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**DEPARTMENT OF MECHANICAL
ENGINEERING**

PRESENTS

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Institute Vision

To be internationally accredited, Multidisciplinary, and Multi-collaborative institute working on technology enabled platform fostering innovations and patents through state-of-art academic system designed by highly qualified faculty for the development of common masses at large

Institute Mission

To educate and train common masses through undergraduate, post graduate, research programs by inculcating the values for discipline, quality, transparency and foster career and professional development for employment thereby contributing to the development of society

Department Vision

To be the centre for excellence and centre of learning for innovation, incubation and research in the domain of product design, thermal engineering and manufacturing technology thereby path finder for professionalism, entrepreneurship and new knowledge contributing to the common masses.

Department Mission

To educate and train undergraduate and post graduate students in Mechanical Engineering by inculcating the values for discipline, quality and transparency and profession development in the job and self-employment emphasis industry-based practices.

Program Education Objectives (PEO's)

PEO1: To prepare technocrats that can satisfy the need of mechanical and allied industries.

PEO2: To develop critical thinking, problem solving skills, research aptitude and career and professionalism among the students.

PEO3: To improve and expand technical and professional skills of students through effective teaching-learning and industry interaction.

Program Specific Outcomes (PSOs)

PSO1: Ability to design, analysis and problem-solving skills using basic principle of mechanical engineering.

PSO2: Ability to impart technical and professional skills through industry institute interaction

PSO3: Develop practical skills for the benefits of society.

Objectives of Magazine

1. Primary objective of the magazine is to provide a wide platform to the aspiring engineers to showcase their technical knowledge and to explore innovative ideas.
2. This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them.

Hybrid Solar Wind Turbine

With increasing concern of global warming and the depletion of fossil fuel reserves, many are looking at sustainable energy solutions to preserve the earth for the future generations. Other than hydro power, wind and photovoltaic energy holds the most potential to meet our energy demands. Alone, wind energy is capable of supplying large amounts of power but its presence is highly unpredictable as it can be here one moment and gone in another. Similarly, solar energy is present throughout the day but the solar irradiation levels vary due to sun intensity and unpredictable shadows cast by clouds, birds, trees, etc. The common inherent drawback of wind and photovoltaic systems are their intermittent natures that make them unreliable. However, by combining these two intermittent sources and by incorporating , the systems power transfer efficiency and reliability can be improved significantly. When a source is unavailable or insufficient in meeting the load demands, the other energy source can compensate for the difference.

Several hybrid wind/PV power systems have been proposed and discussed in works Most of the systems in literature uses a separate DC/DC boost converter

connected in parallel in the rectifier stage to perform the MPPT control for each of the renewable energy power sources. A simpler multi-input structure has been suggested that combine the sources from the DC-end for each renewable source. The structure proposed by is a fusion of the buck and buck-boost converter. The systems in literature require passive input filters to remove the high frequency current harmonics injected into wind turbine generators. The harmonic content in the generator current decreases its lifespan and increases the power loss due to heating. In this paper, an alternative multi-input rectifier structure is proposed for hybrid wind/solar energy systems. Solar-Wind Hybrid Energy Systems are using solar panels and wind turbine generators to generate electricity power.

Renewable Energy experts will explain that a small hybrid system that combines wind power, solar power technologies offers several advantages to home applications. In future electrical power is most important in our daily life, without electricity, we can't imagine the present world. The idea of the combined power generation is to get continuous power during day and night for small power

applications with storage battery. This will achieve by “Hybrid Solar Wind Turbine”.

Hybrid Solar Wind Turbine consists of two generating units, solar and wind up to their maximum power operation. Depending on the load requirement these units gets into operation mode. Remaining period this system to feed the battery gets charged. Through this battery, the house loads are connected with the help of inverter in case of Ac loads.

Solar energy and wind energy undoubtedly come to people’s mind when we talk about renewable energy. In an hour, the sun emits enough energy, which can cover human needs for a year. This property makes solar energy the best form of energy to be integrated with other energy forms. However, with the current technology, we are unable to extract the full potential of the integrated systems. Some amount of energy gets wasted due to inefficient operation.

Wind-solar hybrid projects offer several operational synergies, leading to long-term savings in capital investments, operation and transmission of power from hybrid plants. Certain infrastructure could be common for both projects and result in reduced capital costs. The complementary generation patterns lead to more balanced generation curves, with less variability,

and ensure a stable and robust injection in grid, with reduced grid integration costs. Further, projects will be able to adhere to stringent scheduling and forecasting guidelines, and experience reduction in penalties and duties paid for non-adherence to statutory compliances.

HYBRID SYSTEM

Every device we use in our day-to-day life such as mobile phone, computer, induction cookers, washing machines, vacuum cleaners, etc., requires electric power supply. Thus, the advancement in technology is increasing the electrical and electronic appliances usage – which, in turn – is increasing the power demand. Thus, to meet the load demand, different techniques are used for electric power generation. In the recent times, to avoid pollution and to conserve non-renewable energy resources like coal, petroleum, etc., renewable energy sources like solar, wind, etc., are being preferred for power generation. The combination of renewable energy sources can also be used for generating power called as hybrid power system. As a special case, we will discuss about the working of solar-wind hybrid system in this article.

