

Gel Timer And Peak Exothermic Equipment

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Abstract- The main objective of this project to develop the cost effective and simple gel timer and peak exothermic equipment to measure the gel time and peak exothermic temperature of the resin can used for different purpose. The equipment available in market is costly so main aim to reduce the cost of the equipment so any one can afford it and make simply operation so skilled person requirement is minimize. As technology advancing so the resin are used for differ purpose therefore the gel time and peak exothermic temperature is the main parameter to decide the which resin is suitable for any given operation that place the equipment plays and important role to decide the resin. This project deals with innovative rather than a environmental friendly because used some scrap material to make the equipment. The project provide the safety form excessive heating ,the relay and thermostat used for the temperature control. The main component or CPU of the equipment is arduino. The use of arduino make the equipment advanced and flexible. The temperature adjustment is also the allow the different resin to test. For the time and temperature displaying unit is also provided.

Keywords- CPU, Arduino

I. INTRODUCTION

Gel time and peak exothermic temperature are two of most important parameters for a thermosetting material processor . Gel time is the interval of time between introduction of catalyst and the formation of gel. Such information regarding viscosity change with time of resin-catalyst mixture helps to determine working-life characteristics of the material. The maximum temperature reached by reacting thermosetting plastic composition is called peak exothermic temperature. Resin producing high exothermic heat susceptible to cure shrinkage and craze cracking. This is due to the thermal expansion that occurs as the heat is generated and shrinkage that takes place when thermosetting three-dimensional network forms. The American Society for Testing and Materials proposes two standards to characterize thermosetting resins: one is the ASTM D2471 – based on hand-probing for the gel time and thermocouple for recording the peak exothermic temperature , and the other is ASTM D3056 – uses a gel-time apparatus that detects the gel time based on a torsion wire . Since the gel

time and the peak exothermic temperature of a reacting thermosetting plastic composition vary with the volume of material mixed at one time, it is essential that the volume be specified in any determination. By selection of an appropriate volume, gel time and peak exothermic data may be obtained in sufficiently precise and reproducible form or application evaluation, quality control, and material characterization of a thermosetting plastic composition .

II. SYSTEM DISCREPTION

The System is a low cost gel timer and peak exothermic equipment which is developed to find the gel time and peak exothermic temperature of different resin .

The block diagram of the system as shown in fig.

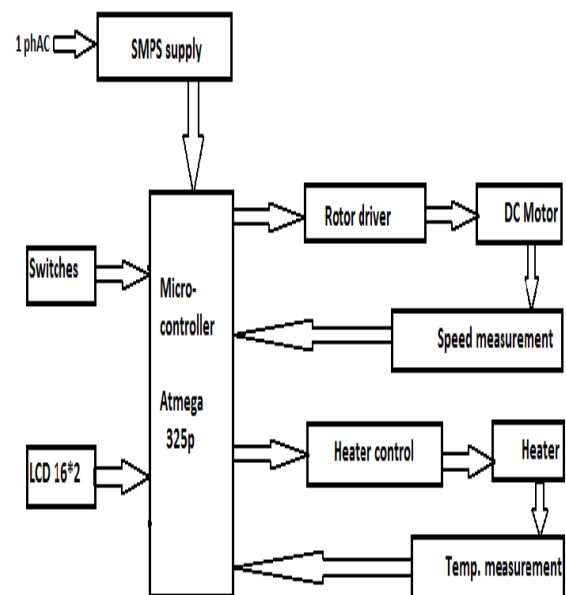


Fig 1. Block Dig

POWER SUPPLY:



AC input GND +12VDC

Fig.2 Power Supply (SMPS and Connection)

SMPS:-This is high quality 12V, 5Amp SMPS intended for industrial use. We use these SMPS for heavy duty robotics applications. They have built in Short circuit, Overload and Over voltage protection. It can withstand input of 1500V AC up to 60 seconds. Output voltage can be adjusted by up to +-10% of the output voltage. Specifications Output: 12V, 5Amp. Input voltage is 180V to 260V AC , 47 to 63Hz. LED power indication, overload protection up to 150% with auto recovery. Over voltage protection up to 135% of the output voltage. Short Circuit protection: long term. Setup time is Less than 1 second. Over voltage tolerance for input to output is 1500V AC for 60 seconds Over voltage tolerance for input to ground is 1500V AC for 60 seconds. Over voltage tolerance for output to ground is 500V DC for 60 seconds.

RESISTORS:- A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:
 $V = IR$

CAPACITORS:- A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates.

VOLTAGE REGULATOR:

The MC78XX/LM78XX/MC78XXA series of three terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe

operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

DIODE: Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier.

