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Magnetism generation & control by using solid state relay for application of absorbing change of conductivity in acids

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***Abstract*---**The Electro Magnetic induction is an electrical instrument which produces the magnetism. By varying the current we control the electro-magnetism in mutual inductance. Here we use SSR as mediator for input and output process. By changing the input voltage we can control the output current. By varying the current we can adjust the magnetism. By hall sensor we can observe the changing in magnetism.

***Keywords*---**SSR, current control, mutual inductance, magnetic variation.

Introduction

The Electro Magnetic Induction is an electrical instrument which produces the magnetism. By varying the current we control the electro-magnetism in mutual inductance. Here we use SSR as mediator for input and output process. By changing the input voltage we can control the output current. By varying the current we can adjust the magnetism. By hall sensor we can observe the changing in magnetism.

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The application of Electro Magnetic Induction is Induction Heating. Induction heating is the process of heating electrically conductive materials like metals by electromagnetic induction, through heat transfer passing through an induction coil that creates an electromagnetic field within the coil to melt down steel, copper, brass, graphite, gold, silver, aluminum, and carbide. An induction heater consists of an electromagnet and an electronic oscillator that passes a high-frequency alternating current (AC) through the electromagnet. The rapidly alternating magnetic field penetrates the object, generating electric currents inside the conductor, called eddy currents. The eddy currents flow through the resistance of the material, and heat it by Joule heating. In ferromagnetic and ferrimagnetic materials, such as iron, heat also is generated by magnetic hysteresis losses. The frequency of the electrical current used for induction heating depends on the object size, material type, coupling (between the work coil and the object to be heated) and the penetration depth.

An important feature of the induction heating process is that the heat is generated inside the object itself, instead of by an external heat source via heat conduction. Thus objects can be heated very rapidly. In addition there need not be any external contact, which can be important where contamination is an issue. Induction heating is used in many industrial processes, such as heat treatment in metallurgy, Czochralski crystal growth and zone refining used in the semiconductor industry, and to melt refractory metals that require very high temperatures. It is also used in induction cook-tops for heating containers of food; this is called induction cooking.

Electromagnetic or magnetic induction is the production of an electromotive force across an electrical conductor in a changing magnetic field. The electromagnet is controlled by SSR. Here we us 24 volts and 20 Amp of voltage and current. By using SSR we can control the current. We can pass the fixed current through. If we increase the current the Magnetic flux of the Magnetic Induction will increase. If we decrease the current the Magnetic flux of the Magnetic induction also decrease.

This application is used in electrical cockers, water heaters etc. In ferromagnetic and ferromagnetic materials, such as iron, heat also is generated by magnetic hysteresis losses. The frequency of the electrical current used for induction heating depends on the object size, material type, coupling (between the work coil and the object to be heated) and the penetration depth.

Methodology

Input side: Here the operating voltage 3v to 32v DC. The positive terminal of SSR input part is connected to positive terminal of 5v dc power supply. The negative terminal of 5v dc power supply is connected to one terminal variable resistance box. Another terminal of resistance box is connected to negative terminal of SSR input part.

Output side: Here the operating voltage is 5v to 200v DC, current maximum is 40amp. The positive terminal of SSR output part is connected to positive terminal of 24v 20amp dc power supply. The negative part SSR is connected to positive terminal of Ammeter (0-30amp). The negative terminal of Ammeter (0-30amp) is connected to one of the terminal magnetic inductive coil. Another terminal of magnetic inductive coil is connected to negative terminal of 24v 20amp DC power supply.