Solar Energy

Solar energy is one of the major renewable energy resources that can be used for different applications, such as solar power generation, solar water heaters, solar calculators, solar chargers, solar lamps, and so on. There are various advantages of solar energy usage in electric power generation including low pollution, cost-effective power generation (neglecting installation cost), maintenance free power system, etc. Solar power system consists of three major blocks namely solar panels, solar photovoltaic cells, and batteries for storing energy. The electrical energy (DC power) generated using solar panels can be stored in batteries or can be used for supplying DC loads or can be used for inverter to feed AC loads. The solar panel output is electric power and is measured in terms of Watts or Kilo watts. These solar panels are designed with different output ratings like 5 watts, 10 watts, 20 watts, 100 watts etc. So, based on the requirement of output power, we can choose appropriate solar panel. But, in fact, the solar panels output is affected by number of factors like climate, panel orientation to the sun, sun light intensity, the presence of sunlight duration, and so on. During normal sunlight a 12 volt 15 watts solar panel produces around 1 Ampere current. Generally, solar panels maintained properly will work for 25 years. It is

essential for designing the solar panel arrangement on the roof top for efficient usage and typically solar panels are arranged such that they face the East at an angle of 45 degree.

Wind Turbine

Wind energy is also one of the renewable energy resources that can be used for generating electrical energy with wind turbines coupled with generators. There are various advantages of wind energy, such as wind turbines power generation, for mechanical power with windmills, for pumping water using wind pumps, and so on. Large wind turbines are made to rotate with the blowing wind and accordingly electricity can be generated. The minimum wind speed required for connecting the generator to the power grid is called as cut in speed and maximum wind speed required for the generator for disconnecting the generator from the power grid is called as cut off speed. Generally, wind turbines work in the range of speed between cut in and cut off speeds.

Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity. The terms "wind energy" and "wind power" both describe the process by

which the wind is used to generate mechanical power or electricity. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity. A wind turbine turns wind energy into electricity using the aerodynamic force from the rotor blades, which work like an airplane wing or helicopter rotor blade. When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity.

Hybrid System of Solar and Wind Turbine

Hybrid systems, mostly known as solar wind hybrid systems, are more advantageous than single-powered systems, such as wind and solar lights. In this system, solar and wind energies are combined to produce green electricity. Gujarat, Goa, Orissa, and many others, located near the seaside, wind speed is

quite high, reaching up to 29 kmph during monsoons. These massive wind speeds are sufficient to fuel windmills and turbines to generate electricity. Sunlight is at its peak during summers. A single solar or wind system installed in your home will produce ample electricity in summer. The efficiency, sadly, will drop in the winter season. During winters, a single energy system cannot operate at its maximum efficiency. Hence, the better choice is to install a hybrid solar wind system. The cost might be more than installing a single system, but it will be a one-time investment and better in the long run. Solar wind hybrid systems are needed to generate electricity during the summer and winter seasons. The variation in the intensity of sunlight and wind speed throughout the year does not organically affect the working of hybrid solar wind systems. It can produce power at any time of the year.

In a large area, both solar panels and windmills are installed. They are connected to a gigantic battery bank that is further joined to a regulation and conversion unit. The energy produced through windmills and solar panels is stored in the battery, which is later on transferred to the load in the powerhouse for distribution. If the energy is needed urgently, it can be transferred to the

generator to produce electricity directly. With technological advancement, 'stand-alone systems' have also become popular. They operate only to produce energy stored in batteries or a generator. They are not connected to any of the electricity distribution systems

Benefitsof a Hybrid Solar Wind System.

1. The solar wind hybrid system generates approximately twice as much wind or solar energy than the singly-installed systems.
2. Installing these hybrid systems will enhance the reliability of the power generation systems.
3. The battery size can be minimised as the dependency on a single source for generating electricity is less.
4. Unlike individual energy systems, hybrid systems do not require grid expansion. It is because they produce power at different courses of time and during different seasons.
5. The overall cost of installing a hybrid system is lesser than installing an individual energy system. The project cost of the hybrid system can be reduced by as much as 2-2.5% of the total project cost of installing either a solar or a wind system. Acquiring land for a hybrid system is

easier. It is because you do not need separate pieces of land to install solar panels and windmills. Both can be installed on a single piece of land.

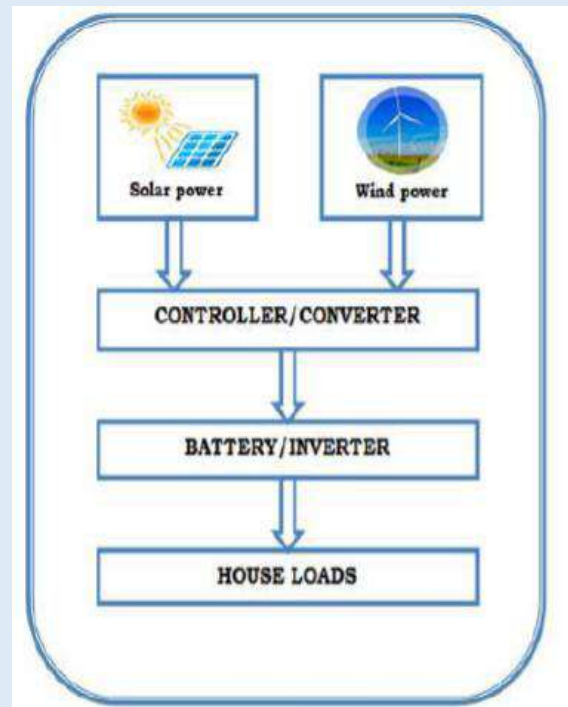


Fig.:- The block diagram of the solar - wind hybrid energy system

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Design and Development and performance evaluation of Green House based Solar Dryer

Drying is a commonly employed post-harvest process used to preserve agricultural products such as crops, vegetables, fruits, and spices. Its primary aim is to enhance the storage life of harvested crops and retain their nutritional values. Open sun drying is a traditional method practiced by farmers worldwide for effectively preserving agricultural products. Most agricultural products naturally contain a certain level of moisture, which contributes to their freshness and quality. Through controlled evaporation, drying eliminates excess moisture from the products, ensuring the inhibition of harmful microorganisms and supporting the preservation of their natural characteristics. While some flavour, texture, and overall quality may be affected, the reduction of weight-to-volume ratio through moisture removal offers practical advantages, including space efficient storage, packaging and transportation. During the drying process, heat and mass transfer occur simultaneously, gently transforming the water content into vapour from the product's surface, maintaining its structural integrity and taste.

