



IMPLEMENTATION AND DEPLOYMENT OF SMART MOTOR STARTER USING MACRODROID

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Abstract— As we know, India is an Agricultural dominated country. According to survey of National Statistical Office's Situation Assessment of Agricultural Households (SAAH) report for 2018-19 India officially has anywhere from 90 million-plus to almost 150 million farmers. But the fact is that the concept of smart farming is on the low scale and farmers are not implementing in their land areas. Because they do not know the power of automation. If the breadwinner of the world is happy then all the country will become happy, isn't it? So that is why we need to come one step forward to do something smart in this agricultural area with some innovations that are truly farmer friendly. More than 90% farmers using submersible & open well motors. This paper represents the implementation of farmer friendly android automation tool which is capable to do many tasks according to the workflow of farmer. This android system is designed to turn on/off motor, schedule on/off, timer, gathering of electrical information from panel box and many more applications. This device will reduce the manual operation of motors for which farmer need to go to the farm field.

Keywords— *Agriculture, GSM, Irrigation system, Motor controlling, SMS.*

I. INTRODUCTION

As we know that three phase induction motor works on a three-phase supply R, Y and B. If any one of the supplies is not available, motor coil will burn due to excessive current draw. To avoid this condition, we can use many protection systems like single phase preventor, VFD's, etc. We have done this project designing in a such a way that, both remote controlling as well as full protection of submersible motor can be possible [1-2].

Using an Android Automation Tool, we can control the motor remotely by integrating an Android device with Automation Tool installed to the single phase preventor. Single phase preventor is nothing but a device to calculate the voltage difference between the two of the phases of three phase supply system [3]. If the voltage is in the permissible level, then supply is healthy, and motor is ready to run on that voltage else if the voltage difference is not in the predefined level, then this condition is called as voltage unbalancing. So, in this condition motor can run but it can draw excessive current through its coil so to avoid it, motor should be protected from this unhealthy condition [4]. But by remotely doing this without any information about the supply voltage and all electrical parameters is not possible. We need to develop a fully automatic and two ways i.e., a duplex communicated automation system [5]. The solution is here we can program an android device in a such a way that it can be capable to fully interact with the user regarding all mechanical as well as all electrical parameters and should provide a specific query according to the situation. And all the information should be available on the fingertips of the user anytime and anywhere. The advantage of this technology is there is no

need to carry any separate device, any android device with 1 GB RAM is sufficient to carry out the task [6-7]. By using this technology, we can save time, money and life of farmer thus increases the crop yield.

II. OBJECTIVE

1. To protect a motor from voltage fluctuations, voltage unbalancing and from any abnormal condition.
2. ON/OFF Controlling of motor remotely by using a fully two ways communicated and automated system.
3. To provide the system that can be capable to interact with user regarding any electrical quantity when requested.

III. PROBLEM STATEMENT

After a survey, we observed that farmers are using a traditional manual method to control their submersible motors. This method is time consuming, and it is a safety incautious method. Many of the farmers lost their lives by wild attack while going to turn on and off the motor at nighttime. Also, the timings of the supply availability are not fixed and same in all over India [8]. So, to solve this problem we need to develop a system that can control the motor starter remotely as well as can be communicate with the user and suggest the necessary remedies over the any abnormal condition.

IV. BLOCK DIAGRAM

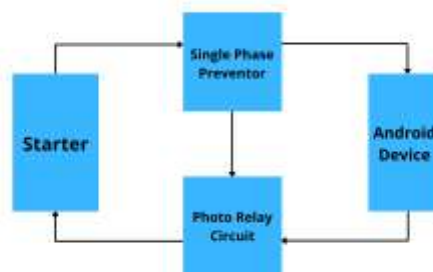


Fig.1 Block diagram

Block Diagram Description:

The block diagram above shown consists of Starter which is of DOL (Direct-On-Line) type, Single Phase Preventor also called as auto switch, Photo relay circuit consists of LDR (Light Dependent Resistor), signal amplifier transistor and Relay switch of 12V with a contact voltage and current handling capacity of 220 to 270 volt and 1 to 1.5 A respectively [9]. The single phase preventor is used to calibrate the supplies given to the motor starter and will decides whether the supply is faulty or not? And gives the indication by the medium of LED's. There are two LED's one is for supply healthy (green), and one is for faulty (red). The wavelength produced by this LED's sensed by the android devices' light sensor and will provide the output to the photo relay circuit. The single phase preventor is also connected to the photo relay circuit [10-12]. If the triggering signal is given only by the single phase preventor to the relay provided that the supply is healthy and android device is not giving the signal to the photo relay circuit even when the supply is healthy provided that the manual mode is set on in the android device remotely the relay will not trigger, and starter coil will not be going to energized. At a time one LED can glow on the single phase preventor.

The android automation system is connected to the photo relay circuit optically while single phase preventor and photo relay circuit are connected electrically. The photo relay circuit consists of transistor which acts a switch and relay to close the circuit of coil of starter.

V. SYSTEM REQUIREMENTS

A. Hardware requirements

- Photo relay circuit (Relay, Capacitor, LDR, Transistor BC548, LM7812)
- Single phase preventor (Auto switch)
- Three-phase motor starter (5HP)
- Android device (1GB RAM 512 MB Internal Memory)

B. Software requirements

- MacroDroid
- Android

VI. MODELLING

- **Single Phase Preventor (Auto switch) (PX-101)**

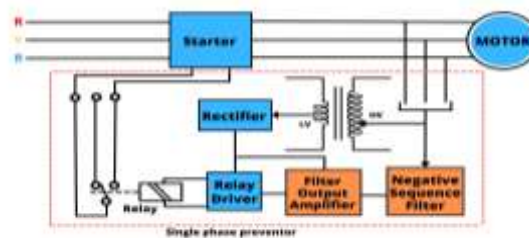


Fig. 2 Single phase preventor

Auto switch or Single phase preventor is particularly a Triggering Unit which connected to a 3 Phase Supply 440v (RYB) and multiple connections of starter with several types of output such as the two terminals of SPST switch shown in the figure is connected across ON Push Button. If the switch is on, then Auto switch will be on auto mode and if the switch is OFF then Auto Switch is on Manual mode. This auto switch consists of microcontroller and relay. The microcontroller inside the single phase preventor is used to check supply voltage levels. And if the supply voltage is in permissible level, the signal is sent to the relay circuit which turns on the starter.

If there is a voltage imbalance between the given input supply is more than the predefined value, then the microcontroller will not send any signal to the relay triggering circuit. And therefore, the starter will not be turned on thus saves coil of motor from excessive current due to voltage imbalance and fluctuations from burning. This auto switch also has two indicators one is for supply faulty means Timer ON and another one is for supply healthy. The TEST button is also provided to test the auto without delaying. The circuit inside the auto switch works on the +12V DC Supply. To convert a 440V AC supply to a +12V DC power supply Transformer (Step down), Rectifier (Bridge Rectifier), Filter Capacitor & Regulatory circuitries are used.

- **Photo Relay Circuit**

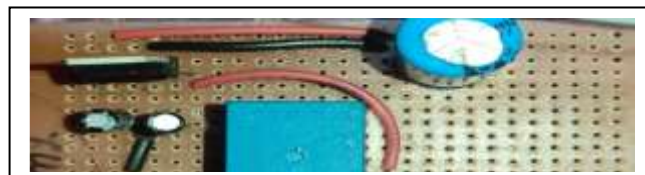


Fig.3 Photo relay circuit

The figure above shows the photo relay circuit. It consists of electromagnetic relay of 12V, regulator 7812 positive voltage regulator IC, transistor BC 548 and LDR. LDR senses the light, when the light falls on the LDR the resistance of the LDR becomes low and provides a conduction path for the current through it and completes the circuit and vice versa. The transistor BC 548 is used for switching purpose. The capacitor filter of value 4700mfd is used to get the pure DC at the input of photo relay circuit].

