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Power Quality in Distribution System using Automatic On-Load Tap Changer(Oltc)

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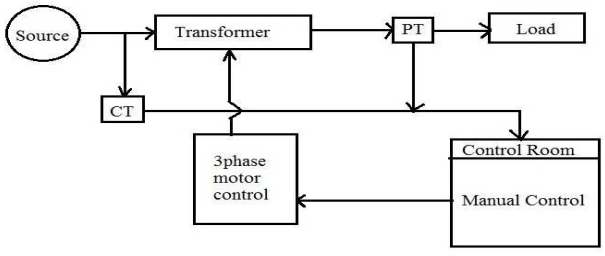
***Abstract*— This project mainly focused on distribution of quality of power. The main criteria required for all the devices is the voltage. It plays vital role in a power quality. In this project it is planned to provide a transformer with multiple taps and selecting the taps required for the moment will be automatically selected by the on-load changeover system which is operated by the controller. In this project as a project model computer acts as a controller with the aid of the Csoftware. In this project voltage transducers are used to sense the voltage and ADC to convert into digital signals. These digital signals arte interfaced with computer which in turns operates the on load tap changers. Suitable taps are selected and its drive relays are operated by the computer through opto-coupler and switching transistors**

I. EXISTING SYSTEM

In the present system to achieve quality of power distribution, the system voltage which is maintained within the extended range by operating the available On Load Tap Changers (OLTC) in a predefined intervals. These OLTC facilities are available only at the Power Generating stations and Sub stations. OLTC facilities are available from 11Kv to 400Kv and the operations are carried out from the local are from the remote control rooms only by manual mode. Universal motors or step drive motors or servo motors are used to operate the taps without any power blink or disturbances. There is no auto operated OLTC's are available in generating station and substation levels.

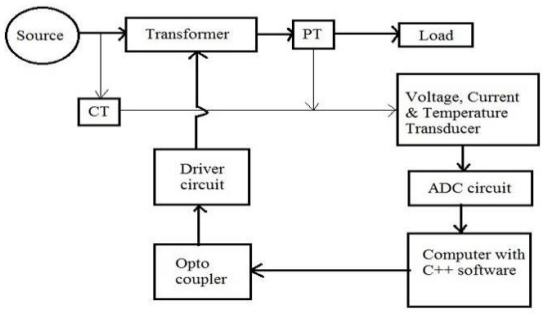
In the distribution transformers even the manufactures are by default designing transformers with multiple taps to operate at desired voltage levels. Due to the operational and other inconvenience the transformers with specified tap is extended to distribute the power continuously. The others taps are not effectively utilized and which are kept as idle. Due to this the system allowed to operate at the wide range of voltage and struggles to deliver the quality of power.



II. PROPOSED SYSTEM

This project is mainly focused on distribution of power with quality throughout the day. It is proposed in this project to provide automatic control circuits to operate the available On Load Tap Changers (OLTC) effectively. The available taps and its voltage levels may be analysed and suitable applications solution will be automatically generated to select and operate the desired tap to deliver the quality of power to meet the system voltage close to the rated voltage. These programs may be pre loaded to operate OLTC's at the power generating stations , Sub stations. Micro controllers are system based controllers may be installed to operate the OLTC's from 11Kv to 400Kv power and distribution transformers. Universal motors or step drive motors or servo motors may be operated by the controller on auto with the aid of programs pre-loaded. No manual commands and controls needed if the OLTC is put on auto mode.

In the distribution transformers also all the tap positions may be effectively utilized by providing automatic OLTC's with the aid of local operated controllers or remote operated autocontrollrers.



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Multi taped transformer specifications

S.	TAP	VOLTAGE
1	Normal	230V / 230V
2	Boost (stage 1)	230V / 245V
3	Advance boost	230V / 260V
4	Boost (stage 2)	230V / 275V
5	Advance boost	230V / 290V

III. METHODOLOGY

In this project voltage transducers are used to sense the voltage and ADC to convert into digital signals. These digital signals are fed to the controller or interfaced computers. Controller or the computer programs checks the present voltage and its required suitable controls from the available solution data table.The necessary controls are generated and operated the drives to operate the on load tap changing devices. These controls are being initiated at the moment of deviation occurs in the system voltage desired quality band.

As a project model it is proposed to made a transformer of 230 volts primary and secondary of different tapings close to 230 volts on its secondary side extended to the load of 230 volts. The transformer is allowed to operate its mode Normal, Boost, Advance Boost and Super Boost/super Advance Boost. As a project model it is decided to develop a software program in C /C++ and to interface the hardware with the computer in parallel port. The hardware consists of multitap transformer and its drive circuits. The drive circuit is equipped with switching transistors and miniature relays. The drive circuits are connected to the computer port through opto-couplers for isolation purpose.