Indian Agriculture and Its Economics

Market Analysis

The global dehydrated food market is forecasted to register a CAGR (Compound annual growth rate) of 4.8 % during the forecast period. During the COVID-19 pandemic, the demand for non-perishable food products, especially freeze-dried food has witnessed a huge surge in the consumer demand. It is mainly driven by the stockpiling nature of the consumer during the pandemic, caused by an extended lockdown, and in most cases, even the consumers avoided stepping outside public areas in order to safeguard themselves. Moreover, in order to maintain the immune system during the pandemic, consumers are highly concentrating on adding sufficient protein content in their diet, which results in augmenting the sales of freeze-dried meat products, dairy products, and others that have more shelf-life together with similar nutrients like that of the fresh products. Furthermore, vegan and plant-based freeze dried food products are witnessing an inflated demand amid changing consumer demands. This is primarily due to the prolonged shelf life of freeze-dried products, which can be

purchased in larger quantities at a time to tackle the hectic work schedules, over the fresh food products that require frequent buying in lesser quantities.

The overall market is driven considerably, primarily amid North American and European consumers owing to their higher purchasing power, thus, adding up to the value of the market studied.

Food Drying

Food drying is a method of food preservation in which food is dried (dehydrated or desiccated). Drying inhibits the growth of bacteria, yeasts, and mold through the removal of water. Dehydration has been used widely for this purpose since ancient times; the earliest known practice is 12,000 B.C. by inhabitants of the modern Middle East and Asia regions. Water is traditionally removed through evaporation by using methods such as air drying, sun drying, smoking or wind drying, although today electric food dehydrators or freeze-drying can be used to speed the drying process and ensure more consistent results.

One of the most popular techniques for food preservation is drying, which involves removing moisture to stop the development of microorganisms that can harm food. This technique aids in lowering the product's weight and volume, which lessens the load on storage and

transportation systems and also aids in storing food at room temperature. Heat and mass transfer are both involved in the drying process, where moisture on the surface is removed first and moisture from the interior is forced to move to the surface and removed later. Therefore, products are cut into smaller pieces or sliced to increase the surface area in order to improve the drying process. Better moisture removal is made possible by increased surface area. Additionally, factors like air flow rate, air humidity, and temperature gradient can have an impact on the drying process.

In addition to vegetables, fruits and mushrooms can be dried as well. Fruits require less moisture to dry than vegetables do because moisture evaporates more quickly when it is exposed to air. It is practical to dry ripe apples, berries, cherries, peaches, apricots, and pears. Vegetables like peas, corn, peppers, zucchini, okra, onions and green beans are suitable for drying. Because they contain a high amount of moisture, some foods, like lettuce, melons, and cucumbers, are not suitable for drying.

Freeze-drying is a unique type of dehydration that is frequently used to preserve perishable materials or to make them easier to transport.

Objectives

The major objectives of the drying process are as follows:

1. To develop greenhouse based solar dryer for drying of grapes.
2. To evaluate performance of greenhouse based solar dryer for determination of drying efficiency.

Methodology

The greenhouse effect is the mechanism by which solar energy is absorbed by greenhouse gases rather than being reflected back into space. This keeps the earth's surface warm and keeps it from freezing. The term "greenhouse effect" describes conditions in which the sun's short wavelengths of visible light pass through a transparent medium and are absorbed, but the longer wavelengths of the heated items' infrared re-radiation cannot. The long wavelength radiation is trapped, causing more heating and a higher temperature as a result. The greenhouse effect has been widely used to describe the trapping of excess heat by the increasing concentration of carbon dioxide in the atmosphere, in addition to the heating of an automobile by sunlight through the windscreen and the namesake example of heating the greenhouse by sunlight passing through sealed, transparent windows. Infrared is strongly absorbed by carbon

dioxide, which prevents as much of it from escaping.

The greenhouse solar dryer (as shown in Fig.1.2) is a structure that uses a direct mode to transform solar energy into thermal energy. It has four sides and a roof that is slanted at a 45° angle. A pvc pipe structure supports the rectangular plywood on which it is placed. Three of the greenhouse's sides are covered with transparent polycarbonate that has a 70% transmittance value to allow the most amount of radiation through. A fan is situated on the upper portion of the right wall to help remove the humid air. On a variety of trays, the product to be dried is distributed in a thin layer. There are 16 trays total, each with a 2.5 kg capacity. Therefore, the dryer's total capacity is 40 kg. Additionally, to reduce heat loss to the outside during the drying process, the fourth side is a black insulated wall that is thermally insulated with 2 mm thick polystyrene.

The door on the right wall gives greenhouse gases access through the polycarbonate, creating the greenhouse effect inside the dryer.

Development Of Greenhouse Based Solar Dryer

Solar Drying Technology

The purpose of a greenhouse dryer is to raise the temperature inside a solar dryer

by using a greenhouse and the greenhouse effect. For development of solar dryer, we used

Transparent materials, such as UV-stabilized plastic, or polycarbonate sheets, can be used for the solar dryer's roof and walls. To prevent humid air or rainwater from entering the chamber other than that which is introduced through the inlet opening, the transparent materials are fastened to a PVC pipes support or pillars with screw's, tea, elbows and rubber packing. Within the structure, there should be a black surface to improve solar radiation absorption. To ensure even distribution of the drying air inside the structure fans are positioned correctly.

When built properly, greenhouse dryers offer more control over the drying process than cabinet dryers, making them more suitable for drying large quantities of material.

