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SCADA BASED CABLE MANAGEMENT SYSTEM

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ABSTRACT
This project can identify and isolate any faults that occur in the transmission lines. The transmission line (3-phase) is first divided into parts and a GX-switch is attached at the start of the cables. The SCADA (Supervisory Control and Data Acquisition) system continuously monitors these different points in the cables. Once a fault occurs, the operator receives a notification on his console. He can then select to isolate the fault and to contact the linesman to repair the fault. Since the fault can be isolated, the area affected by the power outage can be given power through a secondary source. This reduces the time of the power cut, in the meantime the fault can be located and repaired.

INTRODUCTION
Electricity plays a major part in our lives. Many of our house hold equipments work on electricity. So, in case of any power failure, our day to day tasks get hampered. Government is spending heavy expenditure on maintaining transformers, cables, power stations. In order to minimise power failures and to arrest transformer losses as well as to minimise the burden of expenditure on exchequer, it is very important to introduce high level process supervisory management system.

So, we have developed a system that will identify and isolate the faults in the cables, and also contact the linesmen to repair the fault. This system can work with both underground cables as well as overhead cables. The faults in the cables can be either open circuit or short circuit faults. Different points are defined on the transmission line i.e. from the power plant to the substations, at these points a switchgear is connected which transmits the status of the cable section wirelessly. The inputs from these switchgears are taken and given to the PLC.

The PLC along with the switchgear forms the SCADA. Since the switch gears are transceivers, they can be remotely controlled by the PLC. Once a fault occurs, the location of the fault along with the areas affected by the power outage can be seen on the console present at the main station. The operator can use the console to isolate the faults using the GX-switch
present in the switchgear. In doing so, we achieve the isolation of the faulty cable, also power can be rerouted from another point to the areas affected. So, power is restored in minimum time and the faulty cables can be repaired.

HARDWARE REQUIRED
1. Momentary Push-Buttons: A type of switch usually in the form of a push button that is only engaged while it is being depressed, as opposed to a typical “on/off” switch, which latches in its set position. Momentary switches may be normally open or normally closed.
2. Pilot Lights: This is a 24vdc device which is used to indicate the status of the outputs of the PLC.
3. Relay: A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal.
4. SMPS: It stands for Switched-Mode Power Supply. It is a n electronic power supply that uses a switching regulator to convert electrical power efficiently. The one which we used has an output power of 24V DC 5A.

5. NO NC Connectors: These are used with the push buttons to get the desired device. NC stands for normally closed, so this can be used to trigger an output when the button is pressed.
6. PLC: It stands for programmable logic controller; this is the main component of any SCADA system. We are using a delta PLC TP04PM which has 16 digital I/O.

SOFTWARE REQUIREMENTS

1. Wonderware INTOUCH: It is an HMI software that allow us to control PLC through PC.
2. KepSERVER: It is the industry's leading connectivity platform that provides a single source of industrial automation data to all your applications. The platform design allows users to connect, manage, monitor, and control diverse automation devices and software applications through one intuitive user interface.
3. ISPSoft V3.06: used to programme the PLC.
4. RsLogix simulator: This is used to test various ladder logics without uploading it to the PLC.
5. TPEeditor: Used to programme the 4-line text panel on the delta HMI

