International Journal on Applications in Basic and Applied Sciences
Volume 1: Issue 1: January 2015, pp 5-13. www.aetsjournal.com

INDUSTRIAL LOAD SHARING MANAGEMENT AND FAULT CLEARANCE USING PIC CONTROLLER

S.R.Balan[1],R.Ramprakash[2],K.Krishnamoorthi[3], M.P.Arun pandian[4],S.Dineshraj[5]

1.asst.prof of eee, kalasalingam institute of technology.

2,3,4,5-UG students,kalasalingam institute of technology.

ABSTRACT-*The project is all about protecting the transformer under overload condition. Due to overload on the transformer, the efficiency drops and the secondary winding getsover heated and may burnt. In thus, best quality of transformers can be used. In PIC microcontroller is the main part to controlling and signaling the system. Transmission lines having high current and voltage to measure by using current and potentialtransformers. Display screen displays the oil range and temperature of transformers, current and voltage range,etc.We are using load in our system has lamps.(three loads).In ADC, Rectifiers and relays can be used. This Project describes about, how to use power supply,when critical load. Using this module can protect the transformer form the over load. This project will connect and disconnect the transformer automatically.*

I.INTRODUCTION

In our topic to analysis about multiple process made to achieveour objectives.It's simple construction and big support to industries,factories,mills.., any failure of electrical equipment to be easily identify and replace it.Low or High voltage problems are made to be easily handled.In high production company not worry about any drawbacks occurs in manufacturing time and also less stress to workers.The transformer is a static device, which converts energy at one voltage level to another voltage level. So, by reducing the load on the transformer, the transformer is protected. This will be done by arranging another transformer through a micro-controller. The micro-controller compares the load on the first transformer with a reference value. When the load exceeds the reference value, the second transformer will share the extra load. Therefore, the two transformers work efficiently under overload condition and the damage is prevented. In this project three modules are used to control the load current. The first module is sensing unit, which is used to sense the current of the load; the second module is control unit. In this module electromagnetic relay is the main role, and its function is to change the position with respect to the control signal and last module is microcontroller. It will read the analogue signal and perform some calculation and finally gives control signal to the relay. When designing low-voltage power systems to supply large load currents, paralleled lower-current modules are often preferred over a single, large power converter for several reasons. These include the efficiencies of

designing and manufacturing standard modular converters which can be combined in whatever number necessary to meet a given load requirement and the enhanced reliability gained through redundancy.The project is all about the protecting transformer under overload condition.Drop in effiency and overheating in secondary winding can be prevented with help of this project.Load sharing transformer is possible with the help of this project theme and life of the transformer is increased.This project is also used as a un-interrupted power supply.If short circuit is occurs transformers is protected.

The referance diagram(Fig-1) is given below:

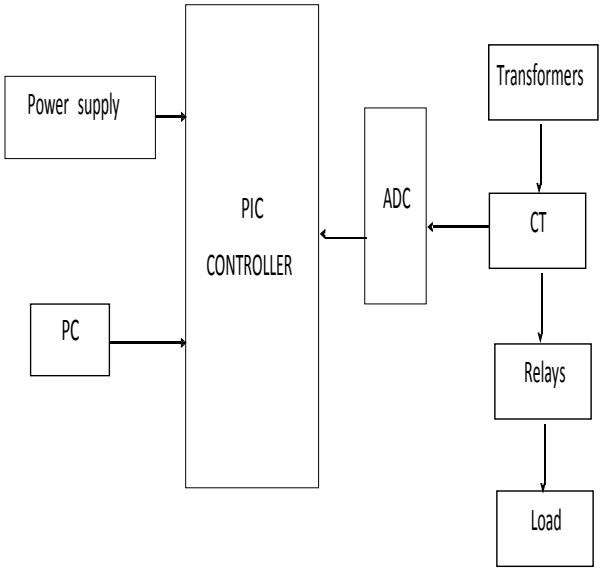

Fig-1

The substation may be defined as "an assembly of apparatus which transforms the characteristics of electrical energy from one form to another say for example from alternating current to direct current or from one voltage to another". For economical transmission, higher and higher voltages should be achieved. At present normal voltages are 66kV, 110kV and 220kV; however 440kVwill be used for the national grid system in future. The consumers do not use such high voltages and so the high voltages must be transformed to low voltages by means of substation. Thus a substation may be called as link between the generating stations and consumers.Substations or switching stations are integral part of transmission system, and function as a connection or switching point for transmission lines, substation feeders, generating circuits and step up and step down transformers .substation of voltages 66kVto 400kV are termed as EHV substations. Above 500kV, they come under the terminology of UHV system.In the first or primary winding creates a varying magnetic flux transformer's core and thus a varying magnetic field through the secondary winding. This induces a varying electromotive force (EMF) or "voltage.secondary winding. This effect is called mutual induction.If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from theprimary circuit through the transformer to the load. In an ideal transformer, the inducedvoltage in the secondary winding (Vs) is in proportion to the primary voltage (Vp) and is in the primary follows as:

Vs/Vp=Ns/Np

given by the ratio of the number of turns in the secondary (Ns) to the number of turns in the primary(Np).By appropriate selection of the ratio of turns, a transformer thus allows

anvoltage to be "stepped up" by making Ns greater than Np, or "stepper down" by making Ns is less than Np.

II.BLOCK DIAGRAM

In this project block diagram(fig-2) represents major operating components are given as,

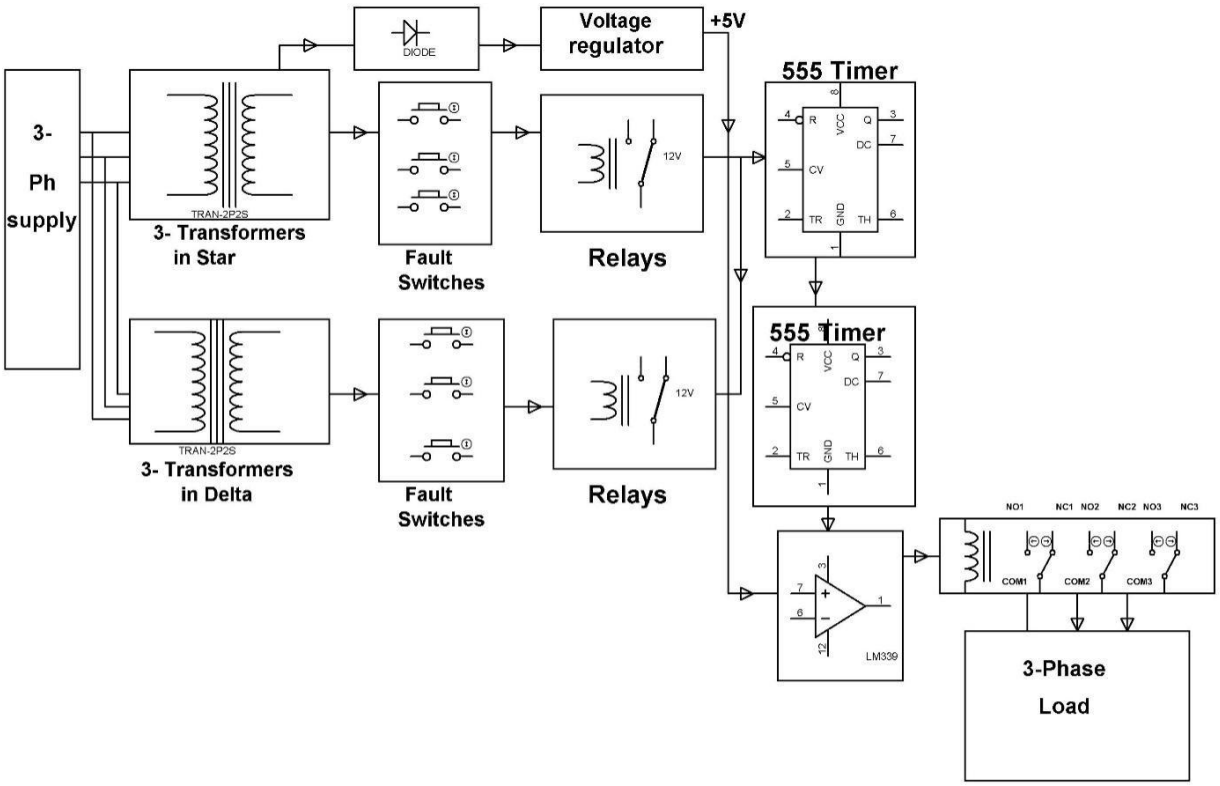

Fig-2

A.Power Transformers

Power transformers are used for stepping up the voltage for transmission at generating stations and for stepping down voltages for further distribution at main step down transformer substation. Usually naturally cooled, oil immersed, known as on type, two winding, 3-phase transformer, are used up to the rating of 10MVA. The transformers of rating higher than 10MVA are usually air blast cooled. For very high rating, the forced oil, water-cooling and air blast cooling may be used. For regulating the voltage the transformers used are provided with on load tap changer.

