



Research Paper

Switching of Generator using PLC with SCADA and Implementation of ATS with GSM Alerts

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ABSTRACT:- We are living in the underdeveloped country like Pakistan where frequent power failure is a major problem facing all over the country. The major issue is how to maintain the availability of electricity under the situation of these sudden power shutdowns, fluctuations and power failure to protect the devices in industries. This research idea is related to the effort to overcome this problem. We are presenting the design of “Automatic Transfer Switch” for a 3-phase generator with the help of PLC, instead of conventional relays and various parameters of generator as well as MAIN timers, along with the designed SCADA systems to monitor the POWER line incorporated with the GSM alerts. This will enable automatic switching of generator as per the MAIN POWER status and it has usage in industrial generators.

Keywords:- Auto start for generator, Programmable logic Controllers, Relays, Supervisory control and Data Acquisition System.

I. INTRODUCTION

Every individual that is paying money to have a better standby supply has a right to have maximum satisfaction for its industrial needs. Generally inverters are not supposed to be the best choice for backup supply because inverters becomes fail due to insufficient battery time .In order to get rid of this problem, the user will go for stand by generators that are specifically designed to fulfill industrial needs. The main problems of turning it on / off can be removed by installing the auto transfer switch (ATS) for industrial generators.

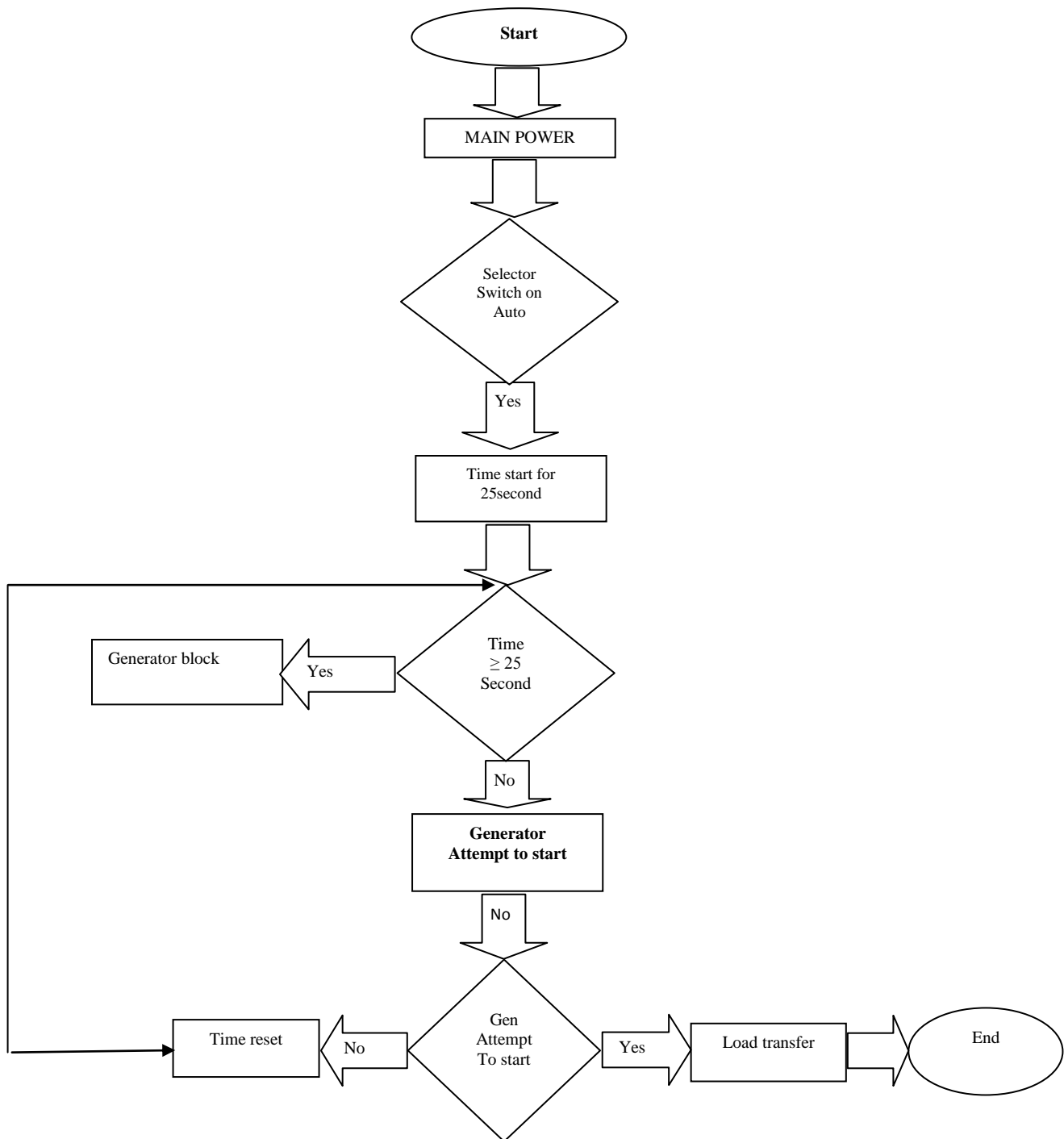
II. DESIGN PHASE

The designing of auto transfer switching system comprises of 2 phases.

