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WINDMILL AUTOMATION

Utkarsha R. Bhosale[1], Shraddha C. Shinde[2], Rutuja R. Bhurke[3], Ashwini A. Bhat[4], Tatugade A. A.[5]
Dept. of Electronics and telecommunication engineering, Rajendra Mane College of Engineering & Technology, Ambav(415804), (Devrukh), Maharashtra, India
University of Mumbai
bhosaleur06@gmail.com[1], shraddhashinde7744@gmail.com[2], rutujabhurke95@gmail.com[3],
bhat.ashwini30@gmail.com[4],ajittatugade@gmail.com[5]

***ABSTRACT*-The main aim of our project is to protect the SCADA system for continuous operation of windmill. We are implementing two main units Power pack unit and Automation unit. The power pack unit is used as standby power supply during interruptions of regular power supply due to power failure or power fluctuations. It consists of auto cut-off and low voltage protection circuit. Auto cut-off circuit automatically switches depending upon battery charging and discharging conditions. And low voltage protection circuit gives the protection to the battery. Why automation? The automation unit for SCADA is developed for monitoring the two signals Ac fail and Dc fail. Controller is used to perform the automation. If any of the one signal fails or both signals fail the message displayed on the LCD as well as the same message is sent to the operator through GSM with the machine number. The keypad is used to input the machine number and operator mobile number. Hence, we are designing such circuits which will give always secure SCADA system in windmill plant.**

***KEYWORDS:* AC fail and DC fail, GSM Module, Keypad, LCD, Microcontroller, SCADA**

I. INTRODUCTION

This project is mainly divided into two parts- Power pack and Windmill Automation for SCADA (Supervisory Control and Data Acquisition). The Power Pack Unit is used as standby power supply during interruption of regular power supply due to power failure, power fluctuation, etc. The power pack provides a reliable and stable power to the equipment/systems sensitive to power variations and interruptions. It functions as voltage stabilizer and at the same time it isolates the equipment/systems from power lines. The power pack consists of a battery charger, an inverter, output transformer, a set of batteries, control circuits and snubber circuit. The on-line power pack provides a conditioned output voltage when the power is on and charges the battery through the battery charger. The control circuits of power pack automatically switch over to the inverter and supply power from the batteries during power interruption/failure. The change-over from mains to the battery and back to the mains supply is done automatically by the control of circuits. The modern power pack employs MOSFET based inverter and pulse width modulators techniques which are implemented here. The Windmill Automation Unit for SCADA is developed for monitoring two signals AC FAIL and DC FAIL. If failure occurs at any one i.e. AC or DC then a message is sent through GSM to the operator. The output of this unit is 24V DC which is ORing of AC fail and DC fail signals.

A. PROBLEM STATEMENT

SCADA system is main controlling technique to gain appropriate analysis of the errors. So, continuous recognition of errors must be present. Hence SCADA system should continuously available for efficient working. For this, designing of the power pack unit as an alternative to the mains supply is done. Also, an automation unit is provided to connect with the operator at a time of failure of supply.

B. OBJECTIVE

The objectives of the project are

I. To design the 110V DC digital power pack circuit
II. To utilize optimum energy through power pack unit to achieve great outputs
III. To provide protective circuit for battery backup
IV. To provide warning of failure of supply
V. To convey message to operator about failure of supply

C. RELATIONSHIP WITH EXISTING NETWORK

Wind energy is fastest growing energy source. Nowadays solar, biomass, hydro, geothermal energy sources are available. But wind energy is advantageous as it does not involve heating problem, greenhouse gas emission, burning

of fuel etc. The operation of windmill is related to the SCADA system. So, this system should be protected by taking care of its continuous working. The existing network having SCADA system for making smooth performance. But if this system shut down for some time the loss will occur. Also at that time operator may not receive the fault indications. To neglect it our system provides power pack with automatic indications by giving out low voltage protection and auto cut-off circuitry. Today's available system does not provide clear indications quickly as any failure occurs. But this system giving information through GSM.

