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Fault Detection and Efficiency analysis of Bottle filling plant

Rohit Harsulkar[1], Pratik Mahajan[2], Prof. H. P. Chaudhari[3]

BE, Instrumentation, AISSMS Institute of Information Technology, Pune, India[1,2]

Professor, BE, Instrumentation, AISSMS Institute of Information Technology, Pune, India[3]

Abstract: Fault detection plays an important role in high cost and safety-critical processes. Early detection of process faults can help avoid abnormal event progression. Fault detection can be accomplished through various means. In this project by using proper sensor for each instrument we are going detect the fault and ultimately try to increase the efficiency of particular plant. The sensors, micro-controller are key parts of the project. We mount separate sensor for each instrument to monitor performance of every instrument. The signals came from sensor is then feed to Micro-controller. We use Raspberry-pi micro-controller in this project. Micro-controller monitors all the signal comes from each sensor and according to that take corrective action if critical condition occurs. This condition, operator can see on his mobile app and control wherever he is. In this way the fault can be detected and the harm cause by any critical condition can be reduce. And it helps to increase the efficiency of whole plant.

Keywords: Sensors, Fault, Efficiency, Raspberry-pi.

I. INTRODUCTION

In modern era in big industries specially ion process industries where the accuracy and efficiency is important to achieve desired goal the fault detection system is arising and getting continuously upgraded day by day. In any process industries the fault is such a bug which create unnecessary problem in continuous process which can tends to further loss in profit of that industry and degradation in instruments process. For Ex in process industries like in bottle filling plant all process are depend on each other like from starting of filling process to fulfilling of whole process each process is depend on each other, now if certain fault occur in between the process the further process disturbs because of the fault occur. Suppose as in above example of bottle filling plant if fault occur in conveyer belt which plays important role in the whole process the further process depending on this will disturb and the whole process may get completely stopped. At the beginning detection of fault is limited up to certain parts of the process. It does not cover entire area of process. As the new technology came into action it was possible to detect the exact fault and exact location where the fault was occur. The modern sensors, transmitter makes easy for operator to detect the fault and according to that helps him to take corrective action. Now a day's system is so upgraded that manual effort on detecting the fault and correct it, is reduced. Now a days Networking is new emerging technology and is a revolutionary in the process of fault detection. Due to networking technology operator can monitor the various parameters of process where fault can occur on the screen of monitor by sitting in his chair. Now it's not necessary for operator to go on regular check on running process the fault can be now detected automatically and can be seen on monitor or on android app. With the fault detection analysis of efficiency of plant is also important. The analysis of efficiency is necessary in all process industries so as to increases the product ability. Efficiency analysis is important to determine the day to day production that occur in process industries. Efficiency analysis helps to match the level of desired production in a day to actual production in a day that occur in industries. Efficiency analysis plays vital role in the profit and loss of the specific industry. The purpose of the project is to detect the fault and thus calculate the efficiency of plant. Thus, an automatic and WSN system for measurement of parameter in the plant process. The system enables to conduct performance test of various sensor for given test parameters. WNS system is designed for quick monitoring for various sensors. The Rasp-Berry pi is used to control all the functions. All signals from the sensor module is feed to the controller. The cloud is the source of all data records which contains data coming from various signals. The condition are to be displayed on designed APP.

II. LITRETURE SURVEY

Process fault detection based on modeling and estimation methods:
The supervision of technical processes is the subject of increased development because of the increasing demands on reliability and safety. The use of process computers and microcomputers permits the application of methods which result in an earlier detection of process faults than is possible by conventional limit and trend checks. With the aid of process models, estimation and decision methods it is possible to also monitor non measurable variables like process states, process parameters and characteristic quantities. This is followed by a description of suitable parameter

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estimation methods for continuous-time models. Then two examples are considered, the fault detection of an electrical driven centrifugal pump by parameter monitoring and the leak detection for pipelines by a special correlation method.

Distributed fault detection of wireless sensor networks:
Wireless Sensor Networks (WSNs) have become a new information collection and monitoring solution for a variety of applications. Faults occurring to sensor nodes are common due to the sensor device itself and the harsh environment where the sensor nodes are deployed. In order to ensure the network quality of service it is necessary for the WSN to be able to detect the faults and take actions to avoid further degradation of the service. The localized fault detection algorithm are proposing to identify the faulty sensors. The implementation complexity of the algorithm is low and the probability of correct diagnosis is very high even in the existence of large fault sets.

Fault detection of wireless sensor networks:
Distributed fault detection algorithm for wireless sensor networks. Faulty sensor nodes are identified based on comparisons between neighboring nodes and dissemination of the decision made at each node. Time redundancy is used to tolerate transient faults in sensing and communication. To eliminate delay involved in time redundancy scheme a sliding window is employed with some storage for previous comparison results. Simulation results show that sensor nodes with permanent faults are identified with high accuracy for a wide range of fault rates, while most of the transient faults are tolerated with negligible performance degradation.

