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FISH DRYER WITH DIRECT SUN RADIATION AND SOLAR CELL

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ABSTRACT

The environmentally friendly fish dryer is utilizing renewable energy with direct solar energy and solar cell to supply electrical energy to incandescent lamps as heaters during day, night and rain. The purpose and benefits of this dryer are to increase fisherman productivity to produce quality and hygienic dried fish products.

Key words: Fish Dryer, Fisherman, Sun, Solar

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1. INTRODUCTION

The utilization of Makassar's coastal and oceanic areas is very potential and diverse, both from fishing, cultivation and processing fisheries [1]. With such abundant potential, fishermen on the coast of Makassar's sea will be able to easily catch a lot of fish. The fish obtained are not all sold to the market but dried to produced dried fish. Their constraints or difficulties prime is marketing for small-scale and fish salting entrepreneurs is very influencing process fish drying.

They generally still use traditional methods of drying fish caught and still relying on nature, namely sunlight. For the dry season, where the sun is abundant and there are no clouds covering the sun, their drying efforts run well [2,3]. Fishermen can produce dried fish with various types and sizes, the results obtained are abundant whereas if in the rainy season, where the sun is shining is not too good and there is often cloudy [4,5], their income decreases dramatically. The dried fish will dry in accordance with a certain level of dryness that the market wants, after days of

drying and they only produce dried fish only about tens of kg, can not reach the size of tons, so the selling price of dried fish during the rainy season is very high.

From the results of a review of the research team to the Makassar coastline shows that the process of making dried fish is still very simple and traditional, namely marine fish are sorted by type and size collected in a container and then sprinkled or soaked in concentrated salt solution. Then the large fish are usually cut or split first so that the salt easily seeps into the meat, then it is dried in the hot sun [6,8,9]. After sufficient salting and weather permitting, fish are appointed and rinsed with water, then dried in the sun. In good weather, drying of small fish such as anchovies is enough for 2-3 days, depending on the weather, while medium-sized fish takes 4 days, and large-sized fish takes up to 5 days [10,11,2].

Medium-sized fish that are often preserved by drying such as kites and sardines, while dried fish are made from large-sized fish that have undergone cleavage and weeding at the time of manufacture. When viewed in terms of hygiene, this method is not good, because in addition to being exposed to free air which has a lot of bacteria or germs, fish are also infested by flies that carry many germs [13,14].

The processing usually uses bamboo woven shelves, used zinc rusting due to salt water, tarpaulin and when harvesting, the fish dried on the surface of the beach without a base. The problem is how the process of making dried fish can be managed by the community and businessmen with touch of technology that supports the community in processing dried fish so that very good quality and hygiene [15,16,17].

2. EXPERIMENTAL SETUP

The research site was conducted at the Laboratories of Electrical Engineering, Mechanical Engineering, Chemical Engineering, Paulus Christian University of Indonesia and Makassar Sea. The material used is welding wire, iron, aluminum and iron plate, glass, paint, rubber, cable, insulator. The tools used in the research activities are Solar Panels, Solar charge Regulators, Inverters, Battery Temperature control, Incandescent lamps, Voltmeters, Ammeters, Multi meters, Thermocouples, Regulators, Moisture meters, Anemometer, Leak detectors, and other Tools, Socket electrical wires, cable roll , cable connector and switch.

In the process of making fish dryers, the first step conducted is to design all dryer component . The fish dryer is designed so that it can accommodate fish for the drying process. This fish dryer is designed to be placed outside the room with the help of solar energy to a drying and energy supply source to be used as an energy source for electrical components such for temperature control, lights and other

The fish dryer is designed to have a shelf so increase the number of fish in the drying process from solar energy. The working principle of this fish dryer is to convert solar energy on solar cell modules into electrical energy. The energy is then stored in the battery using a charge controller. Then the DC electric current that is accommodated in the accumulator and converted using an inverter into AC current voltage is supplied to the incandescent lamp as a heater in the fish dryer rack



Figure 1 Solar Power Generation Unit Scheme

3. RESULTS AND DISCUSSIONS

Solar Panel with product specifications: Max. Power: 185 Watt Peach , Max. Power Voltage : 39.6 Volt, Max. Power current : 5.1 Ampere, Dimension: 1085 × 675 × 25 mm, the Solar Panel is functioning as energy supplier electrical used for fish drying equipment heater . So that Solar Panel is a device used to convert sunlight into electricity, because in sunlight, abound contained energy in the form of photons.

When this photon hits the surface of the solar cell, the electron electrons will be excited and generate electricity. This principle is known as the photoelectric principle. Solar cells can be excited because they are made of semiconductor materials that contain silicon. This silicone consists of two types of sensitive layers: a negative layer (type-n) and a positive layer (type-p).

Solar charge The regulator functions as a voltage regulator from the supply of the photovoltaic module to charging the battery and supplying the inverter. Inverter with specifications: Input voltage = 12Volt, Output voltage = 220Volt AC, Output frequency = 50 Hz, Input voltage range: 10-15 Volt, Low battery shutdown point: 9.7 - 10.3 Volt, High battery shutdown point: 14.5 - 15.5 Volt. The inverter is a function of modifying the input voltage of the solar regulator in the form of DC voltage which is then converted to AC voltage so that it can supply voltage to the control thermocouple, fan and incandescent lamp.

