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ENHANCED AUTO MAINS FAILURE SYSTEM FOR 750 kVA DG SET OPERATION USING PLC

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ABSTRACT

This paper deals with Auto Mains Failure(AMF) system which has its own Diesel engine connected with an ac Generator- will come into service to make up the power requirements to the connected industrial loads under normal power interruption. The emergency bus should be monitored always for any voltage failure (less than 80%). At any case of failure the emergency bus supply should be restored within 17 seconds through a Diesel Generator set for effective unit generation. In case of any problem in DG set of concerned unit automatically with a pre-fixed delay, adjacent unit DG set will come into service to safe-guard the emergency bus of other units. Aim of this paper is to introduce Programmable Logic Controller into action to monitor Auto Mains Failure system, and the unit DG set with its associated circuit breakers operation according to logic requirements. The introduction of PLC is enhancing the DG set operation reliability. The PLC based system enables real-time monitoring and control from remote location. This control technology is safe and highly secured one. The process becomes PC friendly (Human Machine Interface- HMI) with the user-friendly software (LADDER- Structured List) instead of physical wiring using relays, timers which exists.

Keywords: Auto Mains Failure System, Emergency bus, Emergency loads, Diesel Generator, PLC.

I.INTRODUCTION

The fundamental purpose of the AMF controller is to allow automatic operation of stand by generator. The AMF continually monitor the mains supply and it starts the generator if there is a disruption in the supply. The AMF will then run and monitor vital engine and alternator parameters, while the supply interruption continues. The generator will automatically be stopped by the AMF once the main supply has been restored to within acceptable limits. Normally thermal power plants having some Emergency loads. If it is failure of the supply in Emergency bus. The AMF system starts with the DG set and recover to the supply.

II.0.4 kV BUS SYSTEM

Auxiliary supply for electrical equipment of 175kW and less is at 0.4kV, 6.6kV/0.4kV service transformers power to the system. The HT supply is obviously from the 6.6kV system of the station. Broadly the above service transformers have got three ratings viz. 750kVA, 1000kVA and 1600kVA.