A Survey of Fault Management in Wireless Sensor Networks:
Wireless sensor networks are resource-constrained self-organizing systems that are often deployed in inaccessible and inhospitable environments in order to collect data about some outside world phenomenon. For most sensor network applications, point-to-point reliability is not the main objective; instead, reliable event-of-interest delivery to the server needs to be guaranteed (possibly with a certain probability). The nature of communication in sensor networks is unpredictable and failure-prone, even more so than in regular wireless ad hoc networks. Therefore, it is essential to provide fault tolerant techniques for distributed sensor applications. Many recent studies in this area take drastically different approaches to addressing the fault tolerance issue in routing, transport and/or application layers.

III. PROPOSED SYSTEM

In our proposed system the method of detection of fault and analysis of efficiency by various means such as to monitor all the parameters or monitor functioning of all instruments for proper output is composed. In this system quantitative efficiency of the bottle filling process is measured using an IR sensor pair. The IR sensor provides the pulsating output to the ESP8266 NODEMCU, thus the quantity of the bottle filled per hour is compared with the desired production rate of the bottle filling plant process. For the fault detection in bottle filling plant process we monitor different elements of the whole process which includes electric conveyer motor, electric water flow solenoid valves, IR sensor etc. For electric conveyer motor we used current sensor to measure the faults in the conveyer speed and detecting the jamming of the conveyer. For fluid flow electric solenoid valve we used the current sensor which monitors the electrical supply to the solenoid valve ensuring fault prevention due to lack of electrical supply to the solenoid valve. To increases the efficiency and productivity of the bottle filling plant and to reduce the downtime of the process by 75%, we used combination of the current and voltage sensor to record real time data of the bottle filling plant. Using these two sensors we measured the power consumption of the whole plant. This data is then processed and monitor real time for any changes in power consumption. The power consumption of the process should be same for each product cycle which ensures the significance of healthy plant.

Sensor And Controller Network For Proposed System

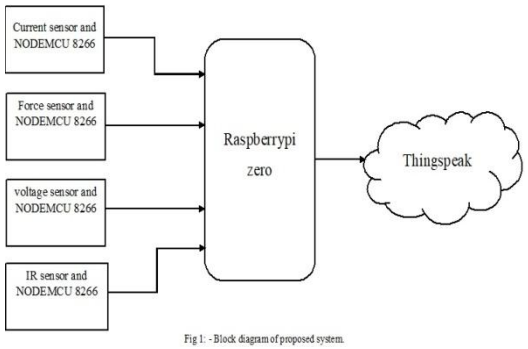

Fig 1: - Block diagram of proposed system.

Field Implementation and Sensor Placement in Bottle Filling Plant

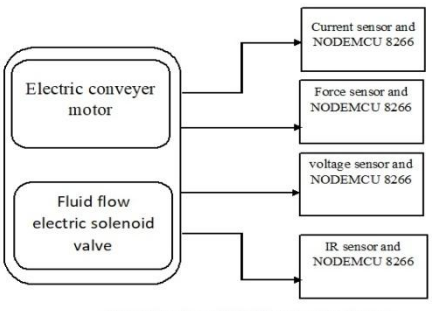

Fig 2:- Sensor placement block diagram for proposed system

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IV. APPLICATION

- Bottle filling plant.
- Intelligent building.
- Food processing industries
- Manufacturing plant
- Packaging industries
- Petroleum industries

V. ADVANTAGES

- Any fault in the system can be detected quickly.
- The particular unit which is faulty can be identified.
- Efficiency of the plant can be monitored.
- Operator need not have to sit in operating room constantly.
- Reduce labor cost.

VI. CONCLUSION

The principle goal of this paper is detect the fault that occur in the continuous process in various plants and ultimately measure the efficiency and to increases it. This system will find the exact fault and exact location where it occurs, and help to operator to take corrective action immediately. The signals from recognized faults by sensors is send to the main micro-controller i.e. Raspberry-pi and further send to cloud or android app where operator can see it and accordingly takes action on it. This work will serve useful in the process industries, for example, in the process of bottle filling plant. It has numerous applications which incorporate process safety in various industries such as petroleum industries, food process industries, packaging and labelling, manufacturing plants etc.

REFRENCES

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[3] Myeong-HyeonLeeYoon-HwaChoi, Department of Computer Engineering Hongik University, 72-1 Sangsu-Dong, Mapo-Ku, Seoul, Republic of Korea
[4] Lilia Paradis[1],Qi Han[1,2]
1.Department of Mathematical and Computer SciencesColorado School of MinesGoldenUSA
2.Department of Mathematical and Computer SciencesColorado School of MinesGoldenUSA