CONTROLLING THE COOLING OPERATIONOF TRANSFORMER USING EMBEDDED PLC

MS.Gayathri.D [1] ,Shriram.E[2], Mohamed Dharik Anwar.M[3], Praveen.E[4]

[1]ASSISSTANT PROFESSOR DEPARTMENT OF EEE , IFET COLLEGE OF ENGINEERING, VILLUPURAM

[2,3,4] UG STUDENTS, DEPARTMENT OF EEE, IFET COLLEGE OF ENGINEERING, VILLUPURAM.

ABSTRACT

To meet out the future load demand, electrical industry needs to be cost efficient . Existing transformer represent as an assert thus monitoring will be prime factor for effective use of these transformer. Online monitoring system implies the operator to optimize the load which has risk over the functionality of transformer. In power system transformer plays a vital role in the conventional ac system. Thus some transformers are critical due to more power handling capacity. Power transformer is a one such transformer whose capacity is more than 1MVA. This system impact good performances along with cost efficiency**.**

Keywords. Efficient, monitoring, power transformer, protection scheme, cooling system.

1.INTRODUCTION

Our project deals however PLC might be introduced to observe a G.T to begin cooling fans (Forced Air Cooling) and to start oil pumps (Forced Oil Cooling) with different enclosed own protections of electrical device and associated switch-yard power transfer components. To compare however superior the PLC is we have a tendency to take ancient relays logic based mostly management for the same activity- on with principle of operating and how the circuit is shaped exploitation Electro-Mechanical Relays and timers, to produce time delays in method. Today's PLC renders Unite States superior management and communication facilities too. It is a time period technology, supports distributed I/Os (Inputs/Outputs) separated even in kilometers.

The maximum output current is such at the purpose wherever the core is saturated, or the windings current rating is exceeded. Power transformers are found in any application that needs mains power. Power transformers play a crucial and vital role within the installation to connecting the subsystems and delivering the electricity to the customers. they're one amongst the foremost costly parts within the installation, that is why that specialize in their standing of parameters is that the primary task. This seminar paper can concentrate on lightness sure necessary aspects of voltage choice and thermal aspects .

1.OBJECTIVES

Our Project based on Programmable Logic Controller (PLC) which find the problem of manual transformer cooling control system by automatically switching between the cooling banks. The cooling system in our project comprises of three cooling banks, each having a fan and a pump. At a time, two out of three cooling banks will be operating. In case of failure of any one of the operating banks, the third bank will automatically switch on in place of the faulty bank. Hence third bank will continue to operate until faulty bank is repaired. This switching between cooling banks is PLC controlled and thus eradicates the errors caused by human intervention.

2. LITERATURE SURVEY

The aim existed methodology is to managing the system in such the way, mistreatment microcontroller in cooling system of electrical device. In electrical device there are several faults occurring within the system like, contact in winding, less variety of turns, conjointly the matter like contact in core. to beat these faults inside short interval, having higher flexibility and potency, thus the microcontroller ATmega8L is employed. It's wont to sense the temperature from temperature sensing element and once temperature goes on top of set limit electrical device cooler fan can on and motor speed is depends on temperature and mistreatment PWM (pulse dimension modulation) technique for speed management. PLC based mostly electrical device watching and system (TMCS) meet these objectives. The designed TMCS is for permanent installation or near a particular electrical device and is meant for watching one unit. laptop with PlC ladder logic for dominant electrical device cooling system is automatic, reliable and value effective.

3.PROPOSED SYSTEM

In our project, we have proposed an cooling system based on Programmable Logic Controller (PLC) which eradicates the problem of manual transformer cooling control system by automatically switching between the cooling banks. Along with this, continuous monitoring and data recording is simultaneously done. We have also focused upon proper utilization of standby bank by means of periodic switching. PLC logic is used for controlling all the components which are involved in the protection of transformer and also using the component only when needed eradicates the wastage of power and unnecessary operations. Human Machine Interface (HMI) can also be used for complete visualization of the process in the control room.

Our project deals how PLC may be introduced to monitor a G.T (GENERATING TRANFORMER) to start cooling fans (Forced Air Cooling) and to start oil pumps (Forced Oil Cooling) with other included own protections of transformer and associated switch-yard power transfer elements

4. SYSTEM DESCRIPTION

1. Components*:*

The various elements required for the most operation of electrical device cooling and used for model are LD micro Embedded PLC, four contact relays (24V DC), indicators, 1.7W 4000 revolutions per minute brushless DC fans and 24V DC toggle switches.

