REAL TIME MONITORING SCHEME FOR HIGH VOLTAGE CAPACITOR BANK

Priyanka Mane[1], Tejaswini Patil[2], Mrunal Patil[3],

Sakshi Pawar[4], Shreya Kapase[5]

[1,2,3,4,5]Electrical Engineering,

Nanasaheb Mahadik College of Engineering, Peth (India)

ABSTRACT

Now days, the electricity distribution companies are experiencing unexpected capacitor failures. This paper describes a new algorithm for selection of faulty circuit in parallel series compensated line. It's suitable for protection of such lines and uses one end phase currents measurement only tracking the performance and health of capacitor bank in distribution system is a changing task due to their high number and we the widespread geographical distribution of feeder circuit. In this work we proposes signal monitoring technique capable voltage identifying and characterizing the exact number of capacitor gets faulty. The main aim of this project is to present a simple online fault detection technique.

Keywords: Faulty circuit discrimination, fast line protection, fault detection.

I.INTRODUCTION

We know capacitor bank provide reactive power thereby improving power factor, reduced line losses improved feeder voltage profile and low power line loadings.

The possibility of dielectric failure in one or more capacitor units is always present, and it a faulted. Capacitor in not immediately removed from the circuit, the internal arc in the capacitor is likely to cause rupture of the case and damage to adjacent good capacitors. For this reason,it customary to connect an individual fuse in series with each capacitor unit. So that the fuse will blow and disconnect it's capacitor from the bank immediately upon failure of the capacitor.

Once in operation, unmonitored capacitor bank are difficult to evaluate and there real performance is obtain unknown. While sophisticated system provides communication to each and every bank for remote monitoring, this practice is expensive and not widespread in the electric utility industry. The technique proposed in this project enables the remote identification and monitoring of capacitor banks using measurements performed only in substation with no manual checking the banks deployed in the branch and with no prior knowledge of the number and size of the banks deployed. We propose the use of a single monitor device per capacitor bank, to that task we employ an on line fault detection technique which measure the capacitor charging current and compare with reference value.

The automatic identification and monitoring allows for future localization of abnormal in capacitor banks of distribution lines.

II.EXPLANATION

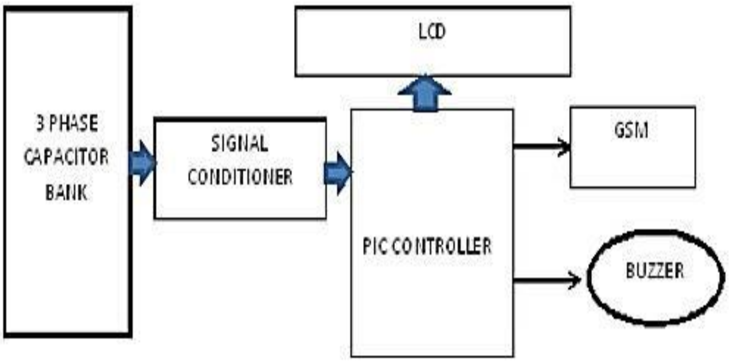

Fig. 1: Block Diagram

The capacitor bank is actually connected in parallel with line for improvement of power factor shown in block diagram above. The capacitor charging current (ic) is sensed by using CT. Sensed signal is fed to input port of the PIC microcontroller.PIC microcontroller also having another two reference inputs, to set the upper and lower reference values to rated charging current of the capacitor considering suitable tolerance.PIC microcontroller continuously monitoring the capacitor charging current and compared with the reference inputs. If current is within the limit then there is no generation of error signal.

Whenever capacitor charging current of any phase is out of tolerable limit then error signal is generated, now controller further proceed for next ten operations on same phase after ten operations if error is remains same then error signal is amplified and transmitted through GSM modem. Sent signal from PIC controller is received on mobile phone. This received signal is given idea about exactly which capacitor gets faulty.