EXPERIMENTAL SETUP

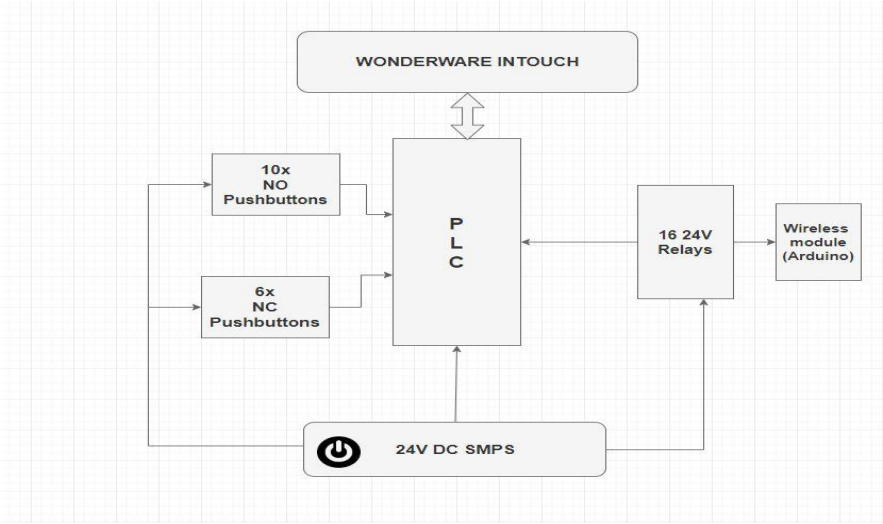

Figure 1: Block diagram of SCADA hardware.

The NO (normally open) pushbuttons are used as fault switches, in order to simulate faults at desired locations to test the system. Some NO pushbuttons are used to remotely control the generator to reroute power to areas where demand is more. The NC (normally closed) buttons act as stop buttons, for both the generators as well as the system. These pushbuttons are then connected to the input of the PLC. The PLC is connected to a system namely windows using KepServer and Wonderware InTouch as the SCADA software. Here the ladder logic can be uploaded to the PLC.

Figure 2: Interfacing with PLC Delta TP04p-16tp1r

The output of the PLC is connected to two 8 x Relay Modules, and then connected to a microcontroller. This microcontroller is using with nRF24L01 module to send status of outputs from the PLC to any far away location. This is done to show the wireless capabilities of the system. Another nRF24L01 module is connected to the model of the area under test to demonstrate the system. The transmission line of the city is divided as shown below. Where the plus sign shows the location of the switchgear. (courtesy of Lucy Electric)

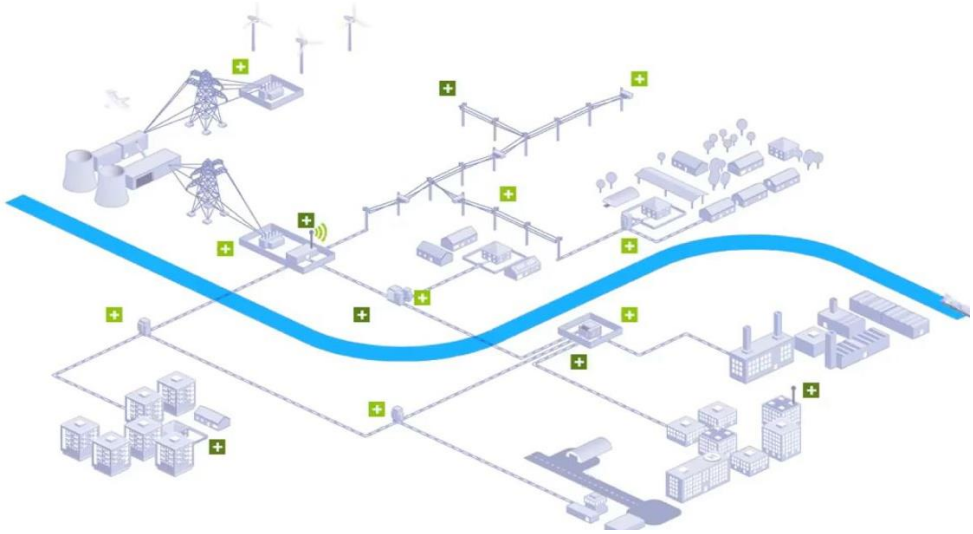

Figure 3: Figure showing the locations of the GX switches.

For testing the system, the GX switches are replaced by a microcontroller and relays along with nRF module to receive the data from the PLC. Faults are then manually created and the system is used to isolate the faults and to reroute the power to the affected areas. The SCADA software can be used to see the status of the faults in real-time and to check if the linesman is contacted in order to fix the faults. It can also be used to manually switch on/off a remote generator to supply additional power.