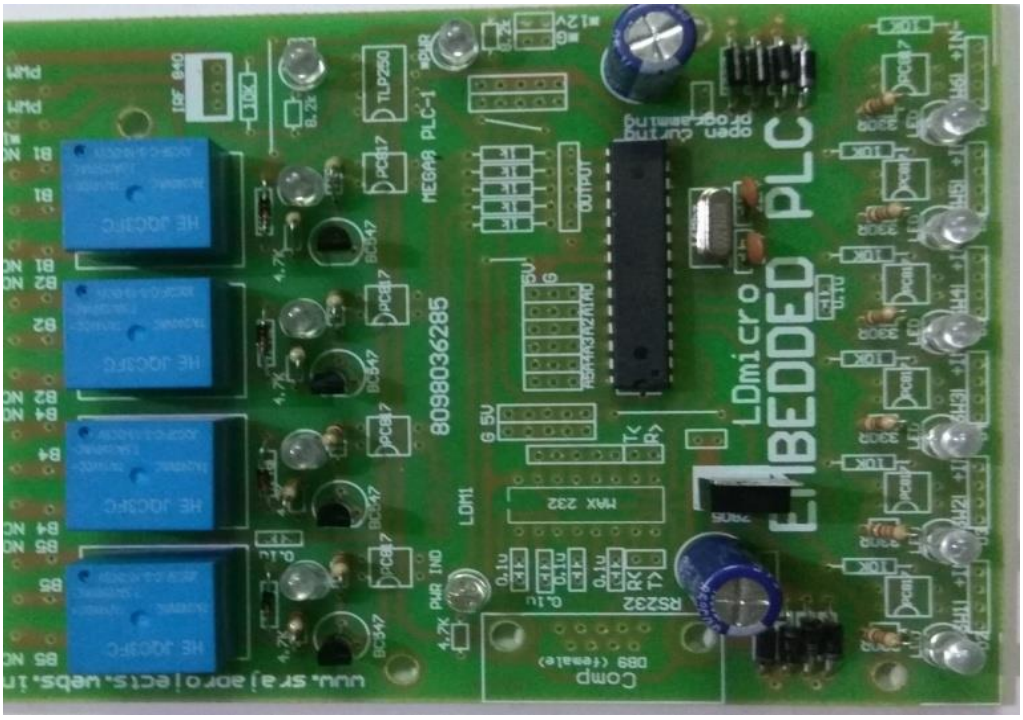


Fig.1 LD micro EMBEDDED PLC

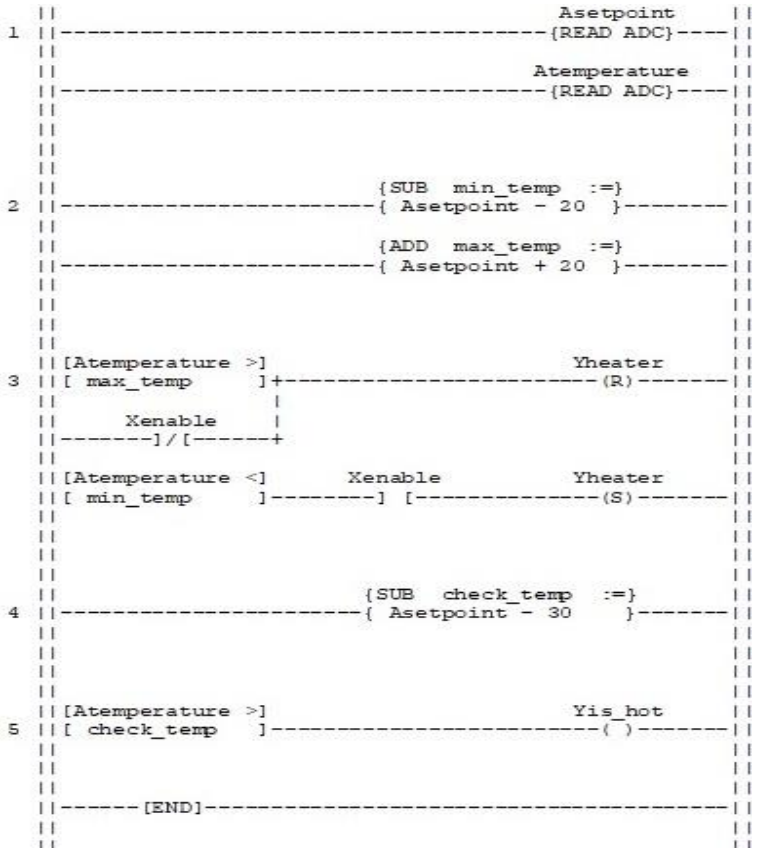
PLC within the designed electrical device cooling system is being employed for serial logical operation, timing, investigation and for autonomous management of varied elements e.g. relays, fans, pumps, switches etc. compared with typical controller, the PLC is rugged; least plagued by external disturbances, versatile configuration and might management n variety of input and output devices relying upon the PLC I/O ports