III.CIRCUITDIAGRAM

IJARSE
ISSN: 2319-8354

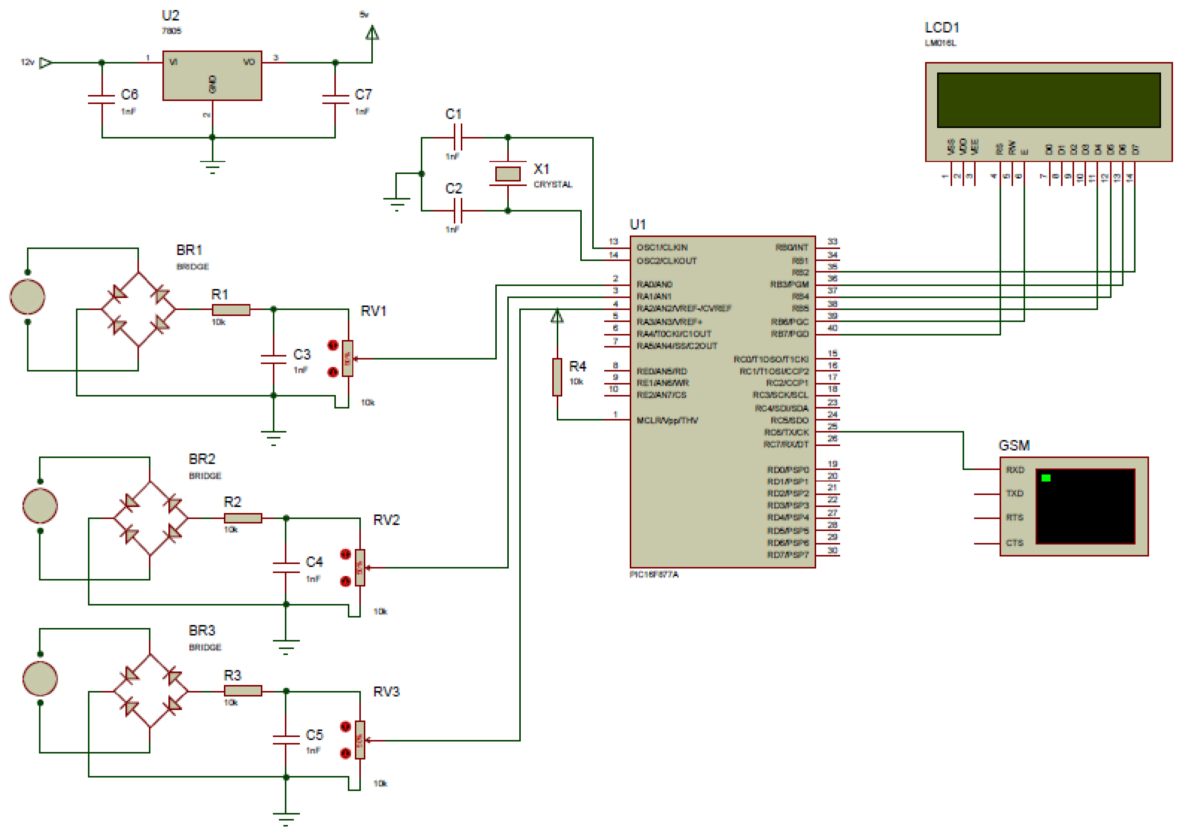

Fig.1: Circuit Diagram

C.T: The output of C.T is in the form of voltage which will be dependents of input. Flow current (i.g in A.C) but the C.T output is given, to micro circuit which will require below 5 V DC. Hence we need a signal condition circuit.

SIGNAL CONDITIONS: In a signal condition circuit convert A.C output in D.C with the help of bridge rectifier then this output is given to RC circuit for measuring the DC voltage into pure form and output is taken through a pot for calibration purpose.

IV.MODEL DESCRIPTION

The actual model we made is shown in above figure. While designing this we have done a systematic arrangement of each and every part of kit.

In this model, CTs are connected with a capacitor bank. This CTs are used to sense the current and convert the current into appropriate lower value(we used30:5 ratio CT). It means that secondary current from CT we get 5A. This current is given to PIC microcontroller.