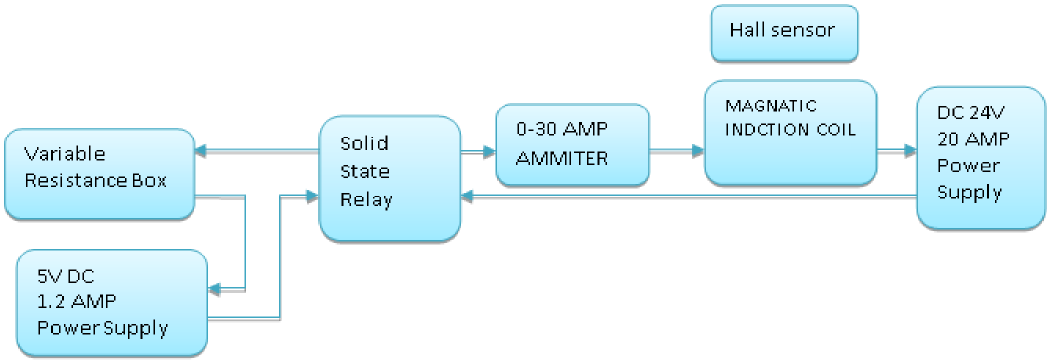

Figure.1. System block diagram

Operation: By vary the input voltage from 3 volts to 5 volts by changing the resistance from resistance-box, we can vary the output current. The output current is 20amp dc with 24 volts. By varying we can observe the change of electro-magnetism in electromagnetic induction. Now we want to keep hall-sensor in front of electro-magnetic induction. We can observe the change in voltage at hall-sensor. If there is variation in voltage at hall-sensor, the electro-magnetism is occurring in Electromagnetic Induction. The variation is mille volts.

Input terminals

i. Resistance box,
ii. 5volts dc power supply,
iii. Multi - Meter.

- Resistance box: The range of this variable resistance box is 0-10,000 ohm (Ω)s. It is used to vary input voltage.
- 5 volts DC power supply: The output of this power supply is 5 volts.
- Multimeter: It is used to find the input voltage and voltage at hall-sensor

Output terminals

1. 24 volts 20amp DC power supply
2. Ammeter (0-300amp)
3. Mutual inductance
4. Hall sensor
5. 5 volts dc power supply
6. Multimeter

1. 24 volts 20amp DC power supply: The range of this power supply is 24 volts 20 amp.
2. Ammeter (0-20amp): It shows the current readings up to 30 amperes.

3. Mutual inductance: The Electro Magnetic Induction is an electrical instrument which produces the magnetism. By varying the current we control the electro-magnetism in mutual inductance. Here we use SSR as mediator for input and output process. By changing the input voltage we can control the output current. By varying the current we can adjust the magnetism. By hall sensor we can observe the changing in magnetism. This is made up of a copper coil which containing 1.2 ohm resistance, 9.746 mill henrys. It is 17 gage copper wire. Its Diameter is 0.16 cm. This particular copper wire is wounded around small halo cylinder type iron rod .It is used produce magnetism. Working principle of if a coil of copper wire is rotated in a magnetic field in such a way as to cut across the lines of magnetic force, an electric charge is created or induced in the wires. This is the basic principle by which practically all our present day electric current is generated. Faraday's Principle of Electromagnetic Induction states that the e.m.f induced in a loop due by a changing magnetic flux is equal to the rate of change of the magnetic flux threading the loop. The magnetic flux threading a coil of wire can be changed by moving a bar magnet in and out of the coil.
4. Hall sensor: A Hall Effect sensor is a type of sensor which detects the presence and magnitude of a magnetic field using the Hall Effect. The o/p voltage of hall sensor is directly prepositional to the strength of the field. Here this is used to find the magnitude of mutual inductance. Working principle of Hall sensor is a current is applied to thin strip of metal. In the presence of magnetic-field Perpendicular direction of current carriers are deflated by the Lorentz force, producing a different in electric potential between the two sides of the strip. This voltage difference [the hall voltage] is propositional to the strength the magnetic field.
5. volts DC power supply: The output of this power supply is 5 volts.
6. Multimeter: It is a device to observe the resistance, voltage, current and etc. Here we used to observe the voltage through Hall sensor.

Solid state relay (SSR)

It is used as mediator for both input and output operations. By using this u can control the output parameters by changing input operators.
Specifications of SSR:

Type	: SSR-KD-40-DD
Voltage	: 200v DC
Current	: 40A

Experimental setup

In this experiment the main part is SSR. It will control the total setup. In SSR there are two parts are there. They are input and output. Here input is control the output.