It is being employed for serial communication with different intelligent devices. The LD micro Embedded PLC may be a good resolution for dominant a good form of applications. once you have got downloaded your program, the processor contains the logic needed to observe and management the input and output devices in your application.

5. SYSTEM CONFIGURATION

2) Software and Specifications*:*

Software Screen and Simulation Process **Fig. 2:**



All the output pins of the PLC are connected to the output devices like cooling fans and pumps. All twelve output pins are connected to Pumps and Fans. The input pins are connected to power provide that may be a 24V DC SMPS and additionally to their individual Toggle Switches.

6. BLOCK DIAGRAM

A. BLOCK DIAGRAM:

The Below diagram shows the ladder logic operating once heat and temperature rise happens in a very electrical device. Initially, Fan one and Fan a pair of are switched ON. Counter is to store the logic that's received and indicates that PLC has received a Trigger command to change on the fan. when a particular quantity of Delay, Pump one and Pump a pair of conjointly begin indicating rise in temperature.

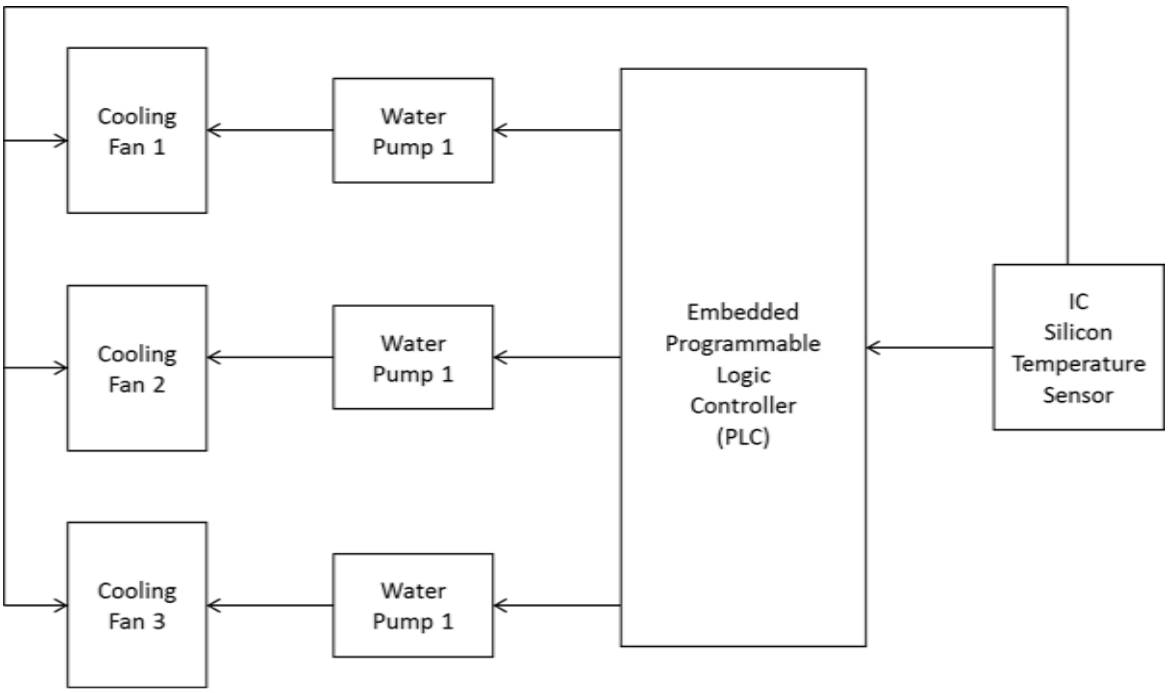


Fig.3 Block Diagram with Three Cooling Banks.