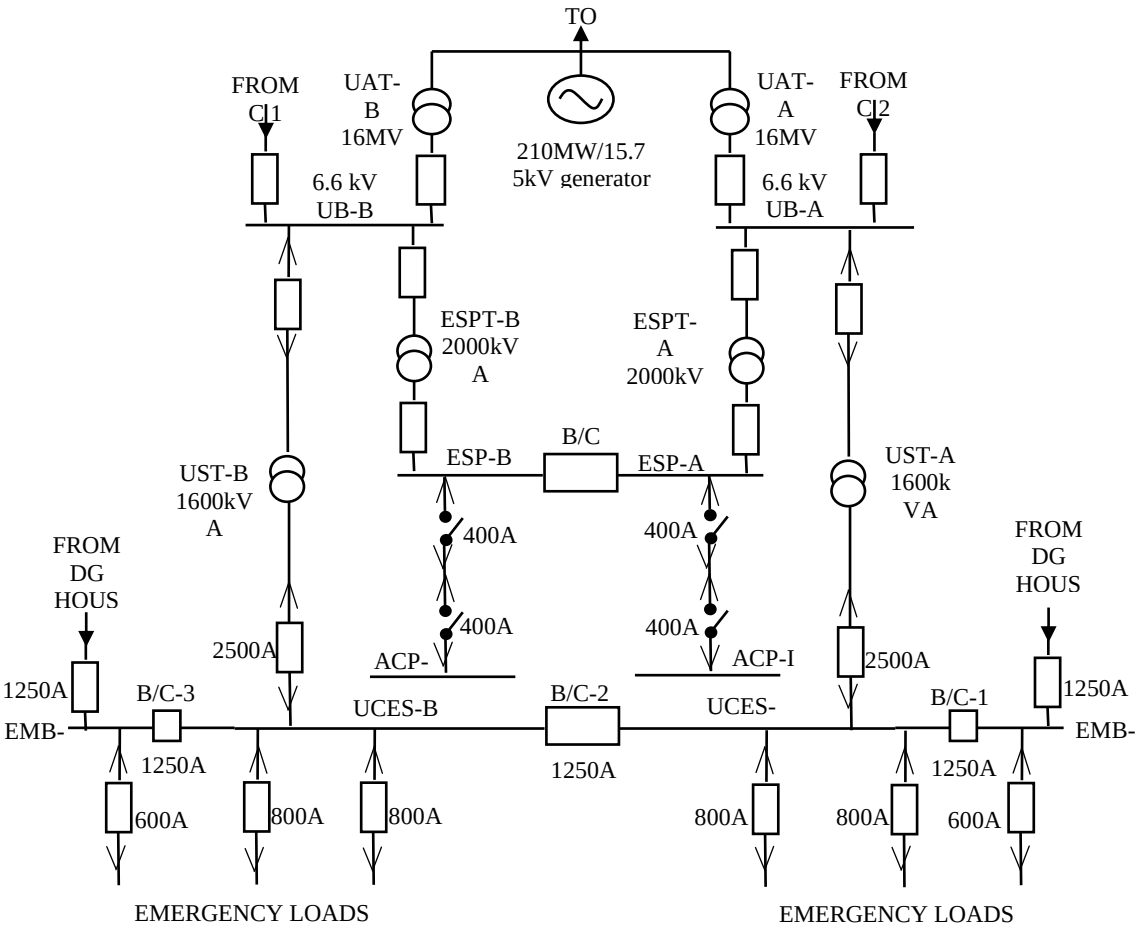

Figure: I (0.4 kV bus system switch gear diagram)

III.EMERGENCY LOADS IN 0.4 KV BUS SYSTEM

1. Seal oil pump – it's seal H_2 gas for unit generator.
2. Shaft turning gear – it's continuously run 5rpm for unit turbine.
3. Lub oil pump for Induced Draught/Forced Draught fans.
4. Scanner air fan – it's use for cooling purpose in temperature sensor.
5. Emergency Lighting loads.
6. Supply to Un-interrupted Power Supply.

IV.AUTO MAINS FAILURE SYSTEM

AMF system is one which has its own diesel engine connected with an AC generator. The system is capable of supply power at the rate of 0.4kV. Each unit has one such DG set arrangement-to supply 0.4kV to emergency loads in case of problem in normal 0.4kV supply. Absence of 0.4kV supply in emergency bus may affect unit power generation either partially or totally in some worst cases. Without supply in emergency bus it is very

difficult to operate the unit (boiler-turbine-generator). This system provides a backup with a 750kVA DG set, which is going to supply for the emergency loads (drives) only. The following roles are function of AMF system.

- Supervision of 0.4kV main supply.
- An impulse for automatic start of engine in case of failure of main supply. (If the engine does not start, two more successive impulses will be given).
- To provide for closing incomer breaker as soon as rated voltage and frequency are achieved.
- Starting up of its own water circulating pumps and cooling tower fans, after the closing of incomer breaker.
- Tripper of the engine and alternator in case of any fault.
- Audio visual alarms to the operator.

V.DIESEL GENERATOR SET

The 750 kVA capacity DG set to meet out the emergency loads supply on total power failure. When emergency switch gear (unit 0.4kV) goes dead due to grid failure or Unit Service Transformers (USTs) failure, the following events take places to enable emergency switch gear supply through the respective DG set.

VI.EXISTING SYSTEM

At present, a large numbers of physical wiring are required to accomplish all these activities. Also, since relay logic (hard-wired logic) uses electro-mechanical relays, naturally contractors chattering, loose connection problems cannot be avoided due to components ageing .In case of physical damage of control wiring at any point may hamper the switch gear operation causing serious damage to both driving equipment and the supply system.

Due to the presence of physical wiring and their complexity in local arrangement, troubleshooting time increases at the time of breakdown and there will be a chance for failure of logic and protection circuits may lead to severe damage to equipment and working personnel apart from power loss and system outage.

The overall activities of DG set starting are being done through traditional control logic. For this wiring is available in AMF panel. It is responsible for the Auto and manual starting of the system according to the Auto/Manual selector. If the system is in Auto – the DG set will start automatically whenever there is a under voltage in any of the emergency bus.

