Continuous Fault Identification and Isolation in Small Scale Industries Using Lab View

A.Sruthi, K.C Ramya, S.Sivarajani, G.RadhaKrishnan, R.Divya

Abstract: The fault occurred in the distribution lines of small scale industries should be checked manually to find out the exact line with fault. The manually checking of fault line minimizes the production of loads and increase the time and maintenance cost. In the proposed method, by continuous monitoring, the system detects the fault in the lines and indicates the position where the fault has occurred and the line with fault is isolated and displayed using Lab VIEW. This method to identify the fault line minimizes time and maintenance cost

Keywords: Distribution line, Line Fault, Isolation of line.

I. INTRODUCTION

The small and micro scale industries run with multiple loads, when a fault occurs in any one of the lines connected to loads, the supply to all the loads will be tripped by the circuit breaker. This will cause hindrance to the continuous production of the unit until the fault is identified and rectified which will be a tedious process. Here the fault should be identified by checking individual lines manually which is a time consuming process. The proposed method facilitates to overcome this drawback. It helps the user to identify the line in which the fault has occurred by indicating the line under fault in the front panel of the Lab VIEW tool [3] and thus eliminates the requirement for checking all the lines for finding the faulty line. Thereby, the time consumption for fault identification will be considerably reduced. Also the line under fault alone can be manually isolated allowing the rest of the loads to run without any problem [2].

An Electrical Fault is abnormal condition of voltage and current than normal. Open circuit, short circuit, over load and under voltage is the common faults [6]. If a fault occurs due to flow of current bypassing the normal load said to short circuit fault. If a circuit is interrupted by some failure an open-circuit fault occurs [9]. In three-phase systems, a fault may occur only between phases or it may involve one or more phases and ground. When failure occurs, the protective devices detect fault conditions and activate the circuit breakers to limit the loss of service.

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In a poly-phase system, a symmetrical fault or asymmetrical fault may affect all phases equally or only some phases. When many devices are connected to a circuit and if the total current requirement is much more than the rating of the circuit, the circuit is subjected to over load. Normally, under voltage faults occur because the voltage supplying the drive is too low. The observable cause of this fault is that the main supply is low or not the rated voltage. The proposed method is implemented considering the short circuit fault and overload fault as there exists better feasibility for detecting these two faults comparatively.

II. PROPOSED METHOD

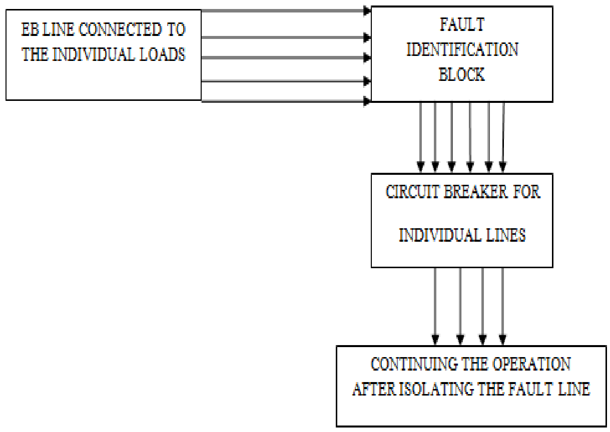

Fig. 1 Block Diagram of Proposed Method

The basic block diagram as in figure 1 shows the sequence in which the fault identification in the lines connecting the loads is done and the continuous supply given to the remaining loads after the isolation of the faulty lines.

1. EB Lines Connected to Individual Loads

In small scale and micro scale industries, many numbers of loads will be connected to the main supply through the lines. A fault in any of the lines which will make the circuit breaker trip is identified by the next block. In real time these lines will be monitored with the help of current transformers and potential transformers.

2. Fault Identification Block

The fault identification block identifies the line in which the fault has occurred and displays it via the front panel of the Lab VIEW tool. If any line is under fault, the led indication of the line will be displayed in the front panel. Also the type of fault with line number fed will be displayed in words in the front panel.

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Even multiple faults occurring at a time will be displayed until the fault is rectified. Once rectified the fault indication will disappear in the front panel.

