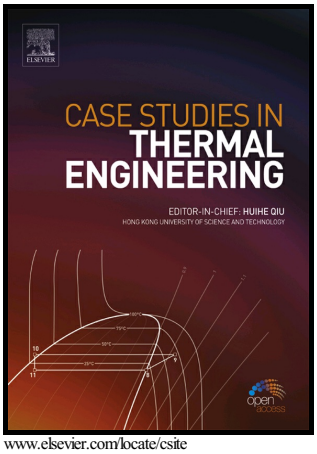

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Fabrication and Testing of Hybrid Solar-Biomass Dryer for Drying Fish

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Abstract

The fishery has been one of the leading sectors in Aceh Province. In 2016 the production of Aceh province catch fishery reaches 185 thousand tons. To increase the added value of the abundant fish products is by doing the post-harvest processing. This study includes the manufacture and testing of a solar energy drying unit equipped with biomass-fueled air heating. The dryer consists of a drying chamber of length 260 cm and width of 80 cm, with glass as a cover. A crossflow type heat exchanger for an air heater that utilizes biomass fuel also mounted to the dryer. There were 25 kg of fish used as raw material and dried utilizing specific devices using several methods. In the beginning, drying was conducted using solar energy, from 09:00 to 16:00, and continued with hot-air produced from biomass combustion from 16:00-06:00 and maintained at 40-50 °C. The test revealed that after reaching 22-23 hours of the drying process, the overall weight of the fish did not change much, and the final weight is 12.5 kg. The cost required for fabrication of a hybrid dryer is Rp. 25.250.000, - ($ 1,870) with a production capacity of 100 kilograms of fish.

Keywords: Solar energy dryer, biomass, fish, techno-economy

1. Introduction

The potential of Indonesian marine catches, especially fish is immense. In 2016 alone, the catch reached 185 thousand tons [1]. Considering the fish is easy to rot, and to provide added value to the fish results, it is necessary to improve current fish preservation method and technology. In general, most of the fishers implement traditional technology passed through generations in processing and preserving fish, namely, drying. Drying is a process of removing a portion of water content from a specific material through evaporation of the water content using heat to achieve the desired moisture content. The drying process is known as an energy-intensive process, and in industry, the drying process consumes 10-25% of total energy consumption in developed countries [2].

With appropriate post-processing steps, energy requirements for drying reduceable, and improved product quality is also achievable. Many researchers have participated in an attempt to reduce energy consumption by introducing a new type of dryer. As reported by Mujumdar [2], there are about 100 commercially marketed types of dryers among 500 dryers. A variety of dryer designs are available due to product-specific conditions, operating conditions (temperature, pressure) and various heat input modes. The description of the drying process by utilizing the solar-energy system, which includes the concept and theory of drying, the application on drying agricultural products and solar drying technology, has been described in detail by Ekechukwu et al., [3]–[5]. While the study of the