Conveyor Belt Fault Detection Using IOT

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***Abstract*: Conveyors Belts are durable and reliable components used in the industries for transporting material. Conveyors producing single type of component at a time generally monitor and control a single type of object. However, if there are more objects, then another system needs to be developed. In order to control reasonably the acceleration and dynamic tension in emergency breaking process so as to assure smooth breaking and the security of conveyor system, accurate design techniques should be adopted, thus the dynamic simulation methods are required to research precisely the breaking performances of conveyor belt. Other applications are in food processing units, bottling plants, and wood log processing companies also make the study on economization of conveyor belt transfer as an important one. The System is design by using Arduino, Temperature Sensor, Vibration Sensor, Accelerometer and its interface wires. Dynamic model of the conveyor system on longitudinal vibration is established by finite elemental method and output data is visualize so that accurate design techniques may be used to Stability and Security of the conveyor belt during emergency control breaking.**

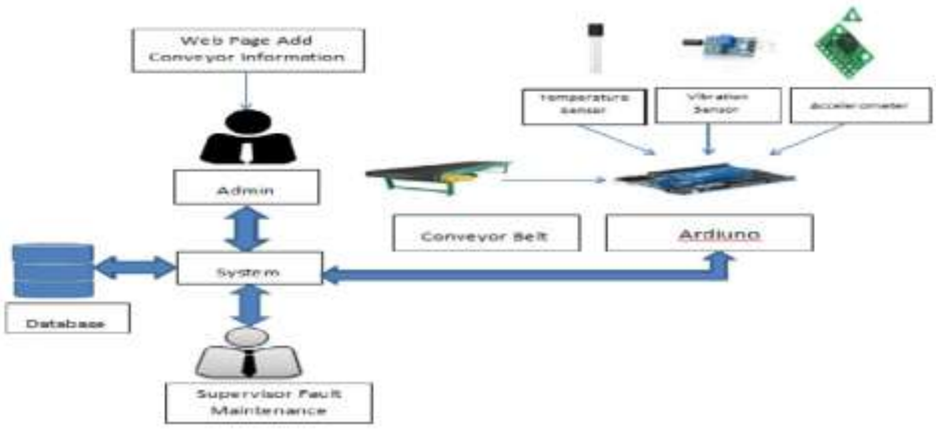
Index Terms: Conveyor belt, Automation, Microcontroller, Sensor, Proteus Simulation, Protection System, Feature Extraction

I. INTRODUCTION (HEADING 1)

The main advantage of conveyor belts that system usually uses is that system can avoid material spillage to a considerable extent. This is noticeable when powdered materials like sand, cement, cement concrete, coal, etc. are transferred with their help. Other applications in food processing units, bottling plants, and wood log processing companies also make the study on economization of conveyor belt transfer as an important one. System is presenting a study of the development of a control method to control the movement and the stop of a continuously running conveyor belt. Different types of conveyor belt systems implemented in the industries. Simple electronics devices are used in this study. A control strategy is for sensing the temperature, vibrations & speed of conveyor belt.

Conveyor systems have become an inevitable part in an automated industry or firm. Conveyor systems find their majority applications in manufacturing industries, transportation sector, workshops, warehouses and many other similar firms, where transportation of bulk quantities is necessary. A belt conveyor system is one of the conveyor systems implemented today. Belt conveyors are the most used powered conveyors since they are highly versatile and less expensive. Conveyor belt, pulleys and electric motors constitute the important parts of a conveyor belt system. Belt conveyor systems are necessary in industries which carry out the activities like coal processing, transportation of agricultural products, chemical segregation, powdering applications etc.

II. SYSTEM ARCHITECTURE



1.1 CONVEYOR BELT:

Conveyor belts are basically very wide belts attached in a loop to two or more turning rotors driven by motors. The loop is the actual conveyor belt, and is generally made of two or more layers of rubber, one layer to give shape and structure to the belt and one to allow it to transport its load safely. This conveyor loop is generally attached to two wheels, called rotors, which are spun by motors. The conveyor belt has enough friction between it and the rotor that it sticks to this rotor.

1.2 Arduino:

Arduino is a single-board microcontroller meant to make the application more accessible Which are interactive objects and its surroundings .The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bitAtmel ARM .Current models consist a USB interface,6 analog input pins and 14 digital input/output pins that allows the user to attach Various extension boards.