3. Circuit Breaker for Individual Lines

The moment the fault occurs, it will be displayed on the monitor and also the circuit breaker will trip. This operation is carried out to prevent the damage of the loads. After the tripping operation, the line indicated to be faulty alone should be isolated manually. Since indication of the specific line is provided, it eases the job of the user for manual isolation and also conserves time as it does not require individual testing of all the lines to find the faulty line.

4. Continuing the Operation after Isolating the Fault Line

After the manual isolation of the faulty line, the remaining load are provided with the supply and allowed to operate. After rectifying the fault, on connecting the isolated line again the fault line indication will disappear in the front panel of the Lab VIEW [10] window. This disappearance of the faulty line indication intimates the user that the fault exists no more.

5. Components used for the Implementation of Logic in Lab VIEW

The Boolean logic is used for the implementation of our fault identification circuit. The gates, loops and case structures are used for creating our program in the block diagram. The front panel components are the controllers are controllers (switches) and indicators (LEDs) [4,8].

The various other components used are comparators which is used to compare the values, string concatenators are used to concatenate the strings which is used to concatenate the strings for displaying in the monitoring display whenever it occurs and local variables which are used to store the input values. The local variables are chosen instead of global variables because it is used for two different purposes here. One is to store the input values from the line and the other purpose is to store the temporary values which is stored in it during the execution of each of the loop.

III. METHODOLOGY

- The operation of our logic designed in LabVIEW tool starts by allowing the current to flow through the EB lines which will be given to the local inputs with respect to which the loops operate.
- We have made use of two while loops, of which the outer while loop runs continuously without termination so that all the lines are checked continuously for the occurrence of fault at any point of time. The inner while loop is used for indicating the fault in a line when it occurs.
- When a fault is encountered, this inner loop terminates and indicates the fault in specific lines. Simultaneously, if a fault occurs in any other line then it will also be indicated with the former one due to the operation of the outer while loop. There are two case structures used here.
- The outer case structure checks whether a fault exists and if it exists only the control is transferred to the inner case structure. The inner case structure checks the type of the fault and indicates it accordingly.
- All the outputs are given to a string concatenator which helps in displaying the existence of the fault in multiple lines simultaneously.
- The string concatenator is connected to the string display which displays the final output which will favour the user in identifying the line in which the fault has occurred so that he can manually isolate the specific line alone allowing the rest of the loads to function without any interruption.
- Thus by using this system we will be able to monitor the faults and indicate easily so that the time complexity in finding the exact line with fault can be avoided.

IV. RESULTS AND DISCUSSION

i. The front panel obtained after connecting all components in block diagram with manual fault creation controller is shown in figure 2. The front panel has the controllers and indicators. The controllers are used to control the input given to the circuit. The indicators are used to indicate the output.

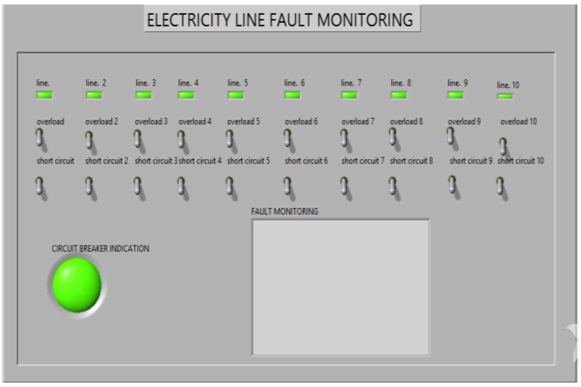

Fig. 2 Screenshot of front panel showing normal operation

ii. The front panel indicating that a fault has occurred in the system with light indication as well as displaying the type of fault and the exact line where it has occurred is shown in figure 3.The block diagram has been designed in such a way that even though a fault has occurred and it remains uncorrected though it's isolated, any other fault occurrence in any of the lines can also be detected.

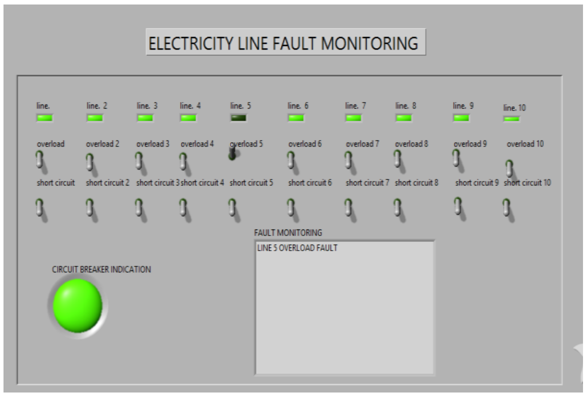

Fig. 3 Screenshot showing that a fault has occurred

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iii. The front panel showing the occurrence of new fault along with the previously occurred and uncorrected fault is shown in figure 4.

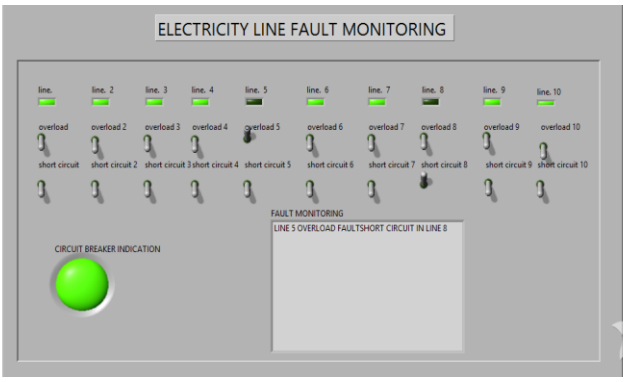

Fig. 4 Screenshot showing the additional faults

iv. Once a fault has been corrected and the line is connected, the line starts to perform normally and so it will be removed from the display that displays that the fault has occurred in that line and the led will be turned on showing the normal operation of the line. This is shown in the figure 5.

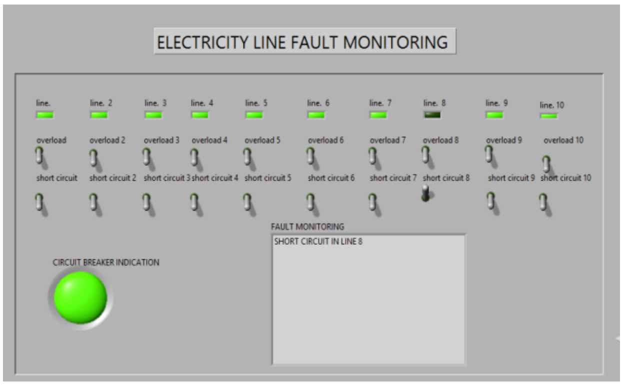

Fig. 5 Removal of corrected line

v. In order to improve the compatibility of the circuit, we changed the manual fault creation controllers in such a way that we can set a preset value and depending on the change in load current, the circuit will find the fault automatically and indicate it. The front panel showing the controllers with the facility to set a preset value is shown in figure 6.This figure shows that a short circuit fault has occurred. Here we use an LED to indicate whether it is a open circuit fault or an overload fault.

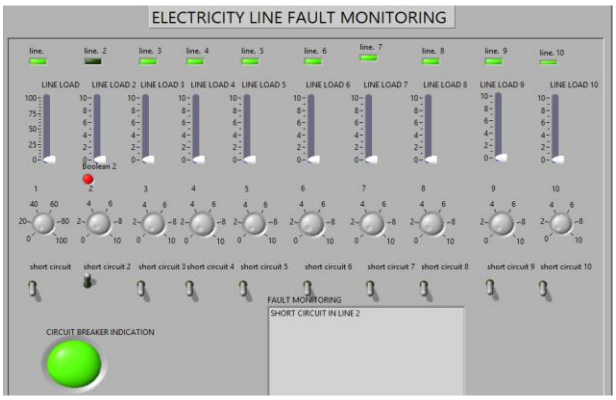

Fig. 6 The front panel with preset controller

vi. If the preset value is set at a particular value and if the load value is varied beyond the preset value, then it will show the fault as shown in figure 7.

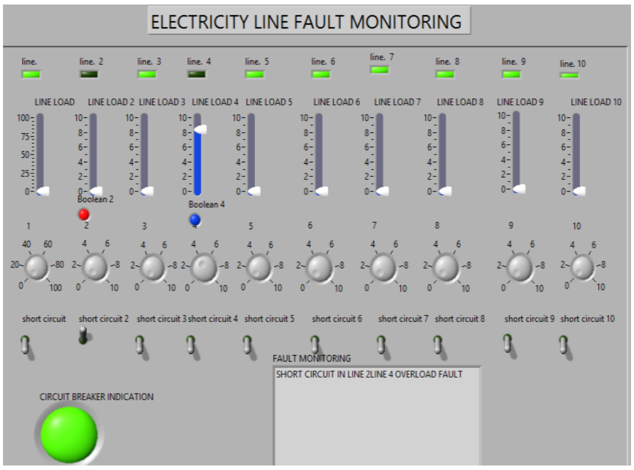

Fig. 7 Different fault indications

The LED properties are changed such that it indicates different colors during different faults. The string concatenator is used to concatenate the strings which come out of the case structure. The delay which is provided helps us to observe the outputs clearly. In case if the delay is not used, then the outputs keep on changing so quickly that it will become so hard for an observer to detect or observe the changes that are happening. Once the fault is indicated it should be isolated manually from the other lines before switching the circuit breaker on again. Otherwise it will keep on tripping the circuit breaker.

vii. Once the faults are corrected it will come to normal operation as shown in figure 8.

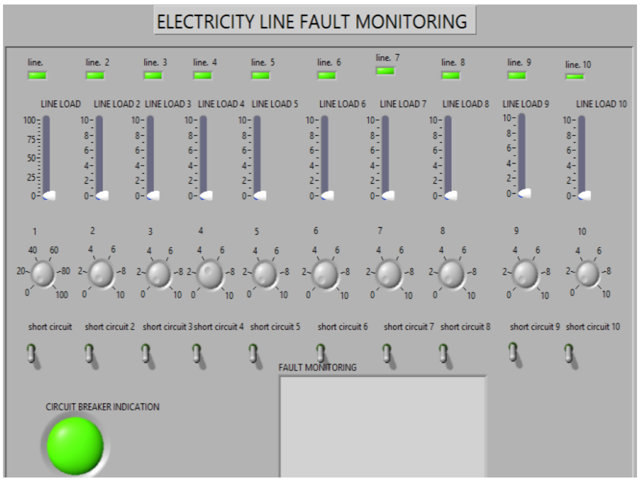

Fig. 8 Monitoring panel after the faults are cleared

Thus this model of fault identification is compatible for multiple kinds of industrial applications which favor easy monitoring and fault detection in the specific line at the moment of its occurrence,[6] thus reducing time complexity which has been a drawback in the existing system. Hence improves the reliability.

V. CONCLUSION

The proposed method increases the production of load and reduces the maintenance cost in small and micro scale industries by continuous monitoring and identifying the exact line of fault, further reduces the time to identify the fault. The isolation of fault line and indication using Lab VIEW provides trouble-free analysis of fault. It provides a best solution for continuous process industry.

REFERENCES

1. AlirezaFereidunian, AlirezaShahsavari, Hamid Lesani, Mahdi Mazhari and Seyed ,(2014) "Fault Indicator Deployment in Distribution Systems Considering Available Control and Protection Devices: A Multi-Objective Formulation Approach", IEEE TRANSACTIONSON POWER SYSTEMS,VOL.29, NO.5.
2. He,Y. (2002) "Modeling and evaluation effect of automation, protection and control on reliability of power distribution systems, Ph.D. dissertation, Royal Inst. Technol., KTH Univ., Stockholm, Sweden.
3. LabVIEW User Manual, April 2003 Edition, National Instruments.
4. S.Sheeba Rani, V.Gomathy and R.Geethamani, "Embedded design in synchronisation of alternator automation" in International Journal of Engineering and Technology(IJET) , Volume No.7, pp 460-463, April 2018
5. Chance Elliott, Richard Hansen, VipinVijayakumar and Wesley Zink (2007), National Instrument LabVIEW: A programming environment for laboratory automation and measurement, the association for Laboratory Automation.
6. D.A. Janeera, Dr.S. Sheeba Rani Gnanamalar, D. Ruth Anita Shirley, Dr.V. Gomathy, Dr.V. Kamatchi Sundari, "Design of programmable marine metal detector using Uni Fi Controller", Journal of Advanced Research in Dynamical and Control Systems, Vol.10, no.05, pp.1317-1320
7. Bitter, Matt Nawrocki, Rick, Taqi Mohiuddin, (2001) "LabVIEW Advanced Programming Techniques Boca" Raton: CRC Press LLC.
8. www.ni.com
9. www.ie.itcr.ac.cr
10. www.ijsce.org