For temperature control inside the dryer we build circuit connection of Arduino

UNO which is coupled with DHT 11 temperature sensor and digital OLED which is used to show value of relative humidity and temperature inside the dryer. Initially set temperature 60 °C with the help of Arduino IDE software. If temperature exceeds than set temperature then it automatically starts the exhaust fan which is coupled through Arduino circuit

with the help of relay circuit. Due to this which maintain even temperature distribution inside the dryer which also help in maintain product quality or we can say that help in uniform drying.

Types of solar dryers:

Types of solar dryers:

1. Integrated Solar Dryers:

In this type, solar energy collection and drying take place in a single unit. Some of the examples for this category include step-type dryers, cabinet dryers, rack dryers, tunnel dryers, greenhouse dryers, and multi-rack dryers.

2. Distributed Solar Dryers:

In this type, the solar energy collection and drying takes place in two different units namely, a flat plate air heater and a drying chamber. The flat plate heater can be placed on the roof of a building or on the ground or a place where the Sun's intensity is high. Air is heated in the flat plate heater and with the help of a blower, the heated air gets circulated in the drying chamber.

3. Mixed Mode dryer:

In this type, the solar energy collection takes place at both the flat plate air heater as well as a drying chamber and the drying takes place only at the drying chamber.

The outer part of the dryer will also get solar energy; this helps to remove the moisture quickly.

Importance of Greenhouse Drying

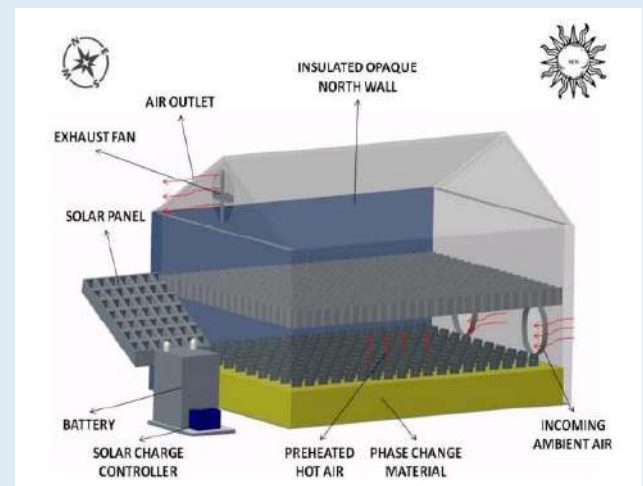
The open sun drying technique is the most widely practiced method for the preservation of agricultural products in developing countries. This method does not provide satisfactory results under unfavourable weather conditions, and it can lead to the degradation of the quality and reliability of the product. These losses mainly occur due to the dust and dirt, as well as bacteria and insects. Alternative methods can avoid these losses by drying the agricultural products in a cheaper and more economical way. Using the greenhouse dryer could be the best alternative method to avoid the disadvantages of open sun drying.

In the greenhouse dryer (GHD), crops are kept inside the trays in the enclosed structure, and the moisture removal process takes place either via a natural or forced convection mode. The mode of heat transfer depends on the removal of exhaust air from the dryer. The main advantages of using a GHD are:

1. The fabrication cost is low.
2. The structure of a GHD can be used throughout the year, which helps to increase the production of a dried crop.
3. Using a GHD improves the use of solar energy in terms of efficiency.

Forced Convection Greenhouse Dryer

In order to regulate the temperature and moisture evaporation, an optimum airflow is required for the greenhouse dryer throughout the drying process; this is achieved by observing the changes in the weather conditions. An exhaust fan is installed on the west wall to eliminate the humid air. The GHD airflow is regulated by the use of a blower or fan; this is called a forced convection solar greenhouse dryer. Fig., shows the pictorial view of a forced convection solar greenhouse dryer.



Forced convection solar greenhouse dryer

Solar Hybrid Greenhouse Dryer

The solar drying system is mainly divided into three modes of operation; direct mode, indirect mode, and hybrid mode. Regarding the hybrid solar dryer, the combination of two sources of energy is supplied for drying purposes. The combination of two sources can be wholly

renewable or non-renewable. The types of hybrid solar dryers are: (i) hybrid solar dryer assisted by geothermal energy; (ii) hybrid solar dryer assisted by biomass energy;

(ii) hybrid solar dryer assisted by ocean/wind energy; (iv) hybrid solar dryer assisted by renewable energy; and (v) hybrid solar dryer assisted by solar air heater. In a hybrid greenhouse dryer, the dryer is assisted by other energy supplies. Moreover, the hybrid dryer should have the ability to work in both an active and passive mode depending on what is required.

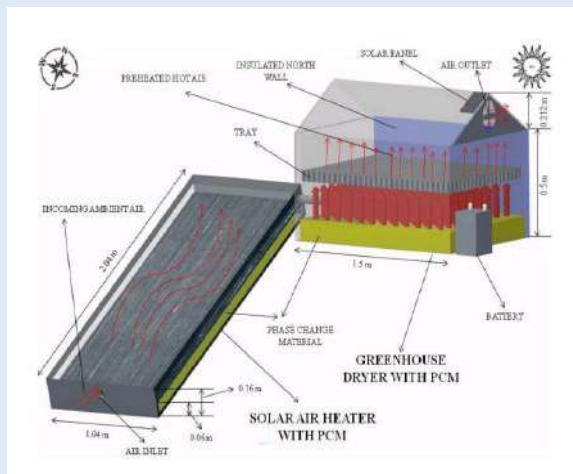


Fig: Hybrid greenhouse dryer

List of the Material/component Used in the Project

Polycarbonate Sheet,
PVC Pipes, Elbows, and Tea.
Exhaust Fans
black plastic sheet
Silicone gel

Polyfix
Hygrometer
Arduino UNO
Plywood
Wheels
DHT 11
Digital OLED
Relay circuit

Greenhouse-based solar dryer model



Fig:- Greenhouse Based Solar Dryer

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Automation of Sleeve Yoke by using CNC