Phase – 1 (Self Starting Generator)

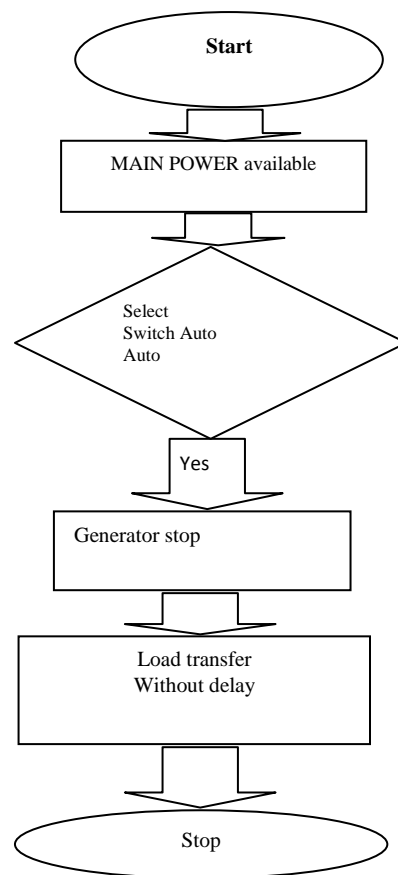
In the phase-I we have Main POWER supply, Circuit, Generator, Load and Contactor are present. The purpose of this panel is to facilitate the user for easy and safe operation of connected automatic start / stop generator and domestic loads. In this mode, generator starts automatically when MAIN POWER is not available & generator stop automatically after restoration of MAIN POWER.

1.1 Flowchart for Automatic Start Logic



Phase – 2 (Automatic Shifting of Load)

Is related to how we have shifted the loads automatically from main supply to stand by generator and vice versa, with time delay of 10 sec for surge protection.



III. ROLE OF COMPONENTS IN PROJECT DEVELOPMENT

Programmable Logic Controllers (PLC)

The role of PLC in the project is divided into three categories

1. Switching

The main purpose of PCL is to automatically turn on the Generator, as it senses that the MAIN POWER signal is no more available, then turning it off when the MAIN POWER supply returns, making sure that at no point in time, both supplies are turned ON simultaneously. A delay time is given, for which the PLC waits for the MAIN POWER to return in case of any short power failure, after that time delay it sends a command to the generator, thus turning it ON. Also when the MAIN POWER returns, it waits for a given time interval, so to ensure that MAIN POWER has returned properly, and if the MAIN POWER supply turns off before that time, then PLC keeps the generator ON.

2. Interfacing

We have augmented the role of PLC, by interfacing it with the SCADA system. So the status of the line active can be easily monitor by a remote user sitting on his/her PC and can also control it. If at any point in time, he would like to minimize the role of PLC, or wants manual switching rather than automatic by PLC, he can send a command to PLC, and it would stop switching between the supplies even if the power goes.

3. Communication

The GSM module used to communicate user through sending message about the status of supply lines, communicates when an event is occurred. This event is prescribed in the SCADA as switching of either device. So whenever the PLC switches MAIN POWER or the Generator, an event is occurred which is recorded in SCADA system, which then generates a message to be sent. This message is send via the GSM modem. The PLC was connected to the system via Ethernet TCP/IP protocol, whereas the Power meter was connected via Modbus communication protocol. Along with PLC, SCADA is the backbone of this research idea. Here we are using SCADA for monitoring purpose only.

In SCADA, we are actually monitoring few parameters of MAIN POWER and generator on PC. These parameters include phase voltage, line voltage, phase current, line current and power factor.