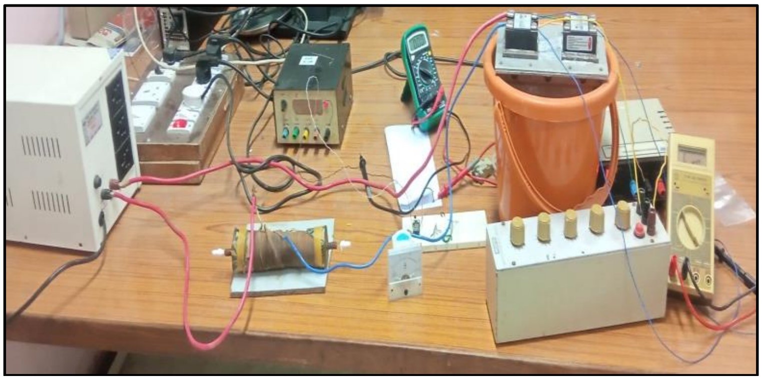

Figure.2. System setup Photography

Results and Discussions

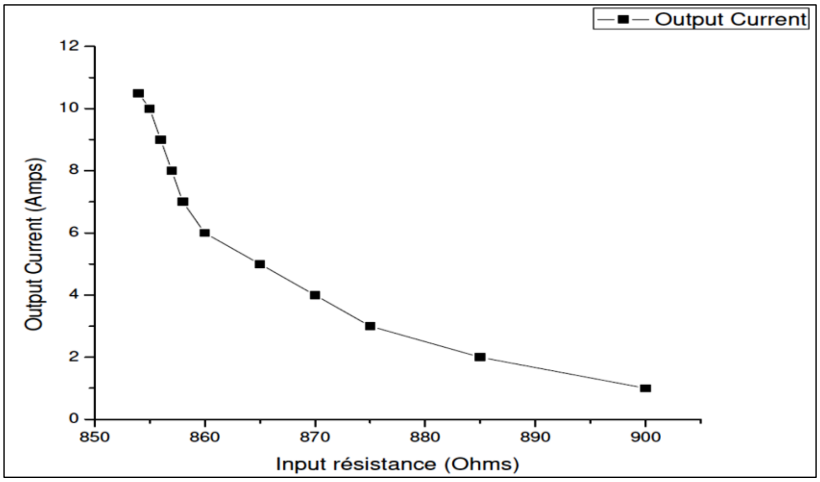

Figure.3. Input Resistance Vs Output Current

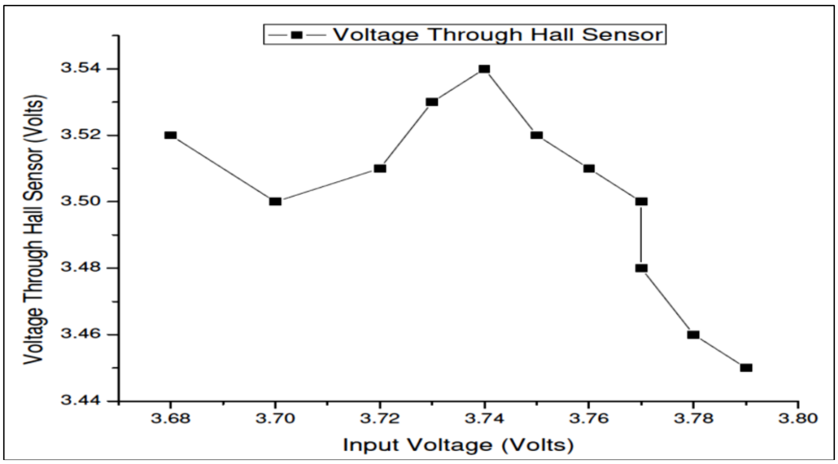

Figure.4. Input Voltage Vs Hall sensor voltage

Table.1. Experimental data

Input résistance in Ohm	Input voltage in Volts	Output current in Amp	Voltage through Hall sensor in Volts	Mgnatic Flux in henry amp2
900	3.79	1	3.45	0.0403
885	3.78	2	3.46	0.0405
875	3.77	3	3.48	0.0410
870	3.77	4	3.50	0.0414
865	3.76	5	3.51	0.0417
860	3.75	6	3.52	0.0420
858	3.74	7	3.54	0.0424
857	3.73	8	3.53	0.0423
856	3.72	9	3.51	0.0417
855	3.70	10	3.50	0.0414
854	3.68	10.5	3.52	0.0420

Results

1) Here the input resistance is increases the output current will decrease. This is due to while increase the resistance the flow of electrons in a path is reduce.
2) The magnetic power of an electromagnetic-induction is depend on output current. If the output current increases the magnetic power of an electromagnetic-induction is also increases which we absorber in hall-sensor output.
3) Here we convert the output voltage of magnetic flux into henry amp2. By using the formula "Estored=(L*I*I)/2". [note: L : inductance, I : current, E : energy] Where I=V/R;

Conclusions

The proposed instrumental setup could easily control electro-magnetic property, with the help of electro-magnetic property to control the temperatures of room heaters, electric cookers and water heater etc.

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