B. Current Transformers

The current transformers(fig-3) are rated voltage of the installation, the rated currents ofprimary and secondary windings and the accuracy class. The accuracy class indicates the limit of the error in percentage of the rated turn ratio of given CT. CT is available in accuracy classes 0.5, 1, 3, 10.

Fig-3

C.Potential Transformer

Potential transformers are instrument transformers. They are used to increase the range of voltmeters in electrical substations and generating stations. There is a large number of primary turns and only few secondary turns so that the voltage is stepped down from the high voltage used in a power transmission line to a low voltage actually being measured. For example, 13 kV is stepped down to 5 volts which is then measured using standard instruments.

D.Relays

The protective relays are connected in the secondary circuits of the CT & PT. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switchingmechanism is carried out with the help of the electromagnet.

It is an electro-magnetic relay(fig-4) with a wire coil, surrounded by an iron core. A path of very low reluctance for the magnetic flux is provided for the movable armature and also the switch point contacts. The movable armature is connected to the yoke which is mechanically connected to the switch point contacts. These parts are safely held with the help of a spring. The spring is used so as to produce an air gap in the circuit when the relay becomes de-energized.

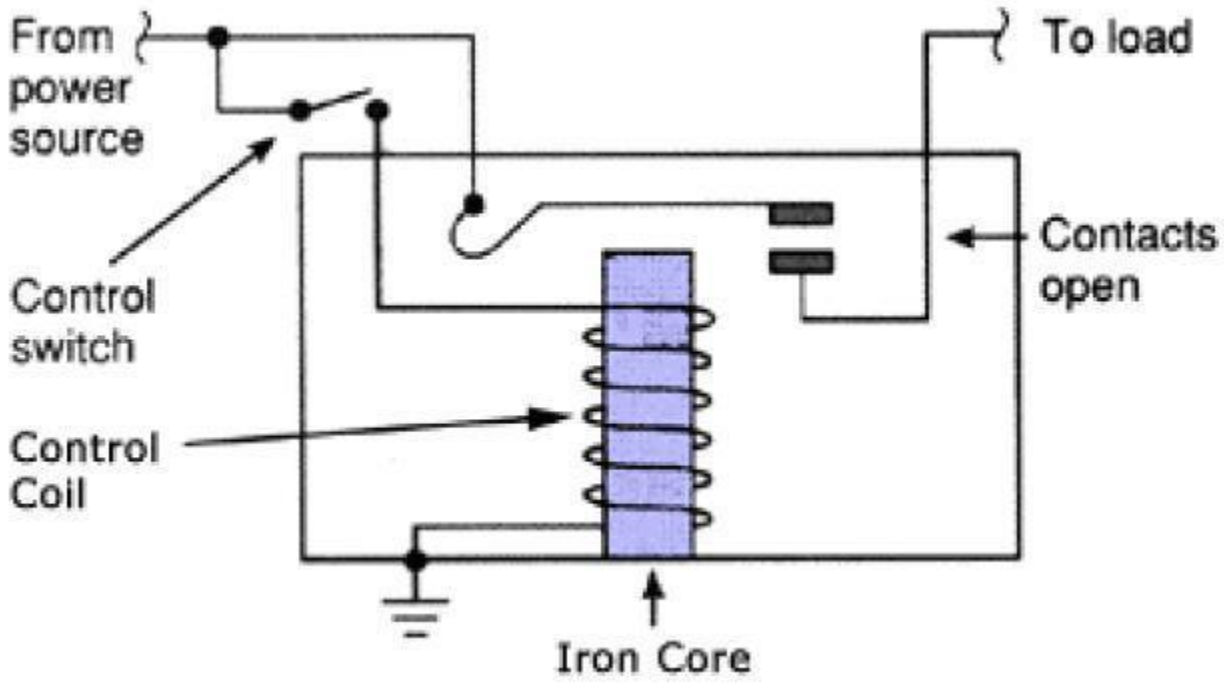

Fig-4

The above mentioned relay is of SPSTS (Single pole Single throw Switch) type. In our project, we have used SPDTS (Single pole Double throw Switch) type. In this relay, as mentioned in SPSTS, an electromagnet is there. It also has 3 contacts: Common, Normally Closed, Normally Open. When this electromagnetic coil is energized, the Common terminal connects to the Normally Open contact. When the coil gets de-energized, the common terminal connects to the Normally Closed.

