

Smart Decomposition System

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ABSTRACT

The Smart decomposition system is an innovative idea which is used for the acceleration of the decomposition process in which the household kitchen wastes are to be decomposed. In this we used moisture sensor and Temperature sensor for the monitoring the waste moisture and temperature. The sensor is the primary component which monitors the temperature and moisture content and alerts us to maintain them in an optimum state. The sensor is programmed and connected by using Arduino IDE software. The Arduino IDE is used to monitor the solid waste temperature and moisture and indicates the signals to the display. If the temperature and moisture content differ the remedial measures should be taken automatically for their optimization. By this process we can optimize the temperature and moisture content for decomposition at the decompose chamber for household kitchen waste.

Key words: Arduino IDE, Household waste, kitchen waste management, etc...

I. INTRODUCTION

Domestic waste generated from the kitchen is mainly organic waste and can easily be composted. Proper segregation of garbage should be done to prevent these wastes from being dumped in municipal waste and landfills, which will reduce the complexity of the decomposition process. The extracted organic waste can be converted into nutrient-rich compost and used for home gardening, terrace farming, etc. For this we need to start composting and try to

solve the solid waste problem at the root level. Our project aims to promote awareness and provide the required knowledge about how to solve the solid waste problem at the source level by providing a smart and low-cost model to compost kitchen waste at home. The smart decomposition system will optimize the process of decomposition by sensing the moisture content and temperature. The optimization of the moisture content can be done by the inoculation of water to the decomposer through water sprayer and the optimization of temperature can be done by turning on the heater fixed in the decomposer. Composting, Recycling, energy conversion from wastes, and land filling are some of the basic moves toward waste management [1, 2]. Kitchen wastes comprises of household kitchen wastes such as vegetables peels, fruit peels, smashed fibre of fruits, spare uneaten food items, food grains. It is full of nutrients and organic materials, and simply biodegradable [3].

II. EQUIPMENTS

ESP8266: The ESP8266 is a versatile and widely used microcontroller chip renowned for its affordability, compactness, and built-in Wi-Fi capabilities. Initially released by Espressif Systems in 2014, it quickly gained popularity among hobbyists, makers, and IoT enthusiasts due to its ease of use and robust functionality. Sporting a 32-bit Tensilica microcontroller, it operates at clock speeds up

to 80 MHz and offers ample GPIO pins for interfacing with various sensors, actuators, and peripherals. One of the standout features of the ESP8266 is its integrated Wi-Fi module, which enables seamless connectivity to local networks and the internet, making it ideal for IoT applications. Programmers can harness its power using the Arduino IDE or other development platforms, leveraging a vast ecosystem of libraries and community support. Moreover, its low power consumption and support for sleep modes make it suitable for battery-powered applications, extending its utility to remote monitoring, smart home devices, and sensor networks. Over the years, Espressif Systems has released several variants of the ESP8266, each offering improvements in performance, power efficiency, and connectivity options. Overall, the ESP8266 has democratized IoT development, empowering individuals and businesses to create innovative connected devices without breaking the bank. Its combination of affordability, versatility, and robust Wi-Fi capabilities has solidified its position as a cornerstone in the world of embedded systems and IoT.

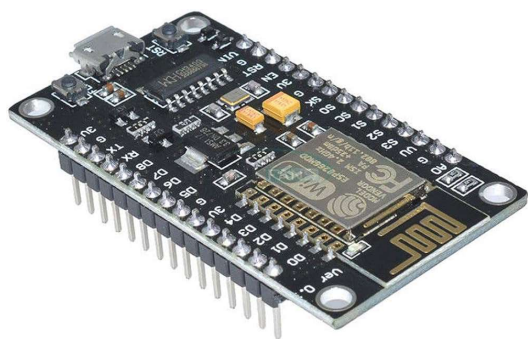


Fig. 1. ESP 8266

MOISTURE SENSOR: A moisture sensor is an electronic device designed to measure the moisture content in soil, allowing for precise monitoring and management of irrigation systems, agriculture, gardening, and other applications where soil moisture levels are critical. These sensors typically consist of two main components: the sensing probe and the circuitry for signal processing. The

sensing probe usually comprises conductive electrodes that are inserted into the soil. As the soil moisture level changes, the electrical conductivity between these electrodes also changes. This change in conductivity is then converted into an electrical signal by the sensor's circuitry. Moisture sensors can utilize various technologies to measure soil moisture, including resistive, capacitive, and impedance-based methods. Resistive moisture sensors measure the resistance between the electrodes, while capacitive sensors rely on changes in capacitance. Impedance-based sensors measure the impedance of the soil between the electrodes. These sensors provide real-time data on soil moisture levels, enabling users to optimize water usage, prevent overwatering or underwatering, and promote healthier plant growth. They are often integrated into automated irrigation systems or connected to microcontrollers for remote monitoring and control. In addition to agricultural and gardening applications, moisture sensors find use in environmental monitoring, research, and soil science studies. Their ability to provide accurate and timely data on soil moisture levels contributes to more sustainable and efficient water management practices.



