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Auto Mains Failure Protection Using PLC

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ABSTRACT: Auto Mains Failure system is one, which has a Diesel engine connected with an Alternator (0.4 KV). Upon normal power interruption, will Start automatically to make up power requirements. Interruption may cause severe problems in Main Generation, hence it has to be restored by some means as quick as possible. This task is being managed by AMF system effectively. The operation of AMF system involves monitoring protection relays, controlling switch gears, starting or stopping of diesel engine / generator and its associated cooling system drives - in a timely manner. This project implements PLC design for the AMF system to do its service in a highly structured and User-friendly approach.

KEYWORDS: Programmable Logic Controller (PLC), Auto mains failure(AMF).

I. INTRODUCTION

An emergency power system or Auto Mains Failure System is a standby generator to provide backup power resources in a crisis or when regular systems fail. They find uses in a wide variety from hospitals, scientific laboratories, data centers, telecommunication equipment and modern naval ships, Airports, small and Large scale Industries. In recent years, large units of power stations are usually designed (BTG) on a unit system basis. A unit is the Steam Boiler (B) supplies steam to a Steam Turbine (T) which in turn connected with a Generator (G). To start a station Generator Boiler has to supply required steam for Steam turbine. Thus for starting the unit, the auxiliaries are supplied with power by station auxiliary transformer- which is powered from Grid.

It is imperative that the power to unit auxiliaries (to light up boiler and associated auxiliaries) is highly required. The unit bus scheme normally split up into two categories. The supply in Emergency bus scheme should be kept 'ON' at all times. In case of interruption it has to be recovered as early as possible. If recovery time going beyond 17 seconds, the main generation will be reduced gradually- causes major revenue loss. That's why both the emergency bus loads were tie-up with private DG system called AMF system.

II. CONTROL OF AMF PANEL

EXISTING CONTROLSCHEME

The control circuit of AMF System OEM design uses number of control relays and timers. Here Auto and Manual starting modes are available through AUTO- MANUAL selector switch. If the selection is in auto, it will monitor 0.4 KV bus system under-voltage faults. When u/v occurs immediately Relay PR-1 will be energized and subsequently Fuel solenoid, start solenoid, cranking operation, DC excitation supply for 3 seconds through relay AC4. Cranking operation will be governed by the timer T-2 which is a cyclic timer, having 5 secs On and 5 secs OFF periods for 30 seconds controlled through timer T-3. Timer T-1 is the DG set stop

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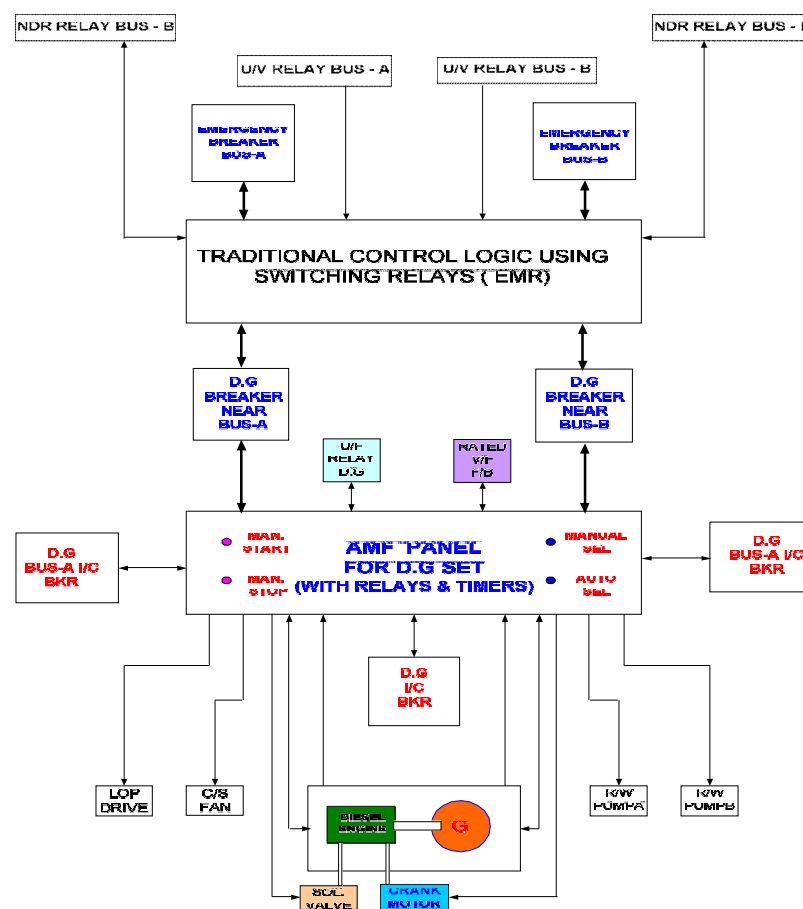
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timer. When DG system is decided to stop, it will be done manually through Manual stop PB. However, Auto stop command also available, it was not interlocked at present.

