Load Sharing Of Transformer by Using Arduino

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Abstract: *Transformer is fundamentally a inactive gadget which exchanges the electrical control from one circuit to another circuit with wanted alter in voltage and current at consistent recurrence. It is as it were one gadget which works at most elevated proficiency at full stack condition. But unusual condition happens at over-burdening condition which may result in extreme issue in future. To maintain a strategic distance from such condition we are utilizing other standby transformer which supplies the load when over-burdening happens on primary transformer unit, which switch on consequently by Arduino Microcontroller. This will result in effective stacking of both transformers. Moreover when load is ordinary both transformers can be exchanged on to supply the stack then again. This will avoid the warm over-burdening of transformer. Too this course of action will give legitimate maintenance office for both transformers. At whatever point the sharing of stack on transformer occurs, the administrator gets message through the arduino. All these points of interest will make this system exceptionally effective and reliable.*

Key Word*: Arduino; LCD; Sensor; Transformer*

I.INTRODUCTION

A transformer is a hard and fast tool that transforms energy from one voltage degree to any other. it's an inductively related electrically separated tool that adjusts voltage level without converting frequency. The idea of mutual induction is used by transformers to transmit ac voltage from one electrical circuit to some other. The heart of the power device is the distribution transformer, that's one of the most critical portions of gadget inside the machine. The distribution transformer's efficient operation is crucial to a electricity gadget's reliability. As a end result, critical factors like voltage and present day have to be monitored and managed so as to evaluate the distribution transformer's overall performance. As a result, it assists in warding off or restricting the disturbance as a result of an unanticipated breakdown. Transformers, as one of the most crucial pieces of system within the electric powered energy device, require protection as a part of the overall machine protection method. moreover, rising populace and essential needs have increased the call for electric strength. the existing structures have come to be overburdened due to the rising needs. Overloading on the consumer quit manifests itself on the transformer terminals, posing a chance to the transformer's performance and protection systems. The effectiveness of the transformer decreases as a result of the overload, and the windings grow to be overheated and maybe burnt. Repairing it takes a long time and prices a variety of cash. because of any possible contingencies on transmission strains, any breakdown or disorder in power structures, or economic elements, transformers are from time to time loaded over nameplate specifications. Thermal overload is one of the reasons of distribution transformer damage or tripping. It involves the manipulate towards over contemporary tripping of distribution transformers to prevent transformer damage from overloading at the customer stop.

The growing old of transformers is motivated by an boom within the operating temperature of the transformer owing to overloading. one of the most serious implications of overloading power transformers is increased aging. To maintain the transformers working appropriately, load constraints have to be set. furthermore, when transformers are overloaded, voltage law can also increase and energy thing decreases. The goal of the assignment is to save you the transformer towards overloading. this is completed by using connecting every other transformer in parallel thru a microcontroller and a relay, which shares the first transformer's extra load. To keep away from thermal overloading, the transformers are grew to become alternately. As a end result, two transformers perform efficiently under overload situations, stopping harm. If the load grows over the capacity of two transformers, consumers might be prioritized for load dropping, which will make sure uninterrupted carrier.

II. OPERATION

Handiest one transformer is used to feed the hundreds in the proposed machine. A circuit breaker and a relay hyperlink a standby transformer in parallel. the burden modern-day is constantly measured by means of the contemporary transformer and fed to the Arduino. The consumer enters the reference cost or most load restrict, and the consumer or situation authority also sets the load precedence level. A single transformer might no longer be capable of feed all of the load for the

duration of peak hours when demand will increase. while the weight demand exceeds the reference fee, the Arduino sends a control sign to the relay coil, which energizes it. As a result, the backup transformer will be related in parallel, sharing the burden frivolously. due to the fact the transformers are rated the same. As a result, all the masses are successfully fed, ensuring an uninterrupted energy deliver. when theload exceeds the capacity of the 2 transformers, precedence-primarily based load losing could be enforced. The circuit breaker for the load with the bottom priority can be opened, and the burden will be grew to become off. To keep away from thermal loading, theprimary transformer can be grew to become off while the burden falls and returns to ordinary operating situations. due to the fact theprimary transformer runs for an extended time period than the standby transformer, its body temperature rises. The transformers canbe cooled clearly by permitting opportunity switching .this may boost the gadget's efficiency.