The above Block diagram then shifts and has its cooling bank 1which is totally converted. This happens once a fault condition is developed in either of the cooling banks. once a fault develops in any of the cooling banks or during this case Cooling bank one, or in its fan or pump, the PLC provides a command to prevent the complete Cooling bank one and also the standby bank that was OFF for this long, Turns ON. The cooling method continues once more shifts to make sure that every one the cooling banks are sporadically performing from time to time. Cooling Bank one remains ON for seven Days when that it turns OFF. Similarly, Cooling Bank two operates in a very similar method. Cooling Bank three Switches ON when Cooling Bank one has turned OFF. This method goes ON and every Cooling Bank gets enough time for maintenance

7. WORKING & LADDER LOGIC

A. WORKING*:*

1). Stepping up operation of Transformer :

The Generating Transformer starts to operate when the generator start to generate power. It step UP the voltage continuously, so that temperature rises due to power losses in transformer coil in form of heat. Power losses is nothing but increasing in current i.e(I^2R losses).Core temperature is calculated using Current Transformer and Oil temperature using the Temperature Sensor.

2). Detection of temperature using sensor*:*

The silicon temperature sensor is dipped in touch with oil in the transformer. It detects the temperature rise in oil and send information to LD micro PLC. A/D convertor is used to convert analog signal to digital signal send to the PLC and when the temperature excide the normal temperature the PLC automatically start the cooling fan operation.

3).Using PLC Logic the cooling fan is operated:

This operation start only when the Air cooling is not enough to control and cool the temperature of transformer.The temperature rise is detected by temperature sensor and as soon as the PLC start to operated. First the Cooling fan 1 and Cooling fan 2 is operated . Where as the Cooling fan 3 is in OFF state. Simultaneously the oil is pumped by the cooling pump and oil circulation continuously circulated .

4).When Fault occurred in cooling fan:

When there interrupt or fault is occurred in cooling fan .

That is Cooling fan 1 or Cooling fan 2 is subjected to fault the cycle 1 get stop .So.that the Ladder logic provide a advanced logic to start a another cycle without stopping the operation of cooling in abnormal condition of Transformer . Thus if this operation is not existed the major damages and transformer will leads to explosion. This damaged Cooling fan can be replaced before the completion of interrupt cycle. This processes is common for all cycle of Cooling fan operation . The main advantages of PLC is to operate these operation automatically without any manual work. And the Ladder Logic for this operation is simple and easy to understand.

This operates only when a fault developed in the other cooling banks does not clear soon. After the fault, the Cooling Bank which was OFF for a lot of time till then, turns ON and makes sure that proper amount of cooling is received by Transformer.This cooling Bank operates until the malfunctioned cooling bank recovers completely.

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5). Periodic Use Of Stand-by Cooling Banks:

Once the cooling bank(any other cycle) stops operating after the malfunctioned cooling bank has resumed, the process of cooling continues. The flexibility and the ability of the Ladder Logic ensures that none of the cooling banks exceed a certain amount of time for which they operate. Even if the cooling banks stay completely healthy and there is no fault caused across their terminals, the cooling banks switch OFF after a period of 14 days. This ensures that each and every cooling bank is utilized to its best potential. It also ensures that each and every cooling bank gets sufficient amount of time for maintenance. Each cooling Bank initially operates for 7 days and then switches OFF either for maintenance or for any other purpose .It then resumes after 7days and work for 7 days and one complete 14 day cycle.

LADDER LOGIC DIAGRAM :