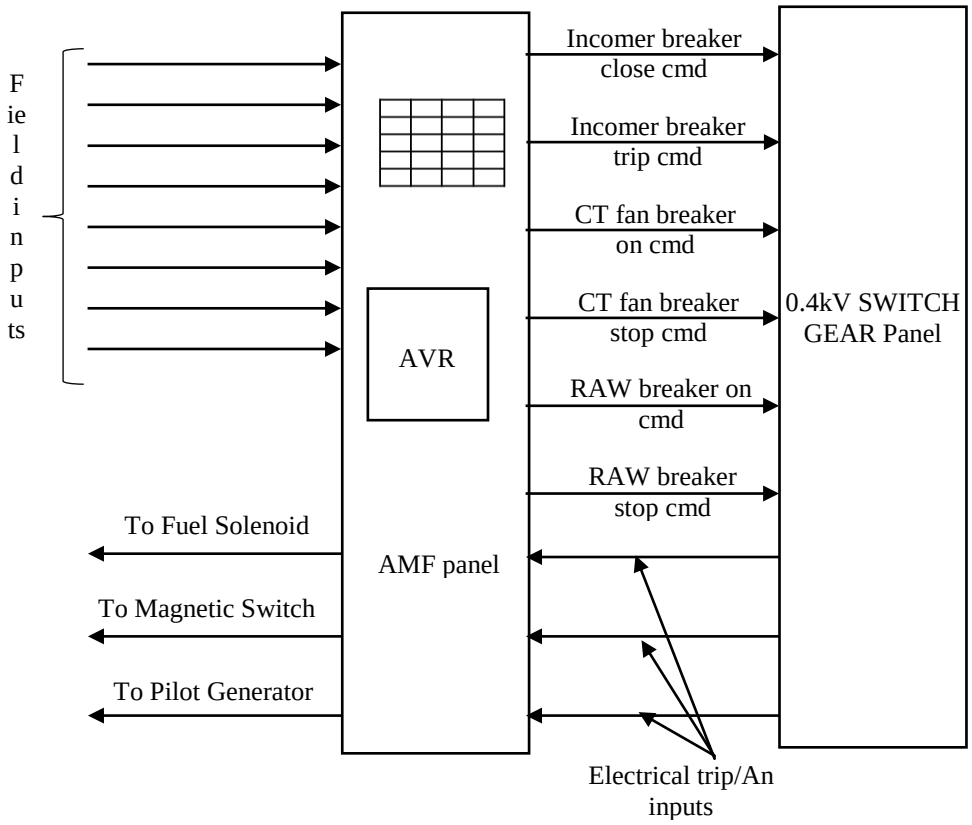

Figure: II (existing system model)

VII.PROPOSED SYSTEM

If 80% of wiring will be avoided when PLC is introduced and here the control action is performed through software which is written in to the memory of CPU. It is having user-friendly application software like LAD (Ladder), FBD (Functional Block Diagram), and STL (Structured List) and so on. If at all switch-yard is automated through PLC.

Only a two core cable is enough (instead of bunch of control cables) between annex area and control room (UCB), which carries out the communication activities. The master PLC would be placed in control room and the slave hard wires would be there in annex area. The master and slave hard-ware linked through communication cable are unique addressed.

This benefits available in PLC so introduce PLC for this concept.