III. METHODOLOGY

The temperature sensor and cargo are linked to the principle transformer. The current sensor is connected to the load. when yourtransformer heats up (the temperature at the principle) the temperature sensor and cargo are linked to the essential transformer. Thecurrent sensor is connected to the burden. when your transformer heats up (the temperature at the primary transformer rises) or yourload rises, your transformer shears its load. We're utilizing a current sensor, but the output isn't always the proper voltage, consequently we're the usage of a sign conditioner to transform the modern sensor's output to the proper voltage. Arduino is used todisplay temperature and modern (continuously). while the temperature or current rises, the Arduino starts off evolved to shear the burden. if your temperature or load exceeds the set factor, your load has grown, and a notification will appear on the display indicating that your load has been sheared to every other transformer due to either temperature or current. the load shear to the second one transformer is then activated by using the second one relay.
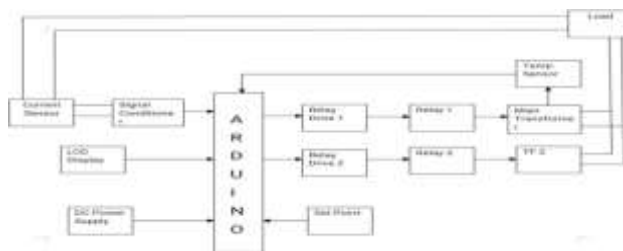
Block Diagram:-

Fig -1 Block diagram

Load is given to main transformer current sensor will measure current continuously. If current is normal then main transformer is ON. If current is above set point 1, Then relay 2 will operate and load is shared by transformer 2. Again if current is increased andif it is above set point 2, then relay 3 will operate & load is shared by transformer 2 as well as transformer 3.If temperature is increasedthen also the load sharing with transformer is done .LCD display is used to display the status of load sharing. Arduino operates on DC + 5v power supply.
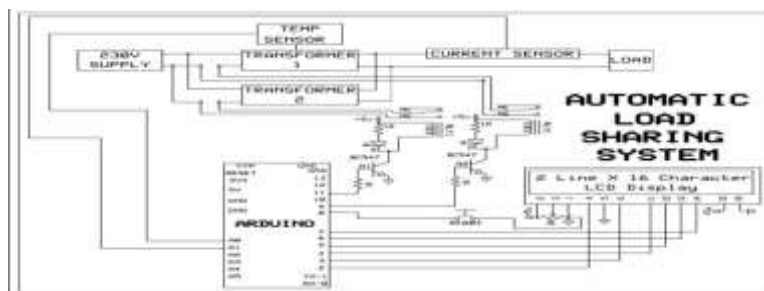
Circuit Diagram:-

Fig-2 Circuit Diagram

Component and Description:

Relay:-

A Cubic, Single-pole 10A Power Relay A single pole double throw relay is a relay with one input and one output terminal. Internally it is wired to be connected as follows: since it only has one input and one output, they act as simple on-off switches in circuits as they can only have 1 of 2 states.

- Sub miniature "Sugar Cube relay "with universal terminal footprint.
- Conforms to VDE0435,UL508,CSA22.2,CQC

- High switching power:10A 250VAC
- Withstands impulse of up to 4,500V
- Coil power consumption:360Mw

- UL class-F insulation type also available
- Tracking resistance :CTI>250
- Contains no lead inside and features
- Cadmium-free contacts ensuring environment-friendly use

Fig-3 Relay

ACS712 Current Sensor:-

Some ACS712 users do not recommend it as a current sensor option due to its low value sensitivity and low linearity, we gave ouralternative recommendation; the Grove - 10A DC current sensor based on ACS725! Based on the ACS725, this is a DC The sensormodule is an economical and accurate solution for your current sensor needs with features measures up to 10 A DC with a basic sensitivity of 264 mV/A! The ACS712 is a fully integrated 2.1 kV rms Hall effect linear current sensor insulator and an integrated low impedance current conductor. Technical terms aside, it's easy to say as a current sensor that calculates and measures the intensityof the current with its conductor applied.