1.3 Temperature Sensor:

The system supports up to 100's of temperature sensors, which are registered with the software by location and alarm levels. Two alarms are supported: one is for normal running temperatures, and one is to alert maintenance teams when the equipment is cool enough to tolerate a restart. This is particularly helpful when frequent electrical power outages are a concern. Datalogs can be downloaded for trend tracking and analysis.

1.4 Vibration Sensor:

Vibration sensors are sensors for measuring, displaying, and Analyzing linear velocity, displacement and proximity, or acceleration. Vibration however subtle and unnoticed by human senses is a telltale sign of machine condition. Abnormal vibration indicative of problems with an industrial machine can be detected early and repaired before the event of machine failure; because such a failure is potentially costly in terms of time, cost, and productivity, vibration measurement allows industrial plants to increase efficiency and save money.

1.5 Accelerometer:

Shear mode accelerometer designs feature sensing crystals attached between a center post and a seismic mass. A compression ring or stud applies a pre-load force to the element assembly to insure a rigid structure and linear behavior. Under acceleration, the mass causes a shear stress to be applied to the sensing crystals. This stress results in a proportional electrical output by the Piezoelectric material

III. APPLICATIONS

- Mining Industries
- Milling Industries
- Bottling Plants

IV. ADVANTAGES

- Temperature sensor will sense temperature and send values continuously to system.
- Vibration sensor will sense vibrations in conveyor belt and send values continuously to system.
- Accelerometer senses speed of conveyor belt and send values continuously to system.
- By taking values from sensors, system will predict fault.
- When sensors crosses threshold values then system will detect fault.

V. LITERATURE REVIEWS

A. Daniel J Fonseca, Gopal Uppal & Timothy J Greene (2004):
The major objective of this paper is to illustrate how Conveyor equipment selection is a complex, and sometimes, tedious task since there are literally hundreds of equipment types and manufacturers to choose from. The expert system approach to conveyor selection provides advantages of unbiased decision making, greater availability, faster response, and reduced cost as compared to human experts. This paper discusses the development of a prototype expert system for industrial conveyor selection. The system, which was developed on Level V Object, provides the user with a list of conveyor solutions for their material handling needs along with a list of suppliers for the suggested conveyor devices. Conveyor types are selected on the basis of a suitability score, which is a measure of the fulfillment of the material handling requirements by the characteristics of the conveyor. The computation of the score is performed through the Weighted Evaluation Method, and the Expected Value Criterion for decision making under risk. The prototype system was successfully validated through two industrial case studies.

B. A.J.G. Nuttall, G. Lodewijks & A.J. Klein Breteler (2006):
This paper presents a simplified approach to modeling the rolling contact phenomena that occur at the surface of a wheel driven rubber belt. The main aim of this approach is to determine the rolling friction due to hysteresis and the relationship between traction and slip in wheel driven belt conveyors. The resulting model is an expansion of an existing linear viscoelastic model consisting of a three parameter Maxwell model combined with a Winkler foundation that is used to determine the rolling friction due to hysteresis in a conventional conveyor with a flat belt. Adaptations are introduced to incorporate a curved belt surface and to analyze the relationship between traction and slip. Attention is also paid to matching the model parameters to the viscoelastic properties of an actual rubber sample and subsequently the usefulness of more complex Maxwell models regarding rolling friction and traction is investigated

C. Chun-Hsiung Lan (2003):
This study is deals with The design of a multi-conveyor system in supporting machine loading and unloading has become crucial to management. However, through the mathematical model proposed in this paper, this issue becomes realistically and concretely solvable. This study not only mediates the concept of balancing the number of parallel machines, the conveyor speed for adjacent pallets, the overall relevant costs and the determination of the number of conveyors into the objective, but also develops a two-

staged method to optimise the combined problem to reach a maximum profit. Additionally, the versatility of this study is exemplified through a numerical example. Moreover, the computerised sensitivity analyses are discussed in this study. This paper contributes an applicable scheme for production design in manufacturing, and provides a valuable tool to conclusively obtain the optimal profit of a given production quantity for operations research engineers in today's manufacturing with profound insight.

D. Suhas M. Shinde and R.B. Patil (2012):
The major objective of this paper is to tell us that Over the years a lot of work has done and is still continuing with great effort to save weight and cost of applications. The current trend is to provide weight/cost effective products which meet the stringent requirements. The aim of this paper is to study existing conveyor system and optimize the critical parts like roller, shafts, C-channels for chassis and support, to minimize the overall weight of assembly and material saving.

E. Tadeusz Opasiak, Damian Gąska, Grzegorz Perun & Bogusław Łazarz (2014):
The paