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INNOVATION OF AUTOMATIC SALTED FISH DRYER USING SOLAR CELL TECHNOLOGY BASED ON DIGITAL MONITORING SYSTEM

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Abstract

Traditionally drying salted fish in Indonesia in its use causes difficulties for users to dry fish when the weather is cloudy (rain) due to the absence of a heat source from the sun, by causing decay and damage to the fish will be discarded and cause losses automatically, especially for fish farmers (fisherman). From these problems, a system was designed that can dry salted fish automatically without the help of heat from the sun. This system can streamline the time needed to dry salted fish using LP Gas and solar cells and can be monitored with an Internet of Things (IoT)-based Digital Monitoring System. The output targets to be achieved are in the form of publication of sinta 3 indexed national journals, HKI, videos on how tools work, posters, and a manual for the use of the tool. TKT to be achieved is TKT 2 and the final TKT target is TKT 6.

Keywords: Salted Fish Dryers; Solar Cells; Digital Monitoring System; Internet of Things.

INTRODUCTION

Drying is a way of preserving fish by reducing the water content in fish tissue as much as possible to inhibit bacterial activity. Drying fish functions as heating fish in a controlled environment to remove most of the water contained in fish through evaporation. In Indonesia, many people still use traditional methods or natural use for drying salted fish, namely by using the sun's heat and wind. However, drying salted fish does not actually have to be done with the help of direct sunlight (drying). Fish can be dried without the help of sunlight, for example by drying in a box with the help of artificial heaters. [1], [2]

Judging from the condition of the Indonesian region which has a rainy weather climate, when the rainy season comes the drying process will be disrupted, as a result it will cause losses to fish farmers (fishermen) or households. To dry salted fish without having to depend on the sun’s heat, we need fish drying technology, which can be used for all types of freshwater fish and seawater fish. That way the fish will indirectly be more sterile because it will avoid dust or flies [3]

The innovation of an Automatic Salted Fish Dryer Using Solar Cell Technology Based on Digital Monitoring System in Cibuaya Village, Karawang Regency can help solve existing problems by using gas technology and utilizing solar cells as well as a website-based digital monitoring system that can monitor the process of heating salted fish using a platform open source so users don't have to install applications on cellphones and don't need to use cellphones

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with high specifications. The aim of this technological innovation is expected to be able to increase local products in processing salted fish without having to be constrained by the weather.

LITERATURE REVIEWS

1. Solar Panels

According to this design, solar panels are the source of the first electricity generation. To determine the required capacity of solar panels using the assumption of the effectiveness of the sun for solar panels for 8 hours shining per day. [4], [5]

2. Solar charge control

A solar charge controller is a component for solar power generation, has a function as a battery charger (when the battery is charged and keeps the battery charged) and to regulate the incoming electric current from the solar panels as well as the outgoing load current. The solar charge controller usually consists of 1 input (2 terminals) connected to the output of the solar panel, 1 output (2 terminals) connected to the battery or battery, and 1 output (2 terminals) connected to the load. DC electric current that comes from the battery is usually not possible to enter the solar panel because there is a protection diode that only passes the DC electric current from the solar panel to the battery. [6][4], [7].

3. Inverters

An inverter is an electronic device for producing alternating voltage with a direct input voltage, with a frequency of 50Hz, so that it can produce PWM with high voltage switching by comparing a sinusoidal signal with a triangular signal, [7]

4. Battery 12V/7Ah

Several things need attention from this battery equipment, including [7]

1. Capacity
2. Energy density
3. Acceptance of a small charging current.

5. Arduino Uno

Arduino is a flexible and open-source microcontroller-based electronic prototyping device, hardware and software easy to use. Arduino can be used to 'detect' the environment by receiving input from various sensors. Arduino is an opensource circuit and free to use [4], [8].

6. ESP8266 WiFi Module

ESP8266 is a wifi module that functions as an additional microcontroller such as Arduino so that it can connect directly to wifi and make TCP/IP (4.5) connections.

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7. Temperature Sensor (Ds18b20)

The Ds18b20 sensor is a digital temperature sensor which already has an ADC (Analog to Digital Converter) with a resolution of 12 bits. This sensor has a fairly good level of accuracy and stability compared to the LM35DZ temperature sensor that is commonly used. The Ds18b20 sensor has a fairly high accuracy rate of 0.5 in the temperature range -10 ˚C - 85 ˚C and overall can measure from -55 ˚C - 125˚C. The Ds18b20 temperature sensor has 3 pins consisting of +5 V, ground and input/output. The Ds18b20 sensor has two types of casing, which are common in the market, namely ordinary casing and waterproof casing [4], [9]

8. Weight Sensor (Loadcell)

The loadcell sensor is a sensor designed to detect the pressure or weight of a load, the loadcell sensor is generally used as the main component of a digital weighing system and can be applied to a weighing bridge that functions to weigh the weight of a truck transporting raw materials, measurements made by the loadcell use the principle of pressure [10]. The load cell is a weight sensor, if the load cell is given a load on its iron core, the resistance value in the strain gauge will change. Generally a load cell consists of 4 cables, of which two cables serve as excitation and the other two cables as output signals[4], [10]

9. Humidity Sensor

The soil moisture sensor is able to measure the water content in the soil, with 2 probes at the end of the sensor. In a set of YL-69 type moisture sensors there is a module in which there is an LM393 IC which functions for a low offset comparator process which is lower than 5mV, which is very stable and precise. The detection sensitivity can be adjusted by rotating the potentiometer built into the processing module [9]

10. Visual Studio Code

Visual Studio Code is a source code editor or text editor developed by Microsoft for Windows, Linux and MacOS that supports PHP language programs [11]

PROBLEM REALIZATION AND OBJECTIVES

- To obtain higher temperature limits through solar cells with different weather conditions.
- Find out variations in humidity and temperature in one day from morning to evening hourly time intervals.
- To obtain data on temperature, wind speed, humidity, and solar intensity are recorded for each hourly time interval.

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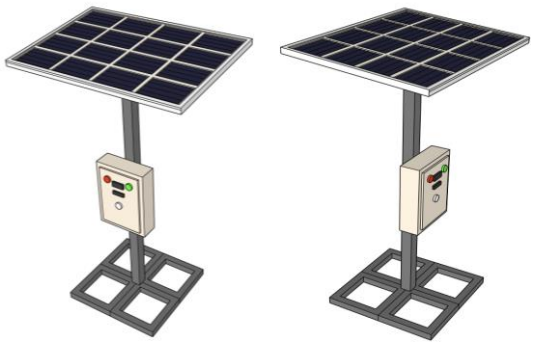
PROPOSED METHODOLOGY

- The experiments are conducted under the clear sky conditions in the month of August and September.
- Solar panel specifications are selected based on conventional functions for objective studies.
- A certain amount of salted fish is selected for drying research.
- Readings related to temperature variations, humidity variations in both systems are carried out for 24 hours.
- Readings of solar intensity, wind speed, temperature and humidity are recorded for each hourly time interval.
- Measurement of weight/mass of salted fish is measured every 24 hours.
- The effect on salted fish was also observed during compatibility studies.
- Calibrated solarimeter (Reading correction *3+10w/m2), hygrometer (+2%) & digital thermometer (+0.10c).

System Design Description

The design of the tool is kept simple but useful. The tool is made of iron that is strong enough to support the weight of the tool. The height of the tool measures 1.5 m.. The high alignment of the tool is set so that it is not too low so that the solar panel can later receive enough heat from the sun. The tilt of the solar panels is also arranged in such a way as to get heat from the sun.



Note: All dimension are in cm

The feet of the tool are made in the form of a square with each side measuring 40 cm. The feet of the tool are aligned with the height of the tool so that the tool does not fall when placed. For solar panels with dimensions of 980x680x20 mm. Solar panel placed at the very top of the tool. Then there is a rectangular box placed in the middle of the tool. This tool is designed simple but can contain the core components of the tool in it. The box measures 30x40cm.