The features of ACS712 include:-
- 80kHz bandwidth
- 66 to 185 mV/A output sensitivity
- Low-noise analog signal path
- Device bandwidth is set via the new FILTER pin
- 1.2 m Ω internal conductor resistance
- Total output error of 1.5% at TA = 25°C

Fig4 ACS712 Current Sensor

LCD Display:-

Display stands are very important in the communication between the human world and the machine world. The display unit works on the same principle, size does not matter The display can be large or small. We work with simple displays like 16×1 and 16×2 units. The 16×1 display unit has all 16 characters displayed in one line and 16×2The displays have 32 characters present on the2nd line. We should know Display of each character there are 5×10 pixels. So to display one character every 50The pixels must be together. There is an on-screen controller, the HD44780 is used to it Control the pixels of the characters to display.

What is a Liquid Crystal Display?

The liquid crystal display uses the light monitoring property of liquid crystals and they do not do not emit light directly. The liquid crystal display is a flat screen or electronic visual representation. If there is little information, LCDs are kept in the still image or content the random image shown or hidden as existing words, numbers or 7 segments Advertising. Random images are composed of many small pixels, and the element has larger items.

Interface I2C 16x2 LCD with Arduino Uno

In this article I will connect a 16x2 I2C LCD to Arduino Uno. In my previous article The interface of the 16x2 LCD screen withArduino Uno is discussed. The difference is in the numbers on. We need more than 12 cores there. But only use

4 wires here. As?!!!!!! Before I use the parallel communication method to connect the LCD to Arduino. But now I use I2C Communication

How it works ?

Here I use the same 16X2 LCD in my previous article. But also attach an I2C form to the 16x2 LCD screen. It acts as an intermediarybetween the LCD and the MCU (here Arduino). Before from the beginning you should know I2C serial interface adapter (I2C module), I2C communication, and address of the I2C LCD

Fig-5 Liquid Crystal Display

Arduino Uno:-

What is Arduino?

Arduino is an easy-to-use and hardware-based open source electronic platform Software. Arduino boards can read inputs: light on a sensor, a finger on a button, or a Post on Twitter - and turn it into output - turn on a motor, turn on an LED, publish something on the internet. You can tell your card what to do by sending a series of instructions to microcontroller on the board. For this you use the Arduino programming language and the Arduino software (IDE), based on processing. Over the years Arduino has been the brainof thousands of projects, of everyday objects to complex scientific instruments. A global community of makers - students, hobbyists,Artists, programmers and professionals - gathered around this open source platform, their Contributions have added to an incredibleamount of accessible knowledge including great helper for beginners and experts. Arduino was born as a simple tool at the lvrea Interaction Design Institute. Prototyping for students without knowledge of electronics and programming. That As it reached the wider community, Arduino boards began to change to accommodate new boards. Requirements and challenges from 8-bit single board to : IOT applications, wearable devices, 3D printing and embedded media. All Arduino boards: Fully open source code that users can create and apply themselves to their specific needs. The software is also open source and growing with it .Share of users worldwide.

What's on the board?

There are several types of Arduino boards available (described on the next page).for other purposes. Some boards are slightly different from the boards below, but most are Arduino boards .Many of these components have the following common properties: Power (USB / Barrel Jack):Every Arduino board needs a way to connect to a power source. the Arduino UNO can be powered via aUSB cable from your computer or from a wall outlet(like this one) that closes in a barrel jack. In the image above, the USB connectoris labeled(1) and the jack is labeled (2).

Fig-6 Arduino Board

- The USB connection is also how you upload the code to your Arduino board. More over how to program with arduino canbe found in our Arduino installation and programming self-taught.

- NOTE: DO NOT use a power supply greater than 20 volts or you will overload (and thus destroying) your Arduino. Therecommended voltage for most Arduino models is between 6 and 12 volts.

Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

Pins on your Arduino are where you connect wires to build a circuit(Probably in conjunction with a breadboard and wire. They usually have black plastic "Headers" that allow you to simply connect a wire directly to the card. The Arduino has several differenttypes of pins, each labeled on the board and used for different functions. GND (3): Abbreviation for "Ground". There are several GND pins on the Arduino, each of them can be used to ground your circuit. 5V(4) & 3.3V(5): As you can imagine, the 5V pin provides 5 volts of power and the 3.3 V pin provides a 3.3 volt supply. Most simple components used with the Arduino run happilyfrom 5 or 3.3 volts Analog (6): The pin range under the "Analog In" label (A0 to A5 on the UNO).Analog input pins. These pins cantake the signal from an analog sensor (such as temperature sensor) and convert it to a numerical value that we can read.Digital (7): Opposite the analog pins are the digital pins (0 to 13 on the UNO). These pins can be used for both digital input (e.g. todetect if a button is pressed) and digital input output (like the power supply of an LED). PWM (8): You may have noticed the tilde (~) next to some digital pins (3, 5, 6, 9,10 and 11 on the UN). These pins act like regular digital pins, but can also be used for something called pulse width modulation (PWM). We have a tutorial on PWM, but for now Imagine that these pins could simulate analog outputs (like an LED going on and off). AREF (9): represents the analog reference. You can usually leave this pin alone. It it is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the higher value limit for analog input pins.

Reset Button:

Like the original Nintendo, the Arduino has a reset button (10). The push will be temporary connect the reset pin to ground and restart any code loaded on the arduino. This could be very useful if your code is not iterating, but you want to test it multiple times.I don't like the original Nintendo though, blowing on Arduino usually doesn't solve any problems.

Power Led Indicator:

Just below and to the right of the word "ONE" on your circuit board, there is a small LED next to it to the word "ON" (11). This LED should light up when you plug the Arduino into a power outlet source. If this light doesn't come on, there's a good chance something is wrong. Time to check again your circuit!

TX RX LEDs:

TX is short for transmit, RX is short for receive. These signs often appear in electronics to indicate the pins responsible for serial communication. In our case there are two placed on Arduino UNO where TX and RX appear - once through digital pins 0 and 1 anda second time next to the TX and RX signaling LEDs (12). These LEDs will give us some fun visual indications when our Arduinois receiving or sending data (like when we are)load a new program on the whiteboard)

Main IC:

The black thing with all the metal tabs is an IC or IC (13). Think of it as the brain of our Arduino. The Arduino' s main IC also differsslightly by board type. Board type, but usually comes from ATMEL's AT mega line of integrated circuits. That can important becauseyou may need to know the CI type (as well as your board type) before hand Load a new program from the Arduino software. You can usually find this information in Labeling on the top of the IC. If you want to know more about the difference between the differentCI, reading the data sheets is often a good idea.

Voltage Regulator:

The voltage regulator (14) is actually not something you can (or should) interact with on the Arduino. But it's potentially useful to know it's there and what it's for. the tension the regulator does exactly what it says: it controls the amount of voltage applied to the Arduino board. Think of it as a kind of guardian; will avoid additional strain which could: damage the circuit. It obviously has its limitations, so don't connect your Arduino to anything bigger of 20 volts.

IV. NEED OF THE PROJECT

The purpose of the proposed works is to protect the transformer against over loads through load sharing. By overloading the transformer, the efficiency drops and the winding is overheated and can get burned By sharing the load between the transformer, thetransformer is protected.

V. OBJECTIVE AND SCOPE

Objectives

The main objective of the project is to protect the transformer in overload conditions sharing the load with a backup transformer and providing uninterrupted power to consumers. Design and manufacture hardware that improves the performance of the load sharing process taking into account the power consumed by the load.

Scope

The future purpose of our project is mainly in the substation .In the cabins, especially during rush hours ,it is necessary to operate additional transformer to meet the additional load requirement .Our design automatically connects the transformer in the presence ofcritical loads. So it is not necessary to use both transformers under normal load. Special during off-peak hours.

In this way, the energyis intelligently shared with the transformers parallel.

VI. RESULT

Fig 7-No Load Sharing

Fig 8- Load Share to the Second Transformer

Advantages:-

- Automatic load sharing by transformers.
- There are no manual errors
- It prevents the main transformer from being damaged due to overloading and overheating.
- Uninterrupted power supply to consumers is guaranteed.
- Comprehensive transformer monitoring.

Application:-

- Power generation and distribution system.
- Processing industry.
- Transformer overload protection.
- Uninterruptible power supply.

VII. CONCLUSION

We conclude that this automatic load balancing system will improve the system efficiency, increases reliability and reduces manual intervention. The "automatic loading "Sharing Transformer Using the Arduino demo runs two transformers in parallel Automatically share the load using a changeover relay and microcontroller circuit. This protects against overload and overheating and thus ensures an uninterrupted power supply customer.

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