It is also planned to include the high resolution advance graphics files in C programs to represent the present status of the OLTC with its connected tap position. The taps operated and the voltage levels may be recorded and represented graphically with time scale.

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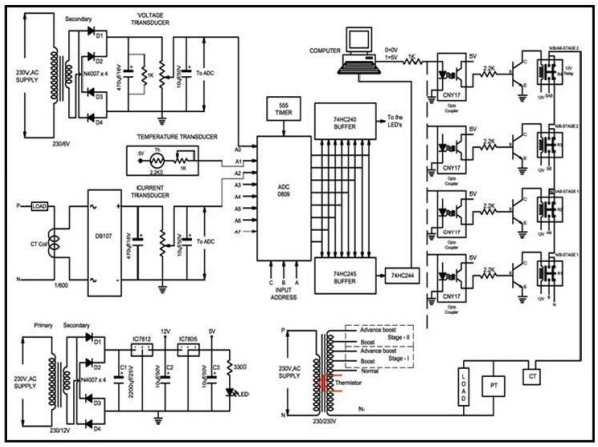

HARDWARE COMPONENTS:

230/230 Volts TRANSFORMER WITH DIFFERENT TAPS ON ITS SECONDARY SIDE.
DRIVE CIRCUITS TO CONNECT REQUIRED TAP POSITION.
ADC & INTERFACE
POWER BAORD WITH TRANSFORMER TO EXTEND 12 V DC & 5 V DC.
ALARMS FOR ABNORMALS.
.

SOFTWARE COMPONETS:

NEUTRON TURBO 'C' FOR WINDOWS 7/8 PLOTFORM
WINDOWS OPERATING SYSTEM 7/8 OR BELOW

Advantages

Quality of power ensured throughout the day.
The distribution voltage profile will be so good and close to rated voltage.
No manual monitoring of voltage is required.
Failures due to abnormal voltages may be reduced.
Transformer winding status is continuously monitored by the temperature sensor.
Parallel operations of transformers with common voltage profile and different VA rating may be easily preformed.

Disadvantages

Due to more number of operations wear and tear may slightly increase.
Cost may slightly increase.

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IV. APPLICATIONS

One of the power quality criterion is that the voltage at the selected points of a network should be kept within the prescribed limits. The most common mode of voltage regulation is the application of transformers with on-load tap changers. When connecting the transformer to different taps, the turn's ratio of the transformer is changing, and suppose, if the primary voltage is constant, the secondary voltage can be increased or decreased according to the requirements. The voltage control can take the actual load state of the transformer and the network into consideration.

The result is that the voltage of a defined remote point of the network is controlled, assuring that neither the consumers near to the bus bar, nor the consumers at the far end of the network get voltages out of the required range. The voltage control function can be performed automatically, but in manual mode of operation the personal of the substation has possibility to set the network voltage according to special requirements. The automatic tap changer control function can be applied to perform this task.

Economic, political, environmental, social and technical factors have prompted the emergence of the power system concept. Distribution systems are arguably the element of power delivery infrastructures where power system technologies are likely to have the most significant impacts.

The power system concept has driven the coordinated and integrated application of existing power, communications, control, and information technologies at distribution system level. Furthermore, it has impelled the development and implementation of new technologies, tools and approaches for optimizing the operation of distribution systems, empowering customers, and creating new products and services. Expectedly, all these factors have also contributed to the emergence of new issues and challenges.

V. CONCLUSION

The power system project model deals with automatic voltage control to maintain the power system system and the consumers to get the quality of power under all circumstances by changing the transformer tapping by measuring the grid voltage with the aid of the ADC and necessary interface circuits. The transformer provided in the power system project model consists of multi tapping which is automatically changed by the computer with the aid fast switching drive circuits to maintain the grid voltage close to the rated normal voltage and thereby frequency also can be maintained close to normal frequency of 50 Hz. In real time transformers with multi-tap may be used to make the power system system very smart to match all the situations which are all expected.

Smart transducer and changeover circuits provides trouble free power system to facilitate for the consumers for their availability of power all times and the failures occurs can be automatically communicated to the power system computer to restore if any failure happens. In this project all the information are passed on to the power system computer as hardware and digitals. The improved communication available in the present trend may transform the power system presented in the project into very smart one.

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