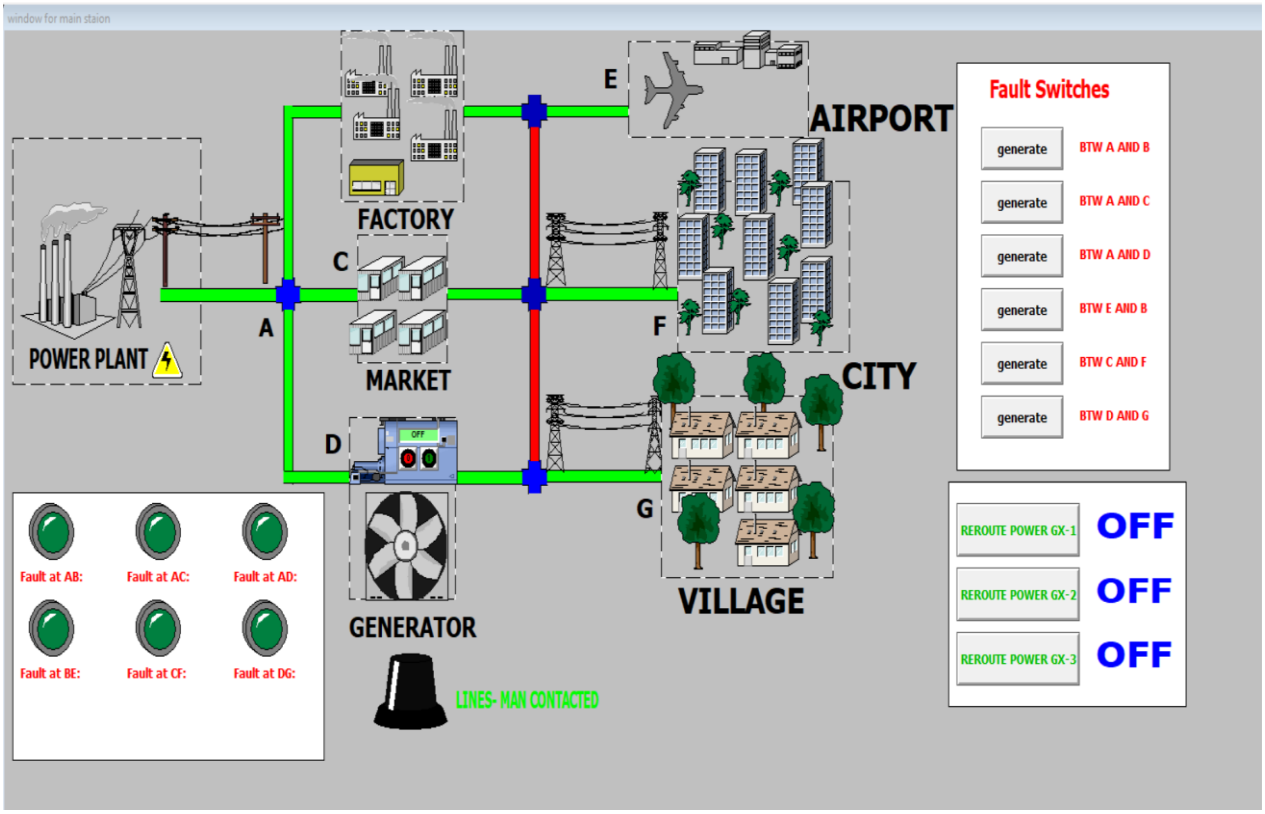

Figure 4: Wonderware InTouch Console.

The above figure shows the console which can be used to check the status of the cables.
Green indicates if the transmission lines are working perfectly, in case of any damage to these lines the indicator will turn on and the affected lines will be represented in red.
The operator can then contact the nearest lineman to the fault, and also can isolate the fault using the GX-switches.

CONCLUSION

This system will help to monitor transmission lines wherein message will be received at the main-station as soon as power supply gets snapped at any particular area. This system will help to identify fault and restore power supply immediately. This system can be used with both underground as well as overhead cables. It can detect both short circuit and open circuit faults. Thus, it saves time and labour cost.

REFERENCES

1) Alan S. Morris,EEE, Principles of Measurement and Instrumentation,2nd Edition
2) John Webb, Ronal Weiss, Programmable Logic Controllers: Principles & Applications, Prentice Hall of India, 5th Edition .
3) Satish Bakanagari,et al Int. Journal of Engineering Research and Application, Three phase analysis with auto reset for temporary fault or permanent trip otherwise,ISSN:2248-9622, Vol. 3, Issue 6, Nov-Dec 2013, pp.1082-1086.