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Design and Implementation of Auto-tap Changer for Transformer Using Atmega328 Controller

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Abstract: - Transformers are an important part of the electrical transmission system. ON-load tap variable electrical devices are important in today's power grid because they allow voltages to be maintained at predefined levels even when loads fluctuate. As a consequence, the project's goal is to create an IoT-controlled electrical connection tap changer as well as other important industrial equipment. In this project, the user may select the transformer tap from the Servo tab, which includes 5 volts, 9 volts, 12 volts, and 18 volts. As a consequence, we'll build the bulk of electrical interface access points for several programmed to handle at the same time .

Keyword: - ON-load tap-changing transformer, Arduino; Relays, Power supply

I. INTRODUCTION

When we evaluate our daily routines, we may deduce that energy is an inextricable component of our existence, and transformers act as electrical transporters from producing stations to the United States. The electrical unit is the most significant component in the power delivery system. At a transformer, a tap-changer is a procedure that enables for different flip ratios to be utilized in different phases. By attaching to a number of access locations known as faucets on either the first or second coil, transformers can gain this vector flip quantitative connection. These devices contain four faucets that enable a percentage departure from the nominal electrical device rating, allowing the output tap changers to be controlled with stepped voltage. For simple access and to lower the current burden during operation, these tap changers are usually situated on the high voltage (low current) electrical device winding. Faucet Changer for On-Load: The On-Load Faucet Changer is a type of power electrical device used in most power plants (OLTC). Not only in the producing station, but also in the distribution category, this station's electrical system has three windings. The main coil, coil, and tertiary windings are the three types of windings. We will ignore the tertiary winding, which is used in residential dwellings, among them. The current mechanical on-load tape changing power transformer has a number of drawbacks, including arcing, regular maintenance, high service costs, and poor response times [2]. Problems with the mechanical onload tap changing power transformer have been eliminated with the adoption of high-power semiconductor devices such as Triac, IGBTs, and Thyristor. New circuits and topologies for tap changers have been devised to circumvent these restrictions and downsides. These may be divided into two categories [4]. On-load tap-changers with electronic assistance (or hybrid) and fully electronic (or solid-state) tap-changers The first hybrid tap-changer circuit was introduced in 1996 [5]. This construction significantly lowers arcing. However, despite the fact that two thyristors remain on for brief periods of time during the tap-changing operation, it is permanently attached to the circuit of the deviation switches and is likely to be burned. As a result, the system's dependability may be compromised. Solid-state tap changers provide the following advantages: 1. No arcing while changing taps. 2. Maintenance costs are lower than with a mechanical tap-changer. 3. It is inexpensive. 4. Operation is faster than with a mechanical OLTC .

II. LITERATURE REVIEW

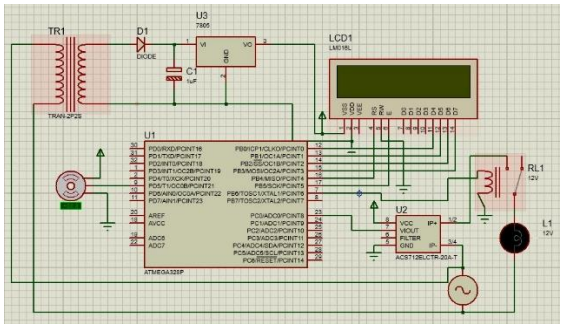
Tap everchanging is the process of neutering the magnitude relation of transformation by sound the windings. Sound is also modified in the main in two completely distinct ways: once the transformer is

detached from the supply, it is called unload tap ever-changing. When an electrical device is working on load (without being de-energized), it is called on-load faucet ever-changing. When an electrical device is off-loaded, it is completely de-energized to avoid arcing at the point of breath. The technique of offload tap ever-changing isn't appropriate for large power supply systems. The sound of that is altered by an on-load tap changer when it is loaded. The techniques employed for onload faucet changers involved the employment of more difficult and expensive tap ever-changing apparatus .

III. PROPOSED METHOD

Eliminating equipment glitches, minimizing labor effort and expense, preventing defects-related accidents, and lowering net costing are all aims of the system. For circuit emulation and Arduino programming, we utilized Proteus software, and for PCB interface design, we used Eagle software. The gadget is designed to transfer electricity from the tap altering transformer as needed. The signal is transmitted to the Arduino Uno R3 when the gadget uses Acs712 to detect current. The Servo would trigger the taps of the transformer based on the received signal. This tapping, as opposed to traditional transformers, has the benefit of allowing optimal applications to be operated from a remote location .

IV. Circuit Diagram:



The voltage from the 230V ac supply in the circuit schematic is stepped down using a step-down transformer. For pure DC voltage, a rectification circuit is installed after the transformer. The circuit connects the IC regulators 7805 and 7812, which have +5 volt and +12 volt regulated power sources, respectively, to ensure a consistent voltage value. The ARDUINO UNO R3 is powered by the ATmega328, a 28-pin microcontroller . It's set up to do a certain job, like executing relays as requested by the user in this project. The relays on the industrial equipment line are actuated when the Acs712 receives a signal. If signal one is present on line-1, for example, relay one is activated. The whole circuit functions in this manner Components Used

• Atmega328 controller • LCD • Crystal • Relay • Relay Driver IC • Transformers • Diodes • Voltage Regulators • Resistors • Capacitors • LEDs • Switches • Asc712

V. Result:

Fig 1 shows the hardware implementation of the system

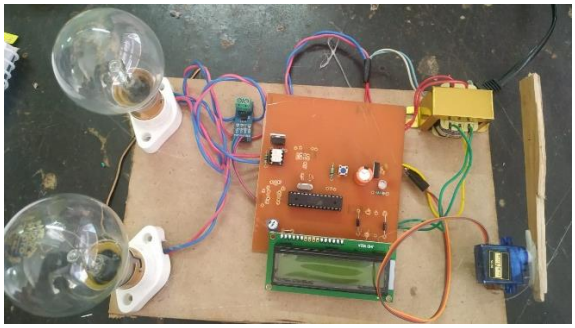


Figure 1 Hardware setup with servo as tap changer.

Below are some of load parameter data of different Load

Above fig are the result of hardware which show the current, voltage, power of system.

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