II.DESIGN DETAILS

Power pack unit consist of:
Inverter: It is alternator for the mains supply.
Battery charger: It should use to charge the battery based on charging conditions. Low voltage protection: It should detect the low voltage and gives protection to the unit.
Snubber circuit: To avoid delay gap between original and inverted signal and remove the spikes.
Automation unit consist of:
GSM: This is used to send SMS to operator about failure of supply with machine number. Keypad: To update password, mobile number of the operator and machine number of windmill.
LCD: to display message of failure

III. IMPLEMENTATION OF THE WORK

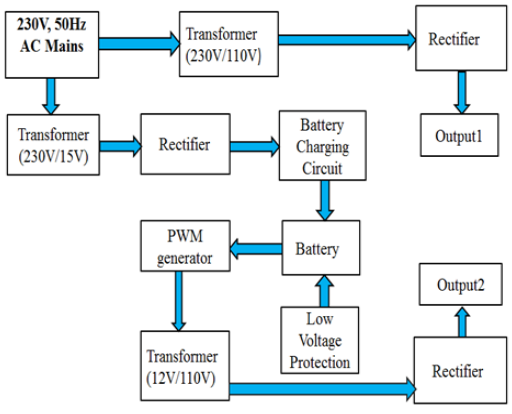

Fig.1. Power Pack Unit

This unit used as power supply by giving mains AC supply to SCADA system by converting it to DC. Also, if mains supply fails then alternator DC supply given to the system automatically. In this case, the DC battery having charging circuit. It has a low protection circuit which takes action when voltage of the battery is below 9V. So, when this condition occurs automatically the charging starts. Then auto cut-off circuit works on exceeding voltage. When voltage goes beyond 13.8V the charging stops. The PWM generation carried out by using SG 3524 which gives the best accuracy than the IC 555 and microcontroller. The Snubber circuitry used to remove spikes and redundancies in original and inverted signal. Then it converted to 110V DC and give out output as an alternator to mains supply.

A. FEATURES OF POWER PACK

This rechargeable power pack has built-in inverter which is powered from the internal battery and being connected to the SCADA system covering very small space. The inverter can power a device up to 110W, such as a battery charger. It is highly efficient, converting 85-90% of its energy into output power. This includes auto cut-off protection to power down the inverter if the battery exceeds a certain level. Also, battery starts charging if battery power drops below a certain level.

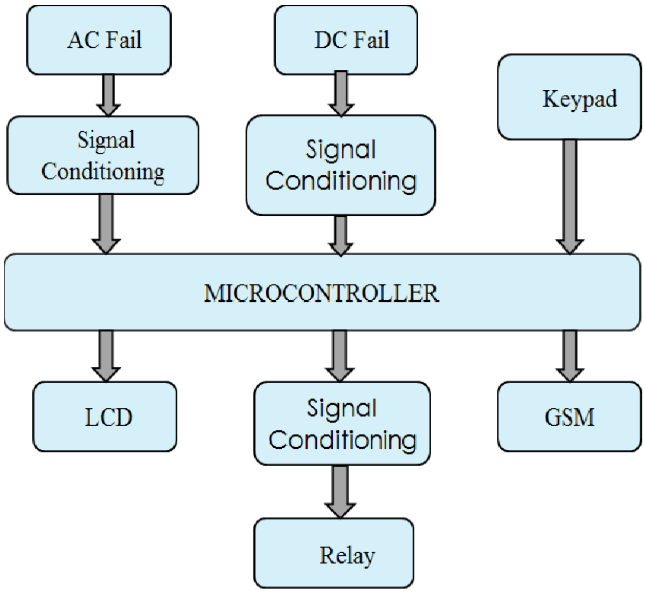

Fig.2. Automation Unit

The Automation unit for SCADA system is key procedure of project. The two DC signal that we obtained from power pack are given to the microcontroller AT89C2051. Before giving the signals to the controller signal conditioning should be done. Also at the input side interfacing of keypad is done where password, machine number of particular windmill, operators mobile number is entered. Then at the output side LCD (Liquid Crystal Display) is interfaced which shows the condition of failures that is AC fail or DC fail. Again, the signal conditioning of output signal is done properly. The PLA (Programmable Logic Array) relay is used to handle electrical loads too large for a small switch to handle. The relay simply acts as a switch, it takes signal from the controller in order to activate and deactivate an output.