A universal joint is a positive, mechanical connection among rotating shafts, which aren't parallel but intersecting. They are used to transmit motion, energy or both. The most effective and maximum not unusual place kind is referred to as the Yoke Joint or Hooke Joint. It includes yokes, one on every shaft, related with the aid of using a move-fashioned intermediate member referred to as the Spider. The attitude among the 2 shafts is referred to as the running attitude. The flexibility is carried out with the aid of using building the joint with U-fashioned yokes that is joined with the aid of using a move fashioned hub. One of the yokes is hooked up to the quit of every part of the cut-up shaft and joined with the move hub, with the Sections orientated at ninety degrees to every other. It is generally acknowledged for its use on automobiles, buses, vehicles etc. The energy transmission device of motors includes numerous additives which come upon unlucky screw-ups. These screw ups can be attributed to cloth faults, production and layout faults, etc. During operation yoke must go through for an countless lifestyles with extraordinary loading. However, the very best stresses arise on the crack starting region of the yoke. A feasible floor

fault results in crack propagation on the exceptionally harassed point. After a crack propagation period, the element undergoes fracture. A finite detail pressure evaluation want to be accomplished on the failure place to decide the pressure distribution and feasible layout improvement. An FEA primarily based totally software program like ANSYS or any appropriate software program is applied for the fixing the given problem. An attempt to evolve an improved design resisting the failure and in turn enhancing the life would be the objective for this work.

Power transmission system consists of several components like yoke assembly, propeller shaft, differential. The yoke assembly consists of two forged steel yokes joined to the two shafts together. A spider hinges are used to connect two yokes together in such way that faces of both yokes situated at right angle to each other. An automotive drive train is an assembly of one or more driveshaft, universal joint, and slip joint that forms the connection between the transmission and the drive axle. The function of drive train is that it allows the driver to control the power flow, speed and multiple the engines' torque. A universal joint (U joint) is a joint in a rigid rod that permits the rod

to move up and down while spinning in order to transmit power by changing the angle between the transmission output shaft and the driveshaft. The most common types of U joint used in automotive industry is Hooke or Cardan joint. A basic U joint consists of driving yoke, driven yoke, spider and trunnions. Each connection part of the spider and trunnion are assembled in needle bearing together with the two yokes. In the transmission system of a motor vehicle, the transmission main shaft, propeller shaft and the differential pinion shaft are not in one line, and hence the connection between them is made by the universal coupling. One universal joint is used to connect the transmission main shaft and the propeller shaft, other universal joint is used to connect the other end of the propeller shaft and the differential pinion shaft.

Objectives

1. To Develop an Automated Process.
2. To Reduce the Running cost.
3. To Increase Productivity.
4. To Reduce cycle Time

DESIGN:

Jigs and Fixtures

The jig and fixture are tool guiding and work-piece holding devices that are used during machining operation.

Jig

A Jig is defined as a device that holds and locates a work piece, and guides and controls one or more cutting tools. The holding of the work and guiding of the tool are such that they are in true positions relative to each other. In construction, a jig comprises of a plate, a structure, a box made of metal or in some cases non-metal having provisions for holding the components in identical positions one after the other, and then guiding the tool in correct position on the work in accordance with the drawing, specification or operation layout.

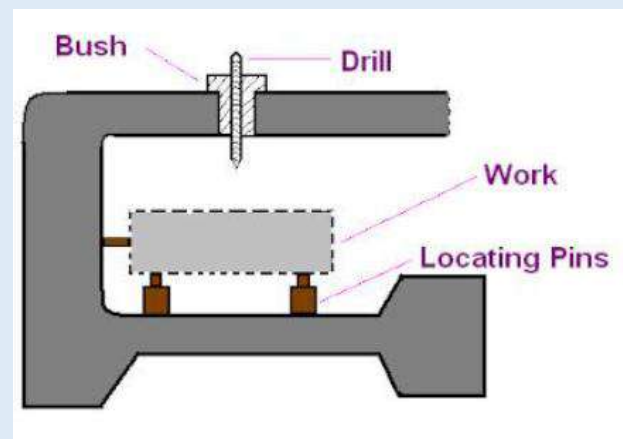
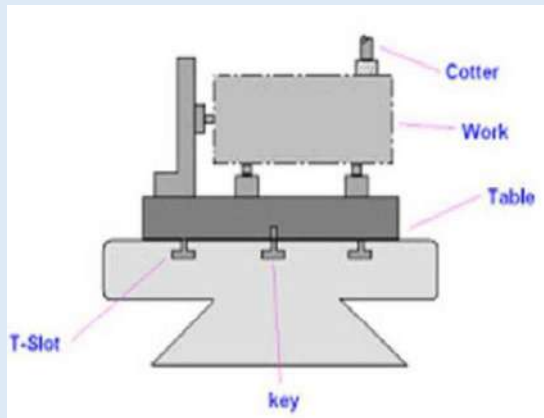


Fig:- Jigs

Fixture

A fixture may be defined as a device which hold and locates the workpiece during an inspection or for manufacturing operations. The fixture does not help in guiding the tool. In construction, a fixture comprises of a different standard or specially designed work holding devices,

which are clamped on the machine table to hold the work in position.



The major advantages of using jigs and fixtures are listed below:

1. Eliminates the marking out, measuring, and other setting methods before machining.
2. Increases the machining accuracy, because the workpiece is automatically located and the tool is guided without making any manual adjustment.
3. Enables production of identical parts which are interchangeable. This facilitates the assembly operation.
4. Increases the production capacity by enabling number of workpieces to be machined in a single set up, and in some cases handling time is also greatly reduced to quick setting and locating of work. The speed, depth of cut and feed for machining can be increased due to high clamping rigidity of both.