Fig. 2. MOISTURE SENSOR

TEMPERATURE SENSOR: A temperature sensor is a device that detects and measures temperature variations in its environment, converting thermal energy into an electrical signal. These sensors play a crucial role in numerous applications across industries, from climate control systems and weather monitoring to automotive, aerospace, and consumer electronics. Temperature sensors employ diverse

technologies to accurately measure temperature changes. One common type is the thermocouple, which generates a voltage proportional to the temperature difference between its two junctions. Another widely used type is the resistance temperature detector (RTD), which utilizes the change in electrical resistance of a metal wire or film with temperature. Additionally, semiconductor-based temperature sensors, like thermistors and integrated circuit (IC) temperature sensors, are popular for their small size, accuracy, and low cost. The data provided by temperature sensors is essential for maintaining optimal operating conditions, ensuring product quality, and preventing equipment damage. In industrial processes, temperature sensors monitor and control the temperature of machinery, chemical reactions, and materials. In healthcare, they are integral to patient monitoring systems, refrigeration units for storing vaccines and medicines, and medical diagnostic equipment. Moreover, temperature sensors enable smart home devices to regulate heating and cooling systems, optimize energy efficiency, and enhance comfort levels. They are also vital components in environmental monitoring networks, allowing scientists to track climate patterns, study global warming, and predict weather conditions. Overall, temperature sensors are indispensable tools for measuring and controlling temperature across a wide range of applications, contributing to safety, efficiency, and innovation in various fields.

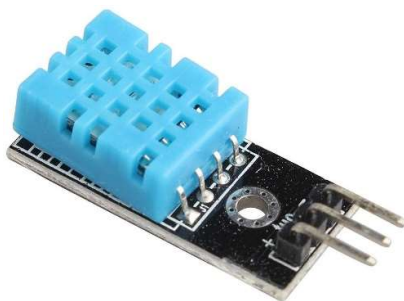


Fig. 3. TEMPERATURE SENSOR

WATER BLOWER: A water blower, also known as a water pump or water jet, is a mechanical device designed to propel or distribute water in various applications. It operates by drawing water from a source, such as a reservoir or tank,

and expelling it under pressure through a nozzle or outlet. Water blowers find widespread use in irrigation systems, firefighting equipment, water features, cleaning operations, and industrial processes. In irrigation systems, water blowers are essential for delivering water to crops, gardens, and landscapes efficiently and uniformly. They can be used in conjunction with sprinklers, drip systems, or spray heads to ensure proper hydration for plants while conserving water resources. In firefighting, water blowers play a critical role in extinguishing fires by delivering high-pressure streams of water to the affected areas. Fire trucks are equipped with powerful water blowers capable of projecting water over long distances to combat flames effectively. Water blowers are also employed in recreational water features such as fountains, waterfalls, and decorative ponds to create visually appealing displays. By propelling water through nozzles or jets, these devices can generate various water patterns and effects, enhancing the aesthetics of outdoor spaces. Additionally, water blowers are utilized in industrial settings for processes such as cooling, cleaning, and material handling. They are instrumental in removing debris, cooling machinery, and transporting liquids in manufacturing facilities, power plants, and wastewater treatment plants. Overall, water blowers are versatile tools with diverse applications across industries, contributing to irrigation efficiency, fire suppression, aesthetic enhancement, and industrial processes. Their ability to move water under pressure makes them indispensable in numerous sectors, promoting productivity, safety, and sustainability.



Fig.4. WATER BLOWER

AIR HEATER COIL: An air heater coil is a crucial component in heating systems designed to warm the air circulated within buildings, industrial processes, and various applications. It operates by passing an electric current through a resistive wire coil, which generates heat through electrical resistance. This heat is then transferred to the surrounding air, raising its temperature and providing warmth to the desired space. The design of an air heater coil typically consists of a high-resistance wire wound into a coil shape, enclosed within a protective sheath made of materials such as stainless steel or ceramic. The coil's resistance to the electrical current causes it to heat up rapidly, with the heat being transferred efficiently to the surrounding air. The coil's length, diameter, and material composition are carefully selected to achieve the desired heating capacity and efficiency. Air heater coils are employed in a wide range of heating applications, including HVAC (heating, ventilation, and air conditioning) systems, industrial ovens, dryers, heat exchangers, and space heaters. They offer rapid and responsive heating capabilities, making them suitable for both residential and commercial heating needs. Overall, air heater coils are essential components in heating systems, providing efficient and reliable heat transfer to warm air for comfort, process heating, and various industrial applications.



Fig. 5. AIR HEATER COIL

III. METHODOLOGY



IV. CONCLUSION

The smart decomposer system presents an innovative solution to managing organic waste, addressing critical environmental concerns while promoting sustainability. Through its integration of advanced technologies such as IoT sensors, machine learning algorithms, and automated processes, the system offers efficient decomposition of organic matter, reducing landfill waste and greenhouse gas emissions. The smart decomposer system not only offers environmental benefits but also economic advantages by generating valuable compost for agricultural use. Its scalability and adaptability make it suitable for various settings, from households to large-scale industrial operations. Embracing this technology heralds a significant step towards a more sustainable future, where waste is efficiently managed, resources are conserved, and environmental impacts are minimized.

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