F.Parallel operation of Transformers

The essential conditions for successful parallel operation of transformers are given below:

I. Transformation or turn-ratios and voltage ratings are same.
II. Polarities of the transformers are same.
III. Percent impedances of the transformers are same.
IV. Ratios of resistance to reactance are same.
V. Phase displacement between primary and secondary windings of the transformers issame.
VI. Phase sequences of the transformers are same.

(i) Single Phase Transformers

For single phase transformers only the first four conditions apply as there is no phase sequence and phase displacement due to voltage transformation. If the turn-ratios or voltage ratings are not same a circulating current will flow even at no load. If the percent impedance or the ratios of resistance to reactance are not same there will be no circulating current, but the division of load between the transformers

when supplied will no longer be

proportional to their KVA ratings. Hence the capacities of the transformers cannot be utilized to a full extent. When the polarity of one transformer is additive and that of the other is subtractive, the transformers may be operated in parallel by reversing the connection of primary or secondary side of either transformer. In such a case check that dielectric strength is satisfactory when the reversed winding has a graded insulation.

(ii) Three phase Transformers

The same conditions hold true for three phase transformers except in the case the questions of phase displacement and phase sequence must be considered. Phase sequence refers to the order in which the terminal voltages reach their maximum values. In paralleling those terminals whose voltages reach their maximum simultaneously are paired.Certain transformer connections as the Wye-delta or WyeZigzag produce a phase displacement of 30° between the line voltage of primary side and those of the secondary side. Transformers of such connections cannot be run in parallel with the transformers not having this phase displacement such as Wye-Wye, delta, - delta zigzagdelta or zigzag-zigzag.

G.Driver Circuit Driver circuit performs amplification process. A transistor is used for that. It is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of semiconductor material, with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals.Because the controlled (output) power can be much more than the controlling (input)power, the transistor provides amplification of signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits

H.IC Regulator

An IC regulator is an electrical regulator designed to automaticallymaintain a constant voltage level. A voltage regulator may be a simple “feed-forward”design or may include negative feedback control loops.It may use an electromechanicalmechanism, or electronic components. Depending on the design, it may be used toregulate one or more AC or DC voltages.

I.Power supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of thedesired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltagevariation.A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc.

III.PIN DIAGRAM:

The PIC microcontroller(fig-5) is given below:

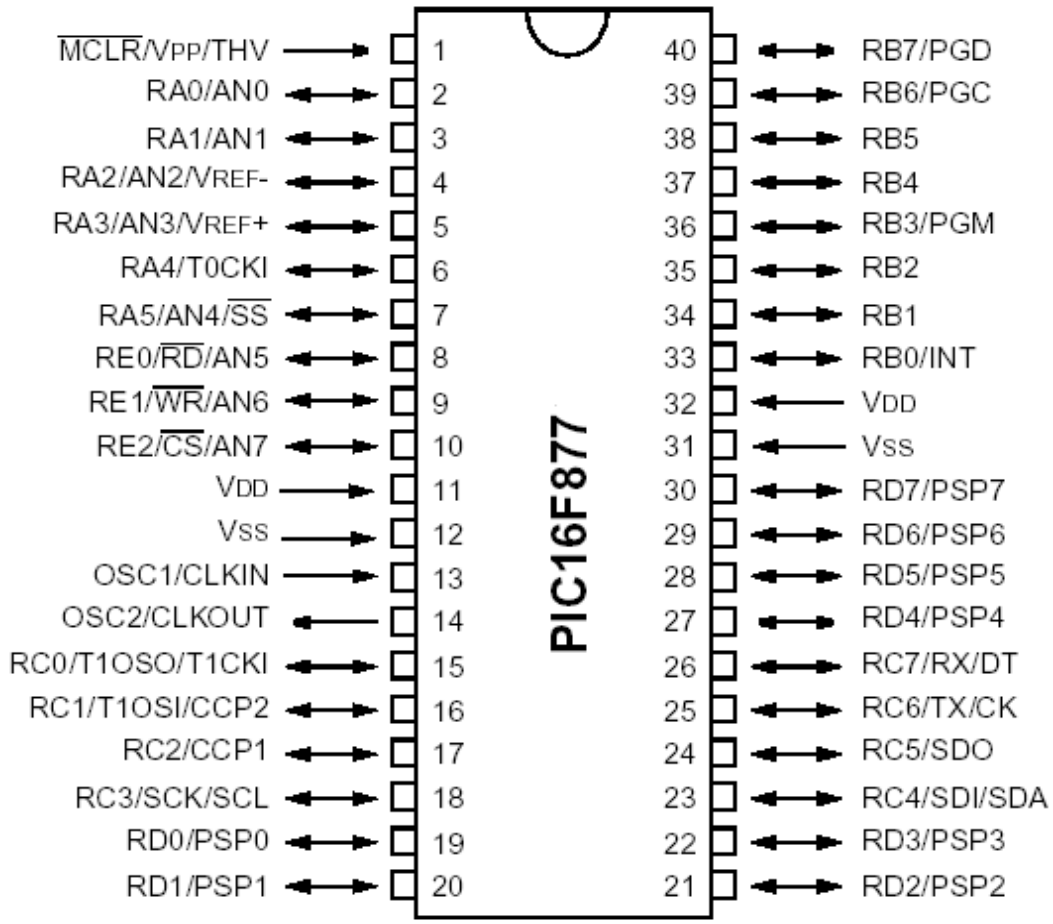

Fig-5

IV.ADDITIONAL COMPONENTS:

A.Temperature sensor:

The LM35(fig-6) is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in **º**C)Temperature sensor LM 35 generates voltage proportional to the room temperature. No external circuitry is needed to measure temperature. Voltage varies in a linear fashion with the scaling factor 10mV/ºC.First, do supply wiring. Then, measure the voltage at the output pin. (Originally, it generates 1V at 100 degree centigrade.) Hence, the current temperature can be found using,

You can measure temperature more accurately than using a thermistor.

- The sensor circuitry is sealed and not subject to oxidation, etc.
- The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

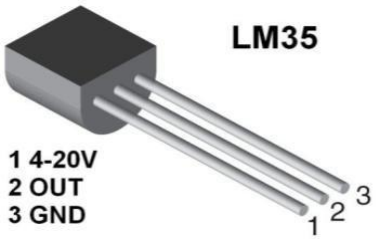

Fig-6

B.ADC:

Analog to digital (A/D, ADC) converters are electrical circuit devices that convert continuous signals, such as voltages or currents, from the analog domain to the digital domain where the signals are represented by numbers.

C.LCD Display Section:

This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information.

V. onclusion And Future Scope

The project describes about how to use power supply intelligently under peak loads. The project automatically connects and disconnects the transformer thus protectingtransformer from overload. Sensing unit, ie.Current transformer plays an important roleby sensing the current through the load and sending feedback signal to themicrocontroller.PIC Microcontroller is so programmed that as soon as the load exceeds aparticular current limit it will soon generate a control signal that would be amplified bythe driver unit and finally control signal is fed to the Electromagnetic relay. For workingthe relay AC supply is obtained through the inverter. The switching process occurs in theElectromagneticRelay which automaticallyconnectsthe transformerinparallelinaccordance to the load sensed by the CT.The future scope of our project is particularly inSubstation. In substations particularly during the peak hours there is a need for theoperationofadditionaltransformerto supply the additional loadrequirement. Our projectautomatically connects the transformer under critical loads. Thus there is no need tooperate both transformers under normal loads, particularly during off peak hours. Thuspower is shared intelligently with the transformers in parallel.

VII.References

[1]www.Transformerprotection&monitoring andcontrol.pdf

[2]http://www.chetanasprojects.com/Thread-EMBEDDED-MICROCONTROLLER-PROJECTS.

[3]www.microchip.com/downloads/en/devicedoc/39582b.pdf

[4]http://www.docstoc.com/docs/41554618/PIC-Microcontroller-Development-Board-%28PIC-16F877A-40-Pin%29.

[5]www.barcolair.com/PDF/BarberColman/Load%20Sharing/f22107-4.pdf

[6]www05.abb.com/1MRK500401SEN_en_Transformer_protection_monitoring_and_control.pdf

[7]http://www.chetanasprojects.com/Thread-EMBEDDED-MICROCONTROLLER-PROJECTS--4754