5. Reduces the operators labour and consequent fatigue as the handling operations are minimized.

6. Enables semi-skilled operator to perform the operations as the setting operations of the tool and the work are mechanised. This saves labour cost.

7. Reduces the expenditure on quality control of the finished products.

8. Reduces the overall cost of machining by fully or partly automatizing the process. The successful designing of a jig and fixture depends upon the analysis of several factors such as

1. Study of the component
2. Study of the type and capacity of the machine
3. Study of loading and unloading arrangement
4. Study of clamping arrangement
5. Study of power devices for operating the clamping elements
6. Study of clearance required between the jig and the component
7. Study of the tool guiding and the cutter elements
8. Study of the ejecting devices
9. Study of rigidity and vibration problem
10. Study of table fixing arrangement

11. Study of methods of manufacture of the jig base, body or frame

OD Turning Operation

A turning operation is employed when the surface of a workpiece needs to be machined to the required diameter. In other words, excess material is removed from the external diameter of a workpiece or cylindrical surface. Lathe is a type of machine tool that removes the material from rotating workpiece (the stock to be machined) with cutting tool (single point tool, or tooling/drilling bits) to make the workpiece form a desired shape. CNC lathes generally consist of various equipment such as the chuck to hold the workpiece, spindle and its motor to rotate the workpiece, servo motor(s) to move the cutting tool to the machining points.

Machining program is a measure to tell the CNC how and in which order it makes the machine tool move. The primary unit of CNC command that constitutes the machining program is made in the combination of an alphabetical letter and the numerical value.

There are two kinds of positioning mode;

- “Absolute mode” to specify the destination with the coordinates.
- “Incremental mode” to specify the amount of motion relative to the previous position.

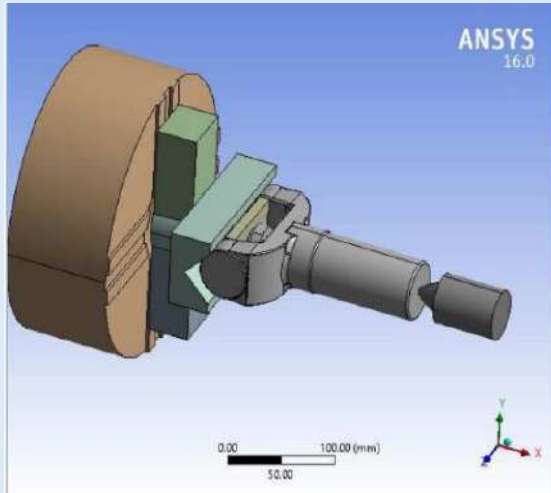
ID Turning Operation

If high accuracy and high-quality finish are required, drilling must be followed by some other operations such as reaming, boring or internal grinding. The most widely employed drilling tool is the twist drill which is available in diameters ranging 0.25 to 80 mm

Internal turning operations machine the inner diameter of the work piece. Long overhangs and poor chip evacuation are two of the challenges with internal turning. Long overhangs can cause problems with both deflection and vibrations. Vibrations and poor chip evacuation can cause insert breakages. Difficulties with chip evacuation can also lead to poor surface finish. The choice of tool is very much restricted by the component hole diameter and length (the depth of the hole with overhang). A general rule is to select a tool with the shortest overhang and the largest possible tool size. Selecting the right tool for the operation, applying it correctly and clamping it properly all have an effect on minimizing tool deflection and vibration. The entering angle affects the direction and magnitude of axial and radial forces. A large entering angle (small lead angle) produces a large axial cutting force, while a small entering angle (large lead angle) results in a large radial cutting force. An entering angle close to 90° (0° lead angle)

and never less than 75° (15° lead angle) is recommended

OD Turning ANSYS Report:



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Dual Mode of Refrigeration System

In today's era, refrigeration industry is passing through evolutionary changes. Emphasis is given to save energy and to protect the environment. Refrigeration technology is expected to develop technologies which are cheap and using refrigerant other than CFC. Many food industries, textiles industries, hotels require both refrigeration and water heating. In case of textile mill, it requires central air conditioning plant which requires chilled water and hot water for steam generation and heating purpose, while in food industries, refrigeration required for product preservation and hot water required for cleaning, sterilization or process heating. It is common for the refrigeration and water heating systems to be separate and unconnected, and both consuming purchased energies. This approach wastes considerable energy, contributing to the depletion of fossil fuel reserves and the release of greenhouse gases. Even in large size VCR system required condenser and cooling tower for condensation process, while by simultaneous heating and cooling requirement of cooling tower is no more. So, by the simultaneous heating and cooling by VCR system save the fossil fuel, energy and initial cost of system/equipment by serving the both

function of heating and cooling simultaneously. In addition, many refrigeration systems employ ozone depleting refrigerants. There are strong international moves to use naturally occurring and ecologically safe working fluids rather than harmful chemicals, in order to minimize the impact on the environment. Alternative technologies are required to limit the economic cost and environmental impact of these applications.

Vapor Compression Refrigeration Cycle (VCR):

When the low pressure gas is passed through the compressor its converted into high pressure gas after that high pressure gas is passed through the condenser its converted vapour into liquid form after that high pressure liquid is passed through the drier it contains chemical like silica gel it absorbs the moisture of gas and washed the refrigerant after that refrigerant is passed through expansion valve it reduces the pressure of refrigerant after that is passed through the evaporator then low pressure liquid is converted into vapor state after that low pressure gas is passed through compression and after cycle will repeat cooling will happens.

Scope of Work

The proposed device can be used in household a commercial application for cold and hot water. But in food processing storage, factories, industrial applications, a water source heat pump water heater can be used all year round. Water source heat pump water heater can sometimes be justified in applications where the cooling output is not valued if the water heating savings are adequate.

Where water source heat pump water heater running time will not be adequate in provide enough operating cost savings to justify the initial cost of water source heat pump water heater its application must be avoided although it has tangible value, the cooling output from a water source heat pump water heater may not cause a savings in utility bills.

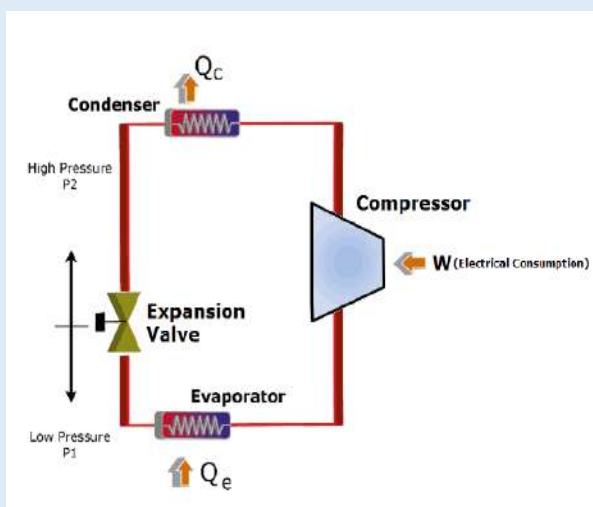


Fig:-Schematic Representation of the VCC

Main Components;-

Compressor

The compressor is an external pumping device that compresses the refrigerant from evaporator pressure to condenser pressure. As a result of compression, refrigerant temperature also increases. The refrigerant temperature in the condenser must be higher than the condenser's cooling media temperature. Refrigerant is compressed to higher pressure because as pressure increases, refrigerant saturation point also increases so that it can be easily cooled to a liquid state in the condenser.

Condenser

After leaving the compressor, the hot vapor refrigerant enters the next stage of the cycle, condensation. During the condensation stage, the refrigerant enters a condenser and flows through a series of S-shaped tubes. As the hot vapor flows through the condenser, cool air is blown across the tubes by a fan. The diameter of condenser coil is 0.7 mm , its length is 25 foot

Evaporator

In the evaporator of any cooling system contain pipes or coils where the liquid refrigerant has low temperature and low pressure. In evaporator liquid refrigerant is evaporated and transfer into vapor refrigerant where the temperature and pressure is both are stays in low. The

diameter of condenser coil is 0.7 mm , its length is 25 foot

Capillary Tube

Copper Capillary Tube is widely used for fabrication of instruments intended for precise measurements, manufacturing of parts of electronic equipment and other equipment. With a large stock place for exported Copper Capillary Tube, we have been successful in providing our customers with products made of various materials. Our Capillary Pipes and Tubes are available in Stainless steel, Brass and Copper and all goods are exported and meets the international quality standards. This had made us the customer preferred brand.

Energy Meter

The multi-function energy meter can test 6 different functions at same time. The active power range is 0~25KW, Energy Storage range is 0~99999kWh, the voltage test range is 80~300V AC, power frequency range is 45Hz~65Hz, power factor range is 0.0~1.0 PF and the current measurement range is 0~100A.

Large-screen LCD displays voltage, current, active power, power factor, power frequency and energy at the same time.

Large LCD screen display colourful readings which makes it very easy to see in dark surroundings. With storage function,

it can store measurement data when power is off.

Refrigerants: (R-134a)

R134a refrigerant is also known as Tetrafluoroethane and belongs to the HFC family replacing R-12 in new installations of refrigerant. This gas is poised to replace the other gaseous such as R-410A and R-407C as the preferred gas due to its lower Global Warming Potential. Its chemical formula is $\text{CF}_3\text{CH}_2\text{F}$

Working Procedure:

In the outdoor unit the refrigerant meets the water in the evaporator (heat exchange). The refrigerant, which is in a liquid state absorbs free energy from the water and evaporates in this process. A sensor in the expansion valve ensure that the liquid refrigerant collects the correct amount of the “free energy” before refrigerant (now in a gas state) is led into the compressor increases the pressure of the refrigerant. The temperature of the heat pump’s heat emitting part.in the condenser, the refrigerant (gas state)meets the water from the heating system(coils).when the warm gas is cooled by the circulating heating water, it changes into a liquid state (condenses).Energy is emitted in this process to the heating system or the hot water. After the condenser it continues on to an expansion valve. The refrigerant pressure is lowered

in the expansion valve. This also causes the temperature to drop. When the refrigerant has left the valve and passes the evaporator it changes to vapor again. This completes the refrigerant circuit.

The heat pump that is commonly used is known as vapor compression refrigeration machine. An absorption machine can also be used but is not as common. The vapor compression cycle is used in our refrigerator and large industry refrigeration systems. The diagram below shows the basic schematic of operation of a typical heat pump.



Fig:- Experimental Set Up

Performance Test:

Procedure of performance test:

- 1) Fill up the condenser and evaporator with defined quantity of water.
- 2) Measure all the initial properties in the system such as
 - a) Initial temperature of water in condenser and evaporator tank

- b) Initial suction pressure (In Evaporator)
- c) Initial discharge pressure (In condenser)
- 3) Start the system with the help of electric power.
- 4) Note current required for system.
- 5) Note down / define the time period required to attain desired temperature of water in the condenser.
- 6) Once the system attains steady state, note down the pressure and temperature as salient points in the cycle such as,
 - a) At entry and exit of compressor
 - b) At entry and exit of condenser
 - c) At entry and exit of capillary tube
 - d) At entry and exit of evaporator
- 7) After stipulated time period, again note down the important system parameters such as
 - a) Temperature of hot water in condenser
 - b) Temperature of cold water in evaporator
- 8) After recording the recordings, use appropriate formula to obtain performance indicating parameter of the system such as
 - a) COP actual (from obtained readings)
 - b) COP theoretical (By plotting cycle on p-h chart for obtained readings pressure and

temperature of various system components)

Conclusions:

1. Simultaneous heating and cooling achieved.
2. Improvement in cop by 1 was achieved due to water cooled condenser
3. Overall improvement initial cost and running cost was achieved

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Design and Development of Colour Sorting Machine using a Conveyor Belt

Nowadays, in the present state of intense competition, production efficiency is generally regarded as the key of success. Production efficiency includes the speed at which production equipment and production line can be lowering material and labour cost of the product, improving quality and lowering rejects, minimizing downtime of production equipment and low cost production equipment.