CONTROLLER:- (ARDUINO UNO)

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

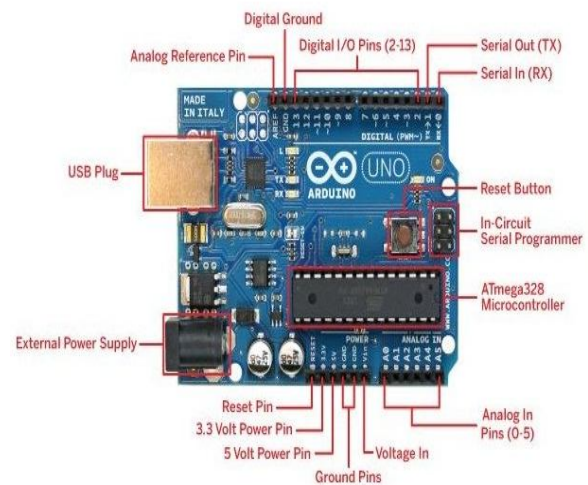


Fig 3. Controller Arduino Uno

Motor :-



Fig 3. motor

30RPM Centre Shaft Economy Series DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 30 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. Tables below gives fairly good idea of the motor's performance in terms of RPM and no load current as a function of voltage and stall torque, stall current as a function of voltage.

IR SENSOR :-

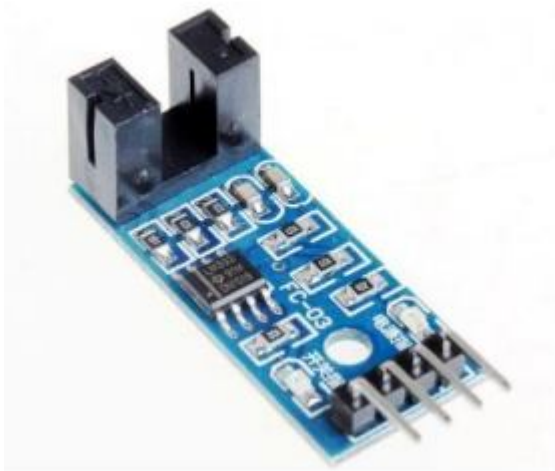


Fig 4. IR Sensor

Wiring Specification:

1. VCC: The positive 3.3-5 v power supply.
2. GND: Connect power negative.
3. DO: TTL switch signal output.

This is Speed Measuring Sensor Groove Coupler Module. The DO output interface can be directly connected to a micro-controller IO port if there is a block detection sensor, such as the speed of the motor encoder can detect. DO modules can be connected to the relay, limit switch, and other functions, it can also with the active buzzer module, compose alarm. Widely used in motor speed detection, pulse count, the position limit, etc.

TEMPERATURE SENSOR :-

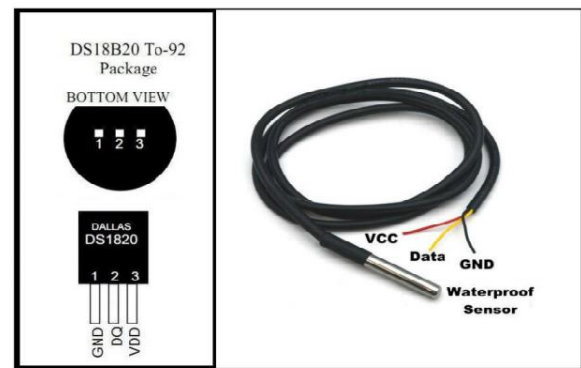


Fig 5. :- Temp. Sensor.

Waterproof DS18B20 Digital Temperature Sensor This is a pre-wired and waterproofed version of the DS18B20 sensor. Handy for when you need to measure something far away, or in wet conditions. While the sensor is good up to 125°C the cable is jacketed in PVC so we suggest keeping it under 100°C. Waterproof DS18B20 Digital Temperature Sensor Probe 100cm Wire Cable for Arduino Because they are digital, you don't get any signal degradation even over long distances! These 1-wire digital temperature sensors are fairly precise ($\pm 0.5^\circ\text{C}$ over much of the range) and can give up to 12 bits of precision from the onboard digital-to analog converter. They work great with any microcontroller using a single digital pin, and you can even connect multiple ones to the same pin, each one has a unique 64-bit ID burned in at the factory to differentiate them. Usable with 3.0-5.0 V systems.

STRIP HEATERS:-

Strip heaters, often known as component heaters, are a simple way of using surface area to transfer heat effectively. ... Strip heaters are composed of a heating element, a protective sleeve or sheath, and mounting hardware.



Fig 6. Strip Heater

constructed of specially selected, high grade materials, including high temperature alloy resistance wire and corrosion-resistant aluminized steel sheath (suitable for maximum sheath temperature up to 1000°F) or corrosion-resistant stainless steel sheath (suitable for maximum sheath temperature up to 1200°F) controlled coil process and

placement assures uniform heat distribution over the entire active surface of the heater. Special refractory material possesses excellent heat transfer characteristics, superior insulation properties and rigid vibration resistance to provide a heavy-duty heating unit. Slotted mounting tabs allow lineal expansion during initial heat-up period. Rated at 120V or 240V, depending on size; a limited selection of 287V heaters available; secondary insulators must be used when voltage to ground exceeds 300V. High-voltage models rated up to 600V when secondary insulators are used maximum amps of 48 amps. Wattage ranges from 125 to 1500 W for the aluminized steel sheath and 250 to 1500 W for the stainless steel sheath, depending on the size of the heater overall length limit of 42 1/2"; effective length limit of 39"

III. CONCLUSION

Hence we will be concluding that, by introducing the concept of gel time and peak exothermic temperature measurement can make our use of resin more efficient and greater efficiency . It fully avoids wastage of time in for testing of resins .

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