Fig 1-1 Monitoring of Generator through SCADA

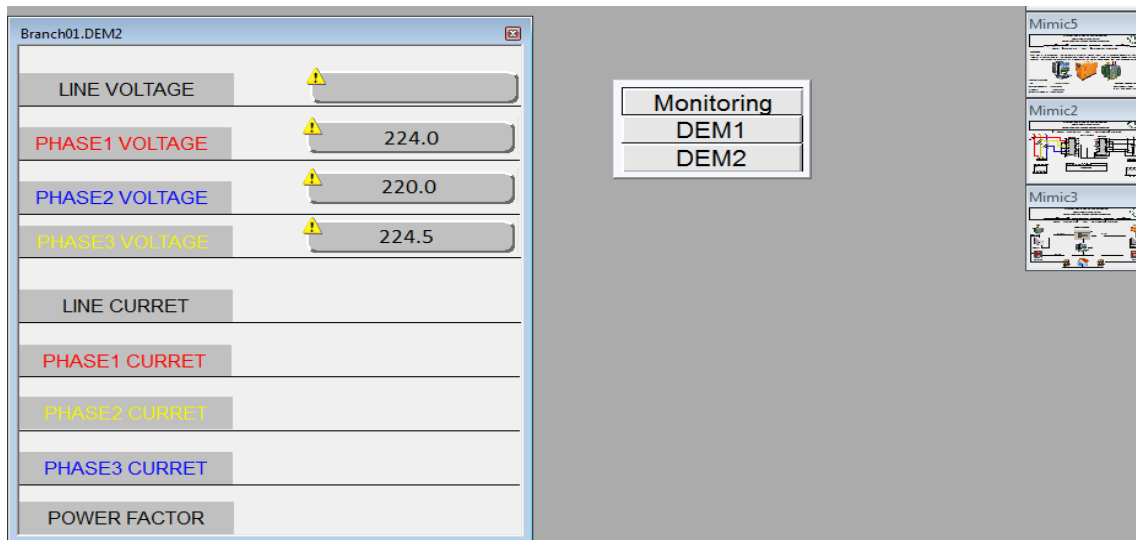
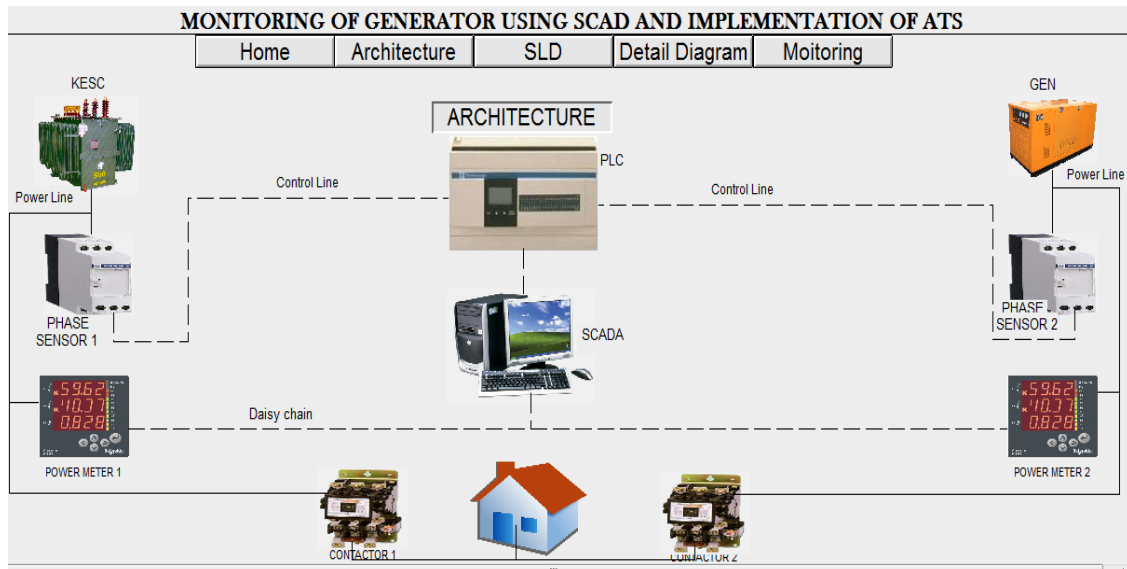


Fig 1-2 Phase Current/Voltage/Power factor

IV. POWER ANALYZER

Power analyzer named as energy meters are utilized with the SCADA system, so that the user can just sit on his/her system, and can check the various parameters of the line, including its Line voltage, Line current and phase. At any time, a remote user would be aware of the status of the line, i.e. either the main line is supplying or the alternate line is activated

V. CURRENT TRANSFORMERS

Current transformers are used for the measurement of electric current and monitoring the operation of the power grid. Along with voltage leads, revenue-grade CTs drive the electrical utility's watt-hour meter on virtually every building with three-phase service and single-phase services greater than 200 amps.

VI. CONTACTORS

A **contactor** is an electrically controlled switch used for switching a power circuit, similar to a relay except with higher current ratings. Here contactor is used to control electrical load. The contactors are provided for change over switching and for the interlocking of MAIN POWER and generator lines

VII. GSM MODEM

We are using the GSM modem to send the alerts of change over from MAIN POWER to generator and generator to MAIN POWER to the user.

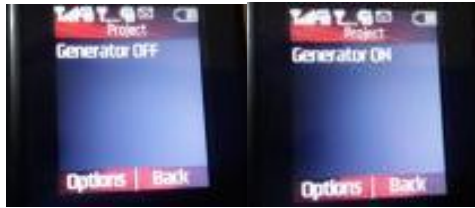


Fig 1-3 GSM Alert 1

VIII. CONCLUSION

In this paper we are presented an economical and easy way for switching application of generator through PLC and monitoring through SCADA incorporated with GSM alerts in industries. We can modify our research work in this way that we can control and monitor huge amount of load with the safety and facilitate the needs of our industrial users.

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