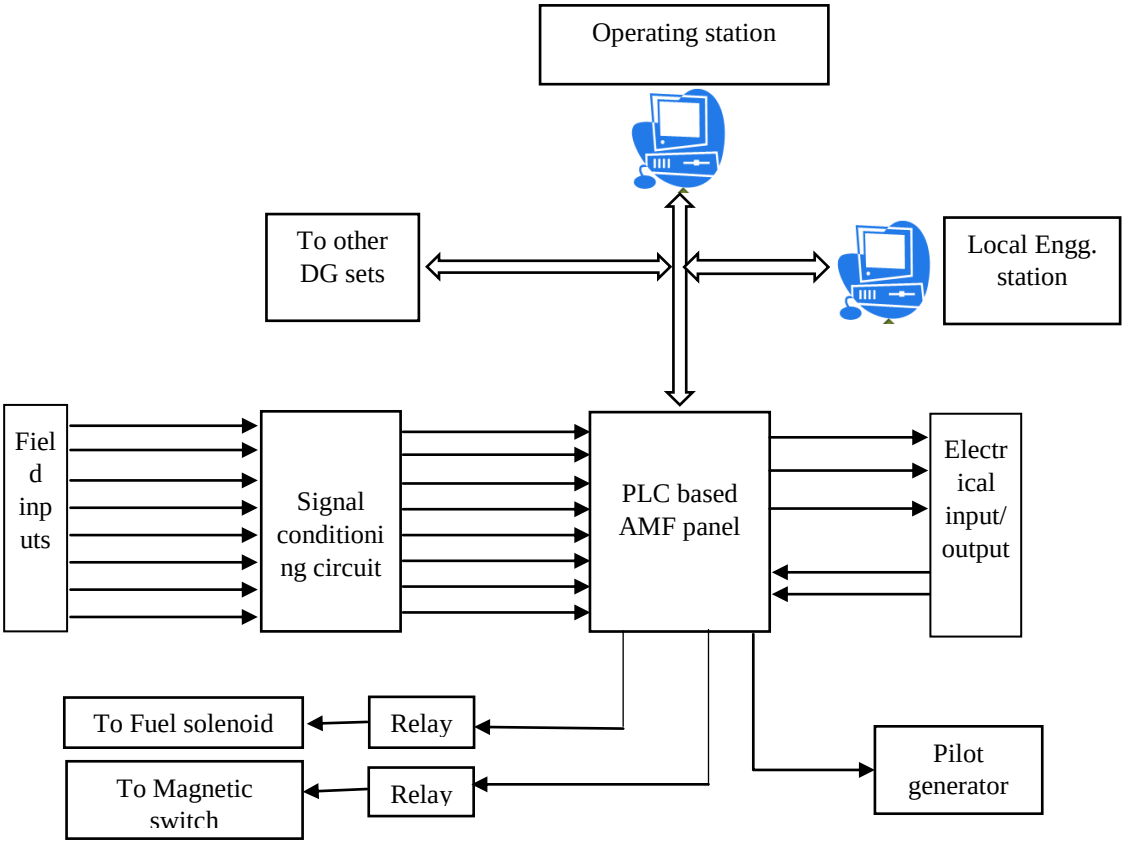

Figure: III (proposed system using PLC)

VIII.ADVANTAGES

- Cost effective for controlling complex systems.
- Flexible and can be reapplied to control other Systems quickly and easily.
- Computational abilities allow more sophisticated control.
- Trouble shooting aids make programming easier and reduce downtime.
- Reliable components make these likely to operate for years before failure.

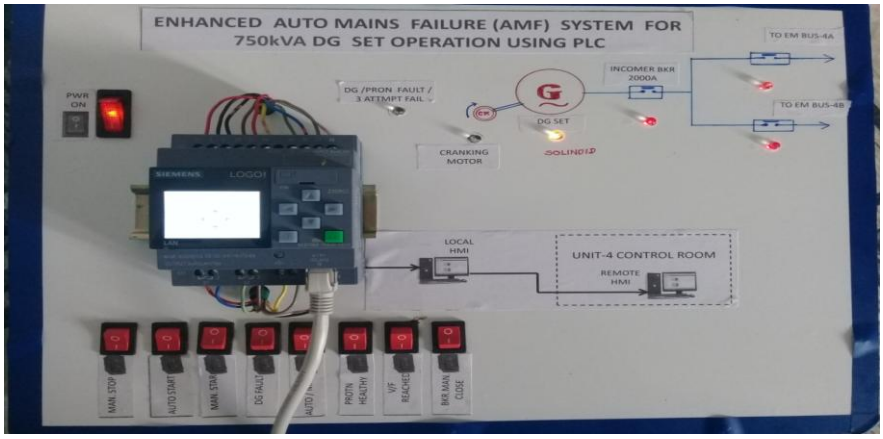

Figure: IV (Implementation Prototype Model)

IX.CONCLUSION

This paper was concluded that with the use of Programmable Logic Controller (PLC) in this Auto main Failure (AMF) system based on the field information, implementation of PLC and software are simulated and tested. The results are found to be successfully monitored via PC. Through this paper attempts for less time consumption, remodeling the program, less wiring circuit and reduce the space of the AMF panel compared with existing relay logical system.

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