CABINET FOOD DRYER FOR MULTI FOOD SPICIES

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ABSTRACT

Drying in the sun is very economical. In an conventional drying we only have to spread the produce on a suitable surface and let it dry in the sun. Somebody has to stay at home throughout the drying period to chase off domestic animals, to remove the produce when the weather becomes too windy and dusty, or when it rains. The dried product is often of poor quality as a result of grit and dirt. The product is often unhygienic as a result of microorganisms and insects such as flies. A basic cabinet-type low-cost solar dryer can be constructed at home or by village artisans. It is made of wire-mesh cabinets in a wooden framework surrounded by a clear plastic sheet. The solar cabinet dryer type has a capable of drying 20 to 35 kg of fresh produce (depending on commodity) over a period of 3 to 4 days. Smaller portable models of the dryer can be constructed, depending on available funds for the dryer, construction and the purpose of drying (home consumption or marketing).This project research reports based on the automation in cabinet dryer for the safety of operator. This was operated by the using electricity as well as conversion of solar energy into electricity. The safety elements as well as the working elements operated on it. The dryer is protected by the used of RFID reader which can start the dryer and operate different range and controlled by the operator.

Keywords: - *Cabinet, Framework, Automation, RFID Reader.*

1. INTRODUCTION

The term drying refers generally to the removal of moisture from a substance. It is one of the oldest, most commonly used and most energy consuming unit operation in the process industries. Drying is often necessary in various industrial operations particularly in chemical process industries to remove moisture from a wet solid, a solution or a gas to make it dry and choice of drying medium is depends on the chemical nature of the materials. Three basic methods of drying are used today 1) sun drying, a traditional method in which materials dry naturally in the sun, 2) hot air drying in which materials are exposed to a blast of hot air and 3) freeze drying, in which frozen materials are placed in a vacuum chamber to draw out the water. The fundamental nature of all drying process is the removal of volatile substances (mainly moisture) from mixture to yield a solid product. In general drying is accomplished by thermal techniques and thus involves the application of heat, most commonly by convection from current of air. Throughout the convective drying of solid materials, two processes occur simultaneously namely, transfer of energy from the local environment in the dryer and transfer of moisture from within the solid. Therefore this unit operation may be considered as simultaneous heat and mass transfer operation. Today, dryers are in operation in most manufacturing industries including chemical, pharmaceutical, process and food. Products that are dried range from organic pigments to proteins, as well as minerals to dairy products. Because of the spectrum of duties required, there is a great variety of dryers available. The correct choice depends on the properties of the feed material and the desired characteristics of the final product. This handbook reviews many types of dryers and

provides guidelines for their selection. Certain types of commonly used dryers are reviewed in detail. Since drying is energy intensive operation, this handbook also provides information on techniques to improve efficiency.

1.1   Working Principle

Solar energy dryers can broadly be classified into direct, indirect and hybrid solar dryers. The working principle of these dryers mainly depends upon the method of solar energy collection and its conversion to useful thermal energy for drying. Cabinet dryers usually operate in batch mode, use racks to hold product and circulate air over the material. It consists of a rectangular chamber of sheet metal containing trucks that support racks. Each rack carries a number of cabinets that are loaded with the material to be dried. Hot air flows through the tunnel over the racks. Sometimes fans are used to on the tunnel wall to blow hot air across the cabinets. *Even b*affles are used to distribute the air uniformly over the stack of cabinets. Some moist air is continuously vented through exhaust duct; makeup fresh air enters through the inlet. The racks with the dried product are taken to a cabinet-dumping station. These types of dryers are useful when the production rate is small. They are used to dry wide range of materials, but have high labor requirement for loading and unloading the materials, and are expensive to operate. They find most frequent application for drying valuable products. Drying operation in case of such dryers is slow and requires several hours to complete drying of one batch. With indirect heating often the dryers may be operated under vacuum. The cabinets may rest on hollow plates supplied with steam or hot water or may themselves contain spaces for a heating fluid. Vapour from the solid may be removed by an ejector or vacuum pump. *Freeze-drying* involves the sublimation of water from ice under high vacuum at temperatures well below 0oC. This is done in special vacuum dryers for drying heat-sensitive products.
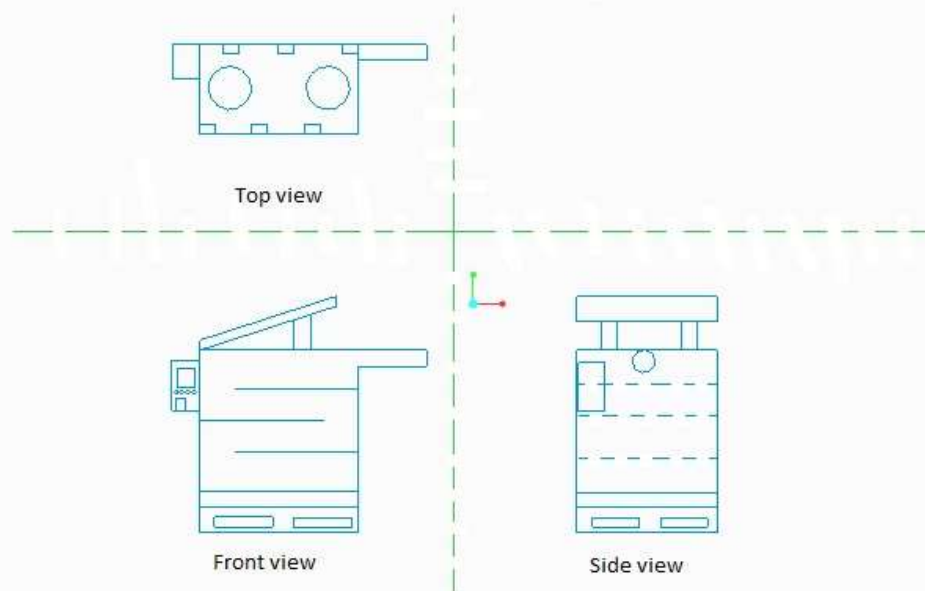

Fig 1. Software Diagram

1.2   Working

1. The system is set ON by switching the electric power supply. Then the system is set active by the RFID ON tag.

2. By switching ON the RFID tag, the electrical components heating coil and fans acting as blowers are set active.
3. There is a temperature rise in the device due to the heating coil which leads to the heating of the chambers installed in the device.
4. The food product meant for the drying purpose also gets heated as they are placed in the chambers. The food products are kept in the chamber respective of their drying time.
5. The various readings can be achieved by using the various sensors which display the reading on the led panel. As soon as the drying period is over the system is set OFF by using RFID OFF tag.

2. ELECTRONIC COMPONENTS USED

2.1 Micro Controller PCB

Programming languages in the expectation that very little assembly language programming will be done when employing these controllers in sophisticated applications. 32 bit controllers are also used in high speed control and signal processing applications.

The ATMEGA328 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel ATMEGA328 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications

Fig 2 . Microcontroller PCB

2.2 LCD Display

The HD44780U dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver. A single HD44780U can display up to one 8-character line or two 8-characterlines. The HD44780U has pin function compatibility with the HD44780S which allows the user to easily replace an LCD-II with an HD44780U. The HD44780U character generator ROM is extended to generate 208 5x8 dot character fonts and 32 5x10 dot character fonts for a total of 240 different character fonts. The low power supply of theHD44780U is suitable for any portable battery-driven product requiring low power dissipation.

2.3 RFID Reader

RFID tags, or simply "tags", are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. They are heavily used to track items in production environments and to label items in supermarkets. They are usually thought of as an advanced barcode. However, their possible area of use is much larger. This paper presents a few new applications that are possible using RFID technology such as locating lost items, tracking moving objects, and others. RFID tags are expected to proliferate into the billions over the next few years and yet, they are simply treated the same way as barcodes without considering the impact that this advanced technology has on privacy. This paper presents possible exploits of RFID systems and some proposed solutions as well.

3. Advantages
- Simpler and cheaper to construct than the indirect-type for the same loading capacity.
- Offer protection from rains, dews, debris etc.
- Safety system by application of RFID.
- Required less space and operation is easy to used.

4. Disadvantages

- Liability to over-heat locally, causing crop damage.
- Poor vapor removal rates leading to relatively slow overall drying rates
- Small capacity limits it to small scale applications.

5. CONCLUSION

A dryer was designed and constructed based on preliminary investigations for multi food species drying under controlled conditions (Cabinet dryer). The constructed dryer to be used to dry multi food species under controlled and protected conditions. The designed dryer with a collector area of 1.5×2 is expected to dry 20-30 kg fresh species (for e.g.10kg of sliced mango) from 81.4% to 10% wet basis in two days under ambient conditions during harvesting period from April to June. A prototype of the dryer which is protected by the RFID reader and als o it gives the security of operation with the help of automation done in project with the less cost as compared to the dryers available in market.

6. REFERENCES

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