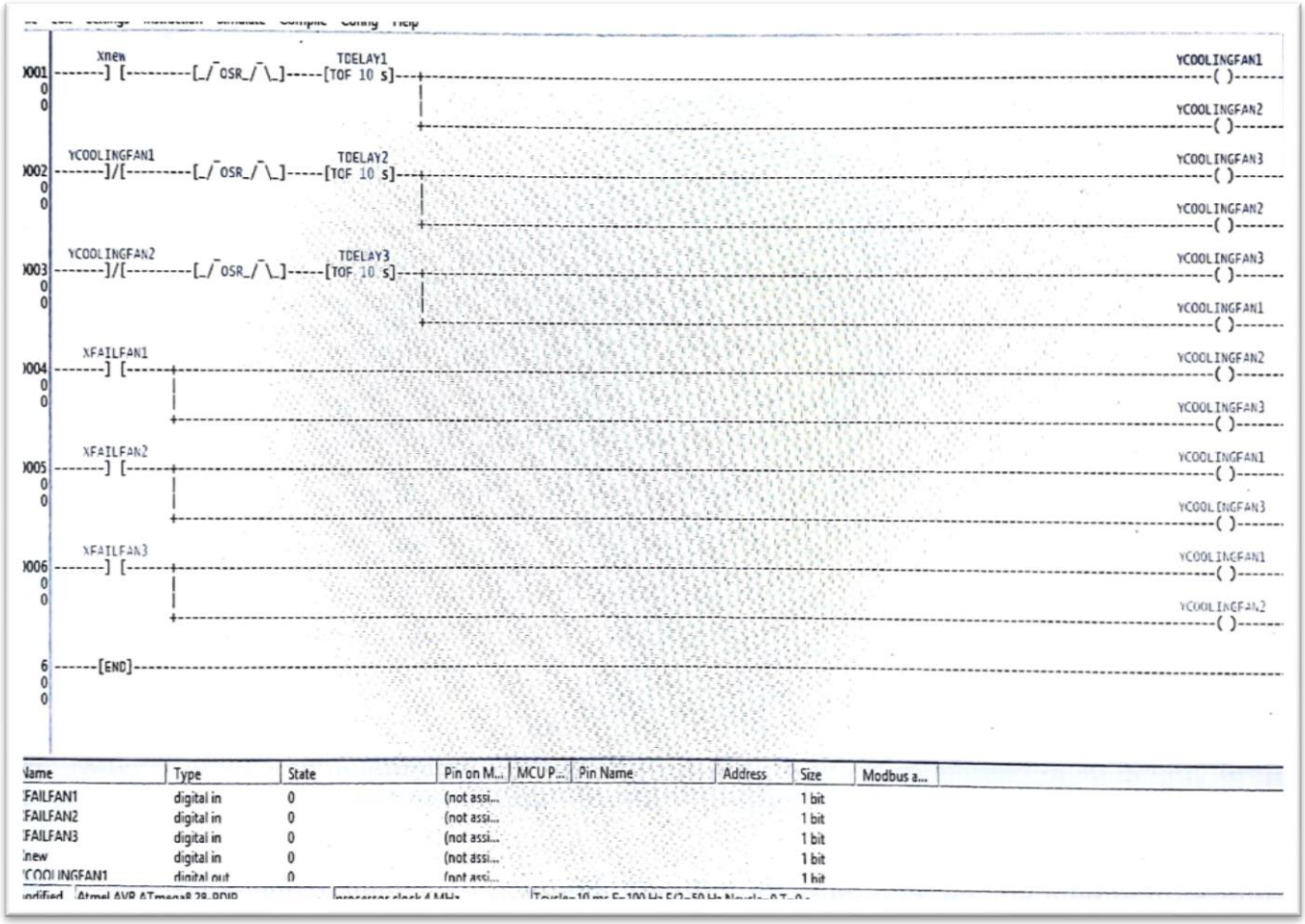

FIG.4 LADDER LOGIC PROGRAM AND SIMULATION PROCESS

8. RESULTS & CONCLUSION

1). Thus the cooling operation of Transformer using PLC is tested and modified . The operation of cooling fan work depend on the temperature rise.

2). The using of complex wiring of hardware and other components are reduced.

3). The time required for designing the system is minimized.

4). Shut downing or restarting of hard-wired system is difficult and these are ignored by PLC.

5). The using of PLC is eco-friendly and very less impacts on environment.

6). Thus other system required some manual operation for doing some operation but PLC are fully automatic and no man power is needed.

7). So that the cooling operation of cooling fan was automatically controlled by PLC (Programmamble logic controller) and temperature of transformer is gradually neutrilized.

9. FUTURE SCOPE

PLC uses the information technologies and control system and reduces the human manual work in the production of goods and services.

2.) The PLC is a small computer that has dedicated operating system and the operating system processes the interrupts that are incoming in real-time.

3). PLC are continuously growing and evolving to be the best option for a variety of industrial automation applications.

4). Scope of plc programming is increasing rapidly because of greater programming flexibility and ease, scalability, more memory, smaller sizes, very high-speed (gigabit) Ethernet and built-in wireless features

5). PLCs are getting benefits from USB technology and thus make it easier than ever before to get online, program,and monitor your control systems.

10. REFERENCES

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