- **Electromagnetic Relay**

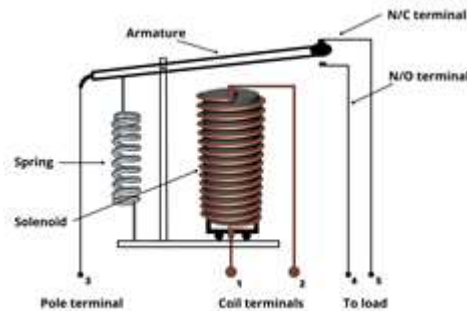


Fig.4 Electromagnetic relay

The relay we are using is of 12V. Electromagnetic relay works under the principle of electromagnetic induction. This type of relay available in the market in a plastic case and all the relay terminals brought out from a plastic case. It has total 5 terminals.

The relay above shown in the figure no.4 is of electromagnetic type. Electromagnetic means when we apply an electric supply across a conductor it produces a magnetic field around it. But it is not enough to attract any metal piece so to increase the strength of magnetic field we need to concentrate the field so in this relay there is a coil. The two end terminals of the coil are shown by 1 and 2 number terminals. 3rd number terminal is pole terminal it is normally connected to the 4th terminal. If the supply (AC or DC) is given to the coil terminals 1 and 2 coil will be energized and will attract the armature contact so the connection of pole terminal 3 gets disconnected with the normally closed contact number 4 and gets connected to the contact number 5. So, by the following operation we can say that the given relay is of single pole double throw type.

VII. USER INTERFACE

The use interface of the automation system can be accessed by using predefined triggers added by user. User can use the trigger to access the IVR menu are by calling a number, by launching an app, by using custom quick action tiles, by using widgets, etc. If user want to check supply status means condition of supply voltage, then user will type '1' and press 'OK' the in-background transmitter device will send the message according to the query passed by the user. This query will reach to the receiver side and receiver side device decodes the received query and according to the query actions will be taken by the received device.



Fig.5 User interface



If the supply is Healthy then receiver side device will send the message in a coded format to the transmitted side, this coded message decodes by the transmitted side device and the result of the query is displayed on the screen in the dialog box.

VIII. PROJECT IMPLEMENTATION

The overall idea behind this project is to use the present GSM infrastructure. So, all the operation involves the GSM system also. So, when the user accesses the IVR panel using one of the triggers assigned by the user macrodroid tries to contact with the receiver's device. When user sends the query by pressing the corresponding number option (different for different queries), In background the transmission system sends SMS in a coded format which is in understandable format for receiver side device. The macrodroid Installed on the receiver side's device will decode the message and necessary actions will be taken by the remote side device.

We can read the messages sent by the receiver & transmitter in messaging box. But we are unable to decode it because it's all in the coded language only understandable by the macrodroid & android system.

IX. RESULTS

Condition	Supply	Auto Mode	Photo Relay Circuit	Motor
1.	Healthy	OFF	OFF	OFF
2.	Healthy	OFF	ON	OFF
3.	Healthy	ON	OFF	OFF
4.	Healthy	ON	ON	ON
5.	Faulty	OFF	OFF	OFF
6.	Faulty	OFF	ON	OFF
7.	Faulty	ON	OFF	OFF
8.	Faulty	ON	ON	OFF

Table 1. Results of experiment

X. ADVANTAGES

1. Saves time by avoiding travelling to motor room every time to switch on and off motor.
2. Saves electricity by turning motor off while not needed.
3. Saves life by avoiding attack of wild animal while going to motor room in nighttime.
4. ON and OFF scheduling is possible.
5. No need to go and turn ON/OFF motor manually while watering the crop.
6. Protect motor from dry run.
7. Flexible wiring kit in modular way helps to make easy wiring and handling.
8. Protect motor from phase imbalance and low voltage.
9. Motor controlling is possible from anywhere and anytime.

XI. CONCLUSION

As far as we know that a microcontroller can manage a one process at a time but in case of microprocessor it is capable to manage the more than one processes at a time. Also, the modification in programming of android automation tool is easy to understand than the other microcontroller's programming. This is the advantage of using an android device. By this we can conclude that this system works efficiently in case of motor starter automation. We can implement any industrial as well as agricultural complexity using this tool. This device will save the cost, fuel and time of the farmers. It also saves the lives of the farmer because there are some chances of wild attack at nighttime.



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