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Fig. 1: Automatic Salted Fish Dryer

The original form of the tool is not much different from the design of the tool that has been made. The iron tool is coated with black paint. The purpose of painting the iron is to protect the iron surface from damage, prevent corrosion of the iron and make the tool more attractive to look at. The choice of black color on the iron so that the iron does not look dirty or in other words, black is a standard color. This type of solar panel uses monocrystalline silicon with a capacity of 120 wp.

RESULTS AND DISCUSSIONS

The experiment was placed in an open space with the aim of getting sunlight. Sunlight is absorbed by solar panels, which will then be read or retrieve data. Data readings of temperature, wind speed, humidity, and solar intensity were recorded at intervals of one-hour duration for all readings. Data retrieval with time intervals every one hour aims to find out the results obtained from solar panels every one hour. Results or readings are tabulated according to observations from morning to evening.

Table 1: Result of observations from morning to evening

Date	Time (hour)	Solar Intensity (W/m2)	Temperature (oC)			Humidi	
			Ta	Tg	Ts	Hg	Hs
10/10/2022	7:00	4.725	28.8	28.1	27.8	40	39
10/10/2022	8:00	1.323	31.4	33	31.2	36	37
10/10/2022	9:00	28.035	33	41.7	35.2	30	34
10/10/2022	10:00	4.788	35	49.5	41.9	25	29
10/10/2022	11:00	693	37	53.4	48.8	22	29
10/10/2022	12:00	79.695	38	55.9	53.6	25	21
10/10/2022	13:00	8.253	39.1	54.7	55	43	42
10/10/2022	14:00	7.938	38.5	57.1	56.3	49	42
10/10/2022	15:00	7.371	40	53.1	50.7	49	42
10/10/2022	16:00	46.305	39.1	51.4	45.3	49	42
10/10/2022	17:00	126	38.5	37.6	42.7	49	42
10/10/2022	18:00	4.725	36	35.8	39.1	49	42
10/10/2022	19:00	2.835	32	33.4	35.2	37	40