IV.FLOW CHARTS

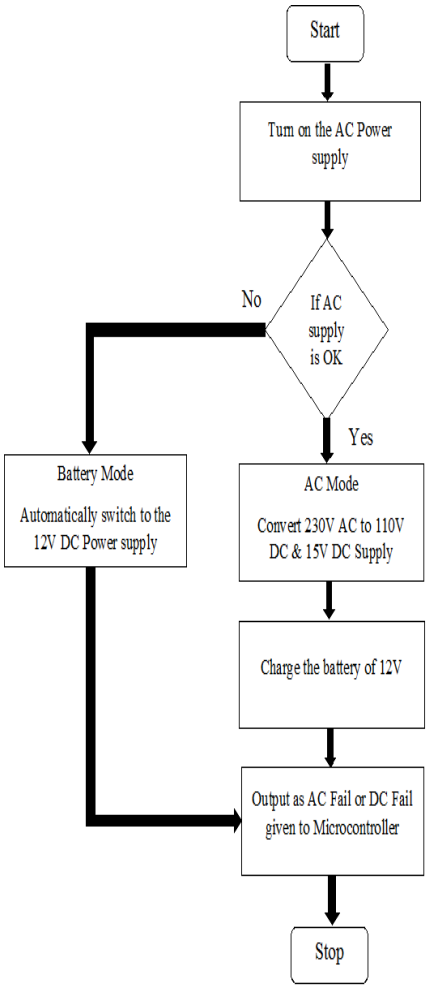

Fig.3.Flow Chart of Power Pack Unit

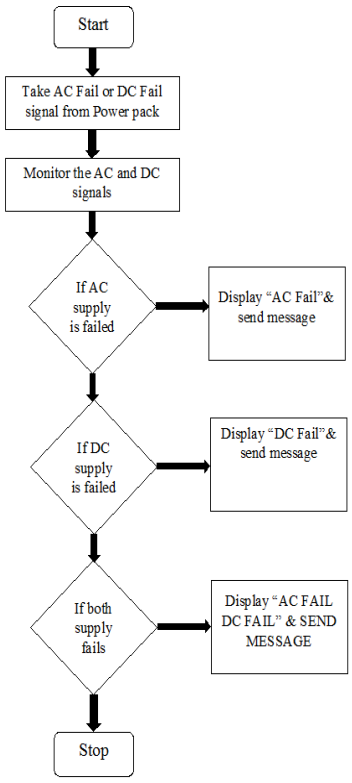

Fig.4.Flow Chart Of Automation Unit

IV.CIRCUIT IMPLEMENTATION

Fig.3.Power Pack Unit Hardware

Fig.4. Condition 1:AC fail & DC fail

Fig.5 Condition 2: AC fail

Fig.6 Condition 3: DC fail

V.RESULT

Through power pack unit our project produced 110V DC voltage. It is efficiently utilised for continuous working of SCADA system. Also by using automation unit successfully displayed as well as conveyed failure message with machine number.

VI. CONCLUSION

Systematic analysis of fault and no-fault conditions were exploited in this development of project. The power pack unit with MOSFET drivers, snubber circuit, auto cut-off and low voltage protection circuit were selected based on their wide applications in power electronics. The proposed project has demonstrated cost, compliance, quality and safety benefits since implementation. This project will provide additional support and guidance to others struggling to change practice and cultures.

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REFERENCE

[1] *MODERN SCADA PHILOSOPHY IN POWER SYSTEM OPERATION – A SURVEY* Nicoleta ARGHIRA[1], Daniela HOSSU[2], Ioana FĂGĂRĂȘAN[3], Sergiu Stelian ILIESCU[4], Daniel Răzvan COSTIANU[5]

[2] *Safe, rechargeable, Battery containing power pack and method* US 5160879 A, 1992, Angelo Tortolo, Donald C. Miffitt

[3] *Use of SCADA Data for Failure Detection in Wind* Turbines K. Kim, G. Parthasarathy, O. Uluyol, and W. FoslienHoneywell S. Sheng and P. Fleming National RenewableEnergy Laboratory Presented at the 2011 Energy Sustainability Conference and Fuel Cell Conference Washington, D.C. August 7-10, 2011

[4] *Risk assessment of power systems SCADA, Power engineering society general meeting*,2003, IEEE G. Hamoud, R.-L. Chen, I.Bradley Hydro One Inc., Toronto, Ont., Canada

[5] *Application of SCADA for controlling Electrical Power System Network*-Rajib Baran Roy1 UITS Journal, Volume:1, Issue:2