Fig. 1 750KVA AMF System



DRAWBACKS

The present way of control employs electro-mechanical relays and timers in AMF SYSTEM control. The control circuit uses control relays like PR-1, PR-2 and PR-3, K-6, K6A and so on. In addition to that Number of timers are also involved in the control circuit addressed as T-1, T-2, T-3 and T-6... the above relays and timers are interlocked with physical wiring to avail AMF system function. The drawback in this control is discussed here

1. For any automation, large number of relays is required. The increase in number of relays makes the wiring complex.
2. Physical wiring of system is complicated and difficult. The panel board arrangement occupies more space. The arrangements also require proper ventilations. The arrangement is not simple and neat.
3. Their parts can wear out as the switch contacts become dirty high voltages and currents cause sparks between the contacts.
4. They cannot be switched on and off at high speed. Slow response and the switch contacts will rapidly wear out due to the sparking.
5. In the case of hard-wired logic required frequent maintenance and occasional replacement of

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- contact. The maintenance cost will be more.
- 6. In case of control wire logic entire physical arrangement should be changed and reconfiguration cost is more.
- 7. Chance of frequent chattering.

III. PROPOSED SYSTEM

Due to the de-merits in the Existing Working Technology, We Aim to do Our Project to monitor and control AMF function with the help of PLC system. The Instant Advantage is the Total Control Wiring Being Converted as User-Friendly Software and PC friendly monitoring and control facility.

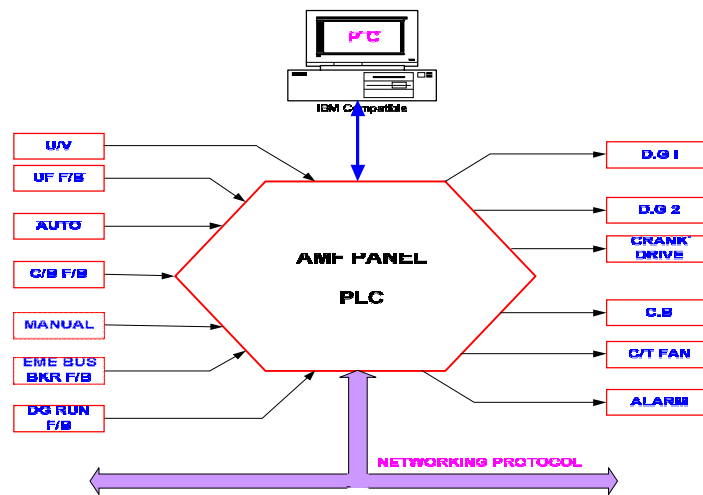


Fig. 2 Proposed system

A PLC works by continually *scanning* a program. We can think of this scan cycle as consisting of 3 important steps. There are typically more than 3 but we can focus on the important parts and not worry about the others.

Typically, the others are checking the system and updating the current internal counter and timer values. After the third step the PLC goes back to step one and repeats the steps continuously. One **scan time** is defined as the time it takes to execute the 3 steps listed

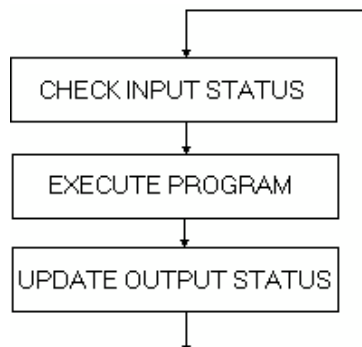


Fig.3 Scan time

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IV. CONCLUSION

We had a golden opportunity to gather adequate ideas of our engineering field implementations in process control during our project period. We did our project in stage-II unit 0.4 KV system monitoring and D.G set starting via PLC. We had idea about existing relays and timers based control for breaker and associated devices. We implement PLC for the above control, and we realize an enhancement in control via software.

While implementing PLC, it is quite convenient to control the elements i.e., circuit breakers, motors. Due to the superior communication facility with PC, system monitoring via computer is possible. Control of elements via PC makes this technology to widespread use in process control engineering applications. PLC makes the system control with high reliability, relatively at faster speed of data transfer compared to other available technologies and consumes very less power for its operations.

Related software uses Ladder language for 0.4KV bus monitoring/DG starting via AMF panel and associated D.G system drives cooling facilities made done via PLC. The output also verified through simulation. Thus we satisfactorily complete our project with PLC technology. We are very glad to thank one and all who help, encourage and guide towards a valuable project.

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