Batteries with product specifications: rated voltage = 12 Volts, rated capacity = 70 Ah, length = 330 mm, width = 171, high = 214 mm. Batteries are used to store energy from the photovoltaic module used as a backup supply for the night so that the equipment continues to operate

Temperature control is to function as a temperature regulator in a fish dryer rack. The controlled temperature range is determined according to the desired set point which is around 35 - 55 °C. If the temperature is less than 35° C then the lamp as a heat source will light up, otherwise if the temperature is more than 50° C then the lamp will be out of the controlled temperature range determined in accordance with the desired set point [14].

Incandescent lamp is an incandescent lamp as a heat source for a fish dryer for the night. Product specifications Type: 50 Watt incandescent lamp, supply: 220 - 240 Volt and weight: 70 grams, Incandescent bulbs in operation can produce heat so that it can be used as a heat source for fish dryers for the night.

Fish dryer which is environmentally friendly by using solar panels and solar energy directly on the coast so that it can increase dry fish production for fishermen. Air ventilation in the dryer

is used as a place to drain air or remove steam from the fish drying rack, and heaters are used to dry or reduce the water content of fish placed or stored on fish drying racks. While the temperature sensor that is placed on the rack serves to control the temperature in the drying rack so that the fish is in a rack in accordance with the desired temperature in the dryer [17]

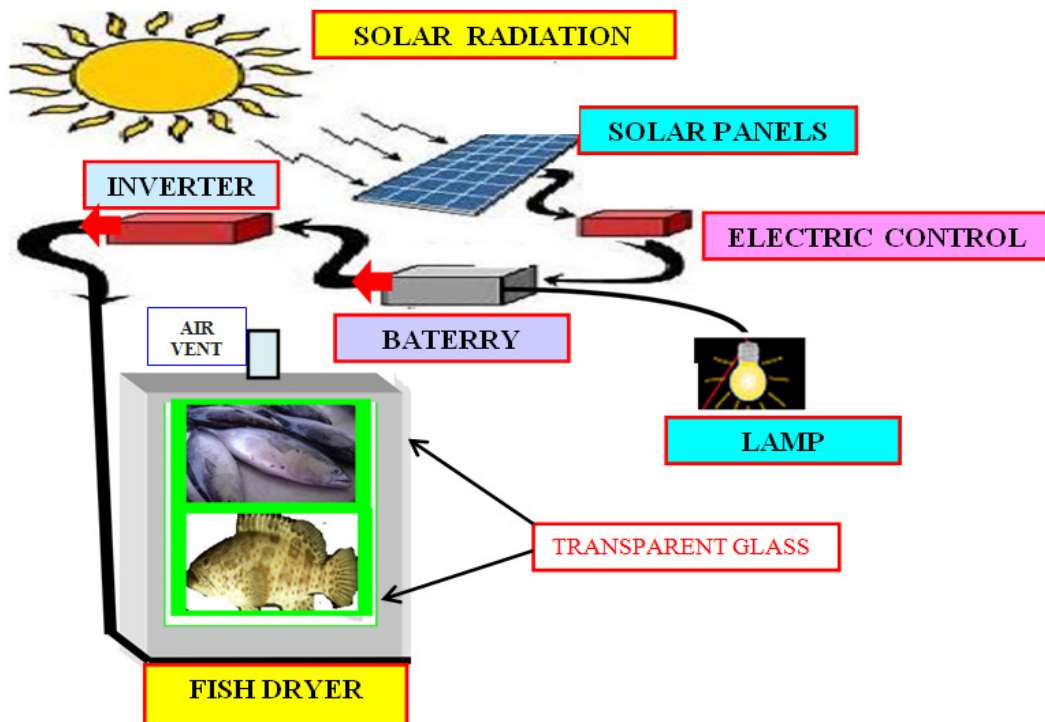


Figure 2 Installation of Fish Dryer Experiment

The results of the study showed the stability of the heat temperature in the fish dryer using the integration of solar panels and solar light directly. The test results showed that the drying process with fish was able to reach 55 ° C with temperatures outside the drying rack space reaching 35 ° C. From the results of observations where there is a difference in temperature between the outside and indoor temperatures, with this difference, the drying time of the fish is faster when compared to drying with direct sunlight. If the direct sun takes 1-2 days if the weather is sunny.

By using equipment in the drying chamber, the intensity of sunlight will increase due to the absence of wind, the heat generated will cause the release of water molecules bound in fish meat. This time is using dryer faster because drying with sunlight openly and traditionally is needed time 2 days of drying. This is because the temperature received by the constant material causes the rate of water removal from fish meat to continue continuously. This is caused by a closed room so that there is a concentration of heat and when the initial water content in the fish absorbs heat so that it releases water molecules in fish meat



Figure 3 Process of Drying Fish

Eco-friendly fish drying technology using Solar panels is a solution for coastal communities. Solar cell to produces heat energy with temperatures that can be adjusted for the drying process of fish. The temperature reaches 55 °C is to produce quality fish that is quality and can be stored for a long time [18]. To obtain good drying quality, there are several parameters that must be controlled during the drying process, namely air flow or steam in the dryer ventilation, drying air temperature and humidity. Another advantage of this tool is that it does not require extensive land and can be moved. The operation is simple and can be put in the open if the weather is good, sunlight can shine on the glass wall of the dryer and absorb heat to heat the shelf space where the fish is drying. But if the weather is cloudy or rainy, this tool can use solar cell panels as a power supply for the drying process of salted fish. This tool is very suitable in the development of technology and is useful for the development of science and technology in helping the government resolve poverty in remote areas.

4. CONCLUSION

Based on the results of the study showed that the fish dryer using a combination of direct solar heat radiation energy and solar cell energy is more effective and efficient because it only takes 10 hours of drying fish. While drying fish traditionally takes longer, which is about 2 to 5 days.

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