After this analog signal converting into its appropriate digital signal and another two reference signal(upper and lower current) with the help of analog to digital converter (ADC). These references are set according to capacitor rated current with tolerance PIC microcontroller continuously monitoring the capacitor charging current with the reference inputs. If current is within the limit then there is no generation of error signal.

Whenever capacitor charging current of any phase is out of tolerable limit then error signal is generated, now controller further proceed for next ten operations on same phase, after ten operations if error is remains same thenerror signal is amplified and transmitted through TXD and RXD pin of port 3. This signal is goes display by port 0.

Sent signal from port 3 of PIC microcontroller is received on mobile phone. This received signal is given idea about exactly which capacitor gets faulty.

V.TESTING

5.1 Testing Methodology

We are testing on the different capacitors and whole set up connected with project.

Testing of the capacitor:

5.1.1 AC Test

5.1.2 Voltage Test

5.1.3 Capacitance Test

5.1.4 Charging current Test

5.1.1 AC Test:

In this test the conductivity is checked between body of capacitor and terminals of same capacitor. Here voltmeter is placed between body casing and terminal to check short circuit if any in capacitor.

5.1.2 Voltage Test:

In this test capacitor is loaded at its full load voltage rating to check its withstand capacity and parameters.

5.1.3 Capacitance Test:

As capacitance represents the capacitor's ability to store an electrical charge on its plates. We can define one farad as the capacitance of capacitor which requires charge of one coulomb to establish a potential difference of one volt between its plates as firstly described by Michel Faraday. So larger the capacitance, then higher is amount of the charge stored on the capacitor for the same amount of voltage.

$Q=C*V$

Where, Q=Charge in coulombs

C=Capacitance in farad

V=Voltage in volts

5.1.4 Charging Current Test:

The current that flows through a capacitor is directly related to the charge on the plates as the current is rate of flow of charge with respective time. As capacitor ability to store charge (Q) between its plates is proportional to applied voltage(V), relation between I and V that is applied to the plates of capacitor becomes-

i(t)=C*dv / dt

VI. APPLICATIONS

- Capacitor Banks for Distribution feeders.

-In distribution feeders more losses are present for this losses overcome capacitor bank is connected for improvement of the power factor of distribution feeders, there are used the proposed on-line fault detection technique.

- Capacitor Banks for Transmission Sub-Station.

-Capacitor bank is used them for Transmission Sub-Station for improvement of the power factor purpose

- Capacitor Banks for Industries.

-Capacitor banks where used in any system there are used project proposed on-line fault detection technique

VII. FUTURE SCOPES

Further Development In this Project Enables Opportunity For Fully Automatic Smart Grid System.

APFC Panel has microcontroller based programmable controller which switches the capacitor banks of suitable capacity automatically in multiple stages by directly reading the reactive load (RKVA) which works in the principle of VAR sensing tends to maintain the PF to 0.99 Lag. The capacitor banks may be selected in number of stages as 4/6/8 according to the load pattern. Install APFC Panel to avoid penalties and enjoy the benefits automatically. But APFC panel is not monitoring the capacitor bank which is connected in Transmission lines. In future our new technique proposed in this project enables the system includes in APFC panel for which monitoring and controlling purpose. The automatic identification, monitoring and controlling allows for future localization of abnormalities in capacitor banks at distribution lines

VIII.CONCLUSION

Several simulation and experimental results are presented to validate the proposed fault detection technique. This automatic system reduces time, cost & and improves performance and reliability of systems.

It stimulus to "Smart Grid Concept"

REFERENCES

[1] IEEE Tuckey, David T.Victoria, B.C. V8P 2J5 (CA), Lupin, Jean-Marc,Pers-Jussy, 74930 (FR) EP 2 439 547 B1 2013.

[2] The 8051 Microcontroller & Embedded Systems.

(By- M. A. Mazidi & J.G. Mazidi, second edition, Published By Person Education, 2006)

[3] Instruction Manual for installation, operation & maintenance (EPCOS).