Taking this matter under consideration the project is developed which is very useful for industries. Machines can perform highly repetitive tasks better than humans. Worker fatigue on assembly lines can result in reduced performance, and cause challenges in maintaining product quality. An employee who has been performing an inspection task over and over again may eventually fail to recognize the colour of product. Automating many of the tasks in the industries may help to improve the efficiency of manufacturing system.

The purpose of this model is to design and implement a system which automatically separates products based on their colour. This machine consists of three parts: conveyor belt, colour sensor, and dc motor. The output and input of these parts was interfaced using Atmega 38P

microcontroller. To reduce human efforts on mechanical manoeuvring different types of sorting machines are being developed. These machines are too costly due to the complexity in the fabrication process. A common requirement in the field of colour sorting is that of colour sensing and identification. Mainly the colour sorters are used in agricultural machineries like rice sorter, beans sorter, peanut sorter etc. Colour sorters are used in other, industrial applications also like quartz sand sorter, plastic granule sorting of colored nuts and bolts etc. It reduces the human effort, labour and cost.

There are three main steps in sensing part, objects detection and recognition. The system may successfully perform handling station task, namely pick and place mechanism with help of sensor. The Arduino microcontroller sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. Based upon the detection, the robotic arm moves to the specified location, releases the object and comes back to the original position.

OBJECTIVES

The objectives of this project are to write colour recognizing and colour sorting code. And to integrate colour recognizing, sorting and motor with microcontroller.

2. To make the process of sorting the material, this Colour sorting is being designed.

3. In some of industries use man power to transfer the material form one place to other by repeating this for a period of time it will cause injuries to an operator.

4. The use of this machine make the work simple for the operator, and no longer to bend and lifts up the materials, this reduce the cause of injuries to the operator and increasing the work efficiency.

5. This technology enables to have more accurate and efficient sorting on production lines across a wide range of industries, saving time, labor and money

List of parts used in color sorting machine

1. Arduino UNO R3 board.

This board comes with all the features required to run the controller and can be directly connected to the computer through USB cable that is used to transfer the code to the controller using IDE (Integrated Development Environment) software, mainly developed to program Arduino.

The detailed specification of the Arduino Nano board is as follows:

- ☐ Operating Voltage: 5 V
- ☐ Input Voltage(recommended): 7-12 V
- ☐ Input Voltage (min and max): 6-20 V
- ☐ Digital I/O Pins: 14 (of which 6 provide PWM Output)
- ☐ Analog Input Pins: 6
- ☐ Flash Memory: 32 KB
- ☐ Clock Speed: 16 MHz

2. Servomotors

It is tiny and lightweight with high output power. This servo can rotate approximately 180 degrees (90 in each direction) and works just like the standard kinds but smaller. You can use any servo code, hardware, or library to control these servos. It comes with 3 horns (arms) and hardware.

Colour Sensor (TCS-34725)

The detailed Specifications of colour sensor is as follows:

- ☐ Interface: I²C
- ☐ Sensing Range: RGB
- ☐ Sensor Type: Light Colour Sensor
- ☐ Supplied Contents: Board(s)

□ Utilized IC/Part: TCS34725

□ Voltage-Supply: 3.3V~5V

4. Conveyor System

Conveyors system is a piece of material handling equipment that carries material from one location to another. Conveyors are especially useful in an application involving the transportation of heavy materials.

Working

The proposed system is designed for automatic sorting of Red or Green or Blue colored products. The prototype consists of two DC motors, conveyor belt, a PIC and a color sensing circuit using TCS34725. DC motors are used to control the conveyor belts. After integrating the programmed PIC and the TCS34725 circuitry with the structure of the model, we measure the frequency of signals corresponding to each color by observing them on a CRO.

Based on this study the timer delay value is adjusted by reprogramming the PIC. The time required for the product to reach the corresponding container in the separator placed on second conveyor belt is also considered. The end section consists of a DC motor (12V, 100rpm), which is used to control the movement of the conveyor belt in order to position the according to the sensor output.

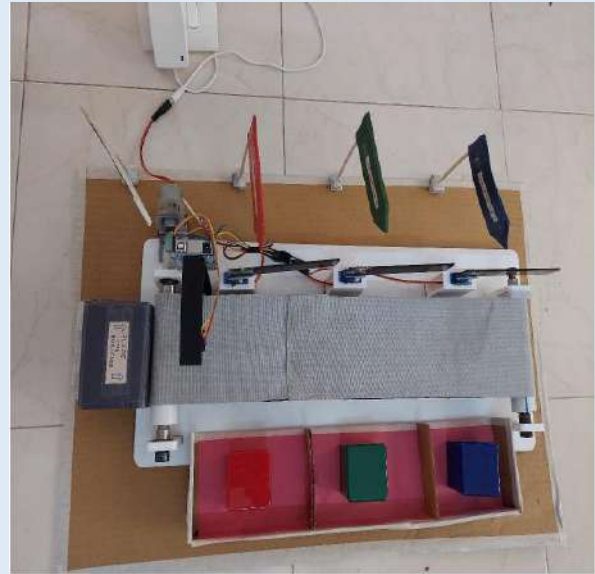


Fig:- Completed Model

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