PC FRIENDLY ICT COOLING SYSTEM USING PLC

V.Divya[1], R.Samundeeswari[2],A.Saranya[3],V.Umasowndari[4],A.Alaudeen[5]

Department of Electrical and Electronics Engineering,

A.K.T Memorial College of Engineering and Technology,Kallakurichi.

ABSTRACT

Our project deals with the Inter Connecting Transformer shortly called I.C.T. It is a bulky Power transformer located between High voltage Grid Lines. It is aAuto Transformer .PLC is user-friendly Hardware whose operation mainly depends on our own-written Software in its memory. It is a proven technology for any level of process complications. On-line program edition correction also possible through PC. Hence, our project deals how PLC may be introduced– to monitor and control ICT feeder and thereby ensuring best Grid discipline. Protection and monitor the ICT cooling system using PLC.

1.Introduction

The Inter-connecting transformer connects 230 KV and 400KV buses. It's a single winding transformer connected in star and the neutral is brought out and earthed. A 33 KV tertiary winding is available and it is delta connected. The transformer has got an on load tap changer with 16 taps.

The Interconnection Transformer is being monitored and controlled through the separate control Box called Kiosk installed near to the ICT location, which uses Relays and timers. It is responsible to isolate faulty section immediately in very minimum time, under abnormal situations. Hence at most importance is given for 'control &Protection scheme design'.

Since the present logic involves control relays, wirings and highly depends on all the connected interlocks – the trouble shooting under crisis will be a tedious one and time consuming too.

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2.Proposed System

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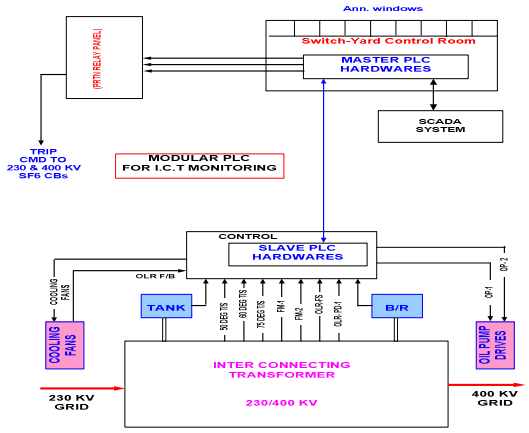

fig 1

3.Switch Yard

The switchyard in TPS-II is to transmit power generated by 7 Nos. of 210 MW units (3 Units in stage 1 and 4 units in stage 2). The generating voltage is limited to 15.75 KV and this voltage as stepped up by two-generator transformer 15/230KV for first 3 units and 15.75/400 KV for remaining four units.

The transmission voltages are 230 kV and 400kV. Thermal Power Station II switchyard is one of the biggest switchyard in the Southern Grid. 230kV system is connected to TNEB grid and PondicheryElectricity system. 400kV system is connected to Southern Electricity grid through Power Grid Corporation Limited lines. The 230kV and 400kV system in switchyard are interconnected through **400kV/230kV interconnecting auto transformers.**

4. Inter-Connecting Transformer

The electrical lay out is shown in fig below. The 230KV side of the ICT is connected to the 230KV bus bars, through bus and line isolators and a SF6 Breaker. The 400KV side is connected through bus isolator, line isolator and a SF6 breaker. Earth switches are provided at the bus isolator towards the breaker, and at the line isolator towards the breaker and also towards the transformer, on both 230KV and 400KV sides.

5. Cooling System

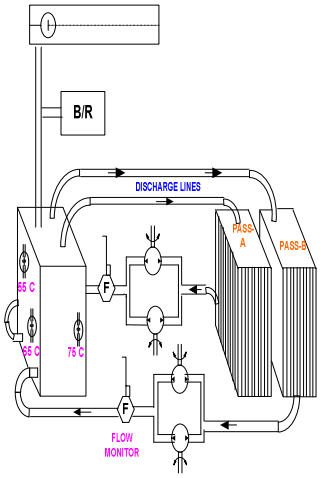

Fig 2

To enable effective cooling efforts air forcing and Oil forcing 3 phase drive systems are provided. The starting and stopping of such systems are purely based on special type of temperature switches. Highly structured control logic circuit is there to monitor and control the protection and control activities of ICT. This system uses number of control relays and physical timers for its intended operation. The cooling system and protection arrangements will be discussed further in following pages.

Since the ICT is a Power Transformer connected between 230 & 400 KV EHV lines, monitoring the temperature of Oil and Winding will be a crucial one. The cooling system of the I.C.T is mainly subdivided into three categories. They are as follows,

1. ONAN TYPE COOLING
2. ONAF TYPE COOLING
3. OFAF TYPE COOLING
4. FORCED DIRECTED OIL COOLING

6. Programmable Logic Controller

PLC's can perform a wide variety of control tasks, from a single, repetitive section to complex data modification. Standardizing on PLC's opens many doors for designers, and simplifies the job for maintenance personnel.

7. Simulation OfPlc Ladder Logic Instructions

The most frequently used instructions in a PLC ladder logic diagram are normally open

(NO), the normally closed (NC), instruction and the output energized instruction. These instructions are represented as symbols placed on the rungs of the program.

8. Ladder Programming For Software Operation Using PLC

On behalf of our project, we made seven ladder programming for various operation purposes using PLC. They are listed as below:

1. ICT Fan Series Control Using Ladder PLC
2. ICT Pump Series Control Using Ladder PLC
3. ICT Alarming And Tripping Indication Using Ladder PLC
4. OLR Fan Trip And Alarming Indication Using Ladder PLC

Thus the PLC ladder logic program closely resembles an electrical ladder diagram. On an electrical diagram, the symbols represent real world devices and how they are wired. A ladder logic program exists only in PLC software – it is not the actual power bus or the flow of current through circuits.Another difference is that in an electrical diagram, devices are described as being open or closed (OFF or ON). In a ladder logicprogram,instructions are either true or false (however, the terms are often used interchangeably).

9. Advantages OfPlc Over Other Available Technologies

1.The process inputs are connected directly to the PLC input module. Hence it doesn't require any additional interfacingagent like the other available technologies.

2.The executed results of our process activities are also taken directly fromPLC, through its output module.

3.More than 80% of physical wiring will be avoided using this intelligenthardware, whoseoperationpurelydepends on software.

4. No limitation for the auxiliary contacts as in the case of hard-wired logic. We can use thousands of NO-NC for a programmed coil or register (solid memory)

5.It does not require physical Timers, Counters. All these will be availed as software. It just need the delay time.

6. PLC proves its talent in Power plants, Chemical Plants, Cement factories, Aircrafts. Hence any level of complications can be solved in real-time.

7. It will support for Real- Time monitoringof electrical and Instrument Process.

8.Power consumption is very minimum.

9.Accommodates very less space.

10.Supports well for further expansion.

11.User-friendly software – easy to understand.

10. Conclusion

We finished our project with the knowledge to control and automate the Inter Connecting Transformers in switch yard**.** By using PLC with interconnected PC- we may control the ICTs. Introduction of PLC into any system automation will make the system control into a simple platform. Monitoring and control via PC will render great visualized facilities for the end-user.

All our programs and software developed here were simulated and tested. Program developing trouble-shooting prepare us in relevant software developing skills.

We conclude that our project isvery much helpful to improve and to maintain good discipline in switch yard operation & control including ICTs. This system reduces the control cable usage, timers and relays.

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