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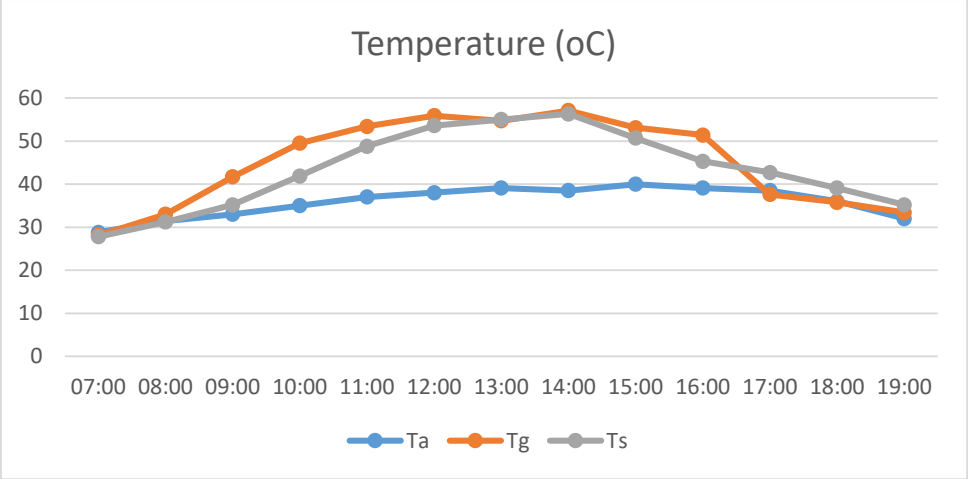
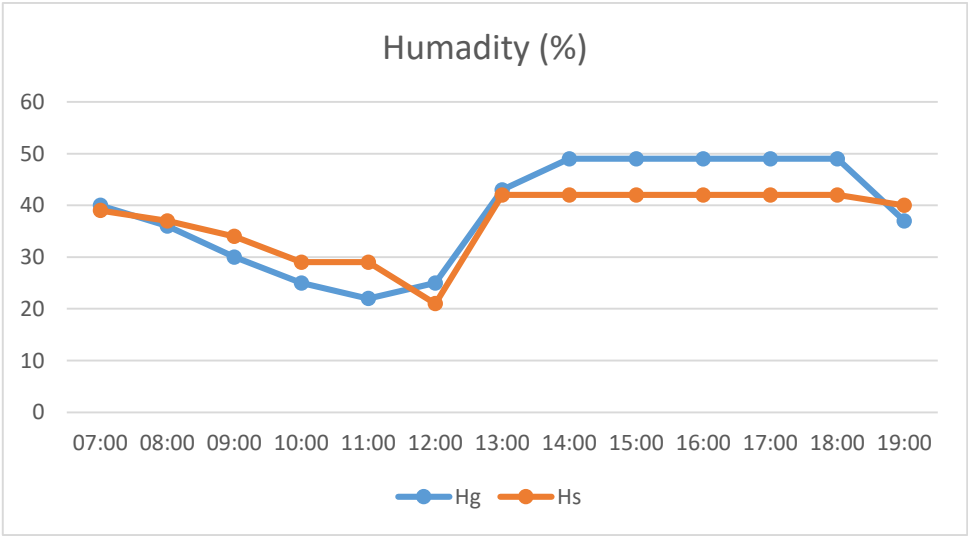
The purpose of the temperature and humidity readings that have been made is to determine variations in humidity and temperature in one day from morning to evening with one hour intervals. This temperature and humidity value will be a factor that will affect the performance of the tool. The performance of the tool will be a major factor in the process of drying salted fish. Temperature and humidity greatly affect the level of drying. Data collection took place from 07.00 to 19.00.



The table above shows the results of observations of three temperatures, namely ambient air temp (ta), greenhouse temp (tg), and solar dryer temp (ts). The overall average greenhouse temp (tg) is higher than the ambient air temp (ta) and solar dryer temp (ts). However, from 17.00 to 19.00 the solar dryer temp increased more than the greenhouse temp (tg) and ambient air temp (ta). When viewed as a whole, the temperature rise occurs from 11.00 to 16.00. The increase and decrease in temperature does not have a fixed value (constant) or in other words, the increase in value or decrease in temperature changes every hour.



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During the day the humidity value decreases while at night the humidity value increases. This proves that the higher the intensity of the sun, the lower the humidity value. At night the humidity value of Hg is higher than Hs. However, from morning to noon the Hs humidity value is higher than the Hg humidity value. The effect of wind speed is the main contributing parameter in influencing variations in humidity and temperature.

At 12.00, the solar intensity obtained was very high compared to that at other hours. In tropical areas like Indonesia, the hottest time is 12.00. At 12.00 is the time when the earth gets the highest solar radiation. In the conventional method, 12.00 is much awaited in drying. Then, if we look at the data again, the next highest solar intensity is at 16.00.

The data obtained is influenced by surrounding environmental factors such as cloudy weather. This cloudy weather will affect the value of temperature, humidity and even solar intensity. This can be seen during the day when the solar intensity value is smaller than in the morning or evening. Logically, solar intensity should be greater during the day than in the morning, but the cloud factor greatly affects the value of this data. So, as is well known, daytime does not guarantee a high average solar intensity value.

CONCLUSIONS

The conclusion that can be drawn is

1. Weather is the main factor affecting temperature, humidity, and solar intensity.
2. The results from the experiments with the three cases show the behavioral tendencies to which designed setups are compared.
3. Overall, the greenhouse temp (tg) has a high average temperature value compared to the others.
4. During the day, the temperature is higher than the humidity.
5. It is observed that solar dehydrators and greenhouse dehydrators are the best economical, quality and reliable ways of harnessing solar energy, which reduces the energy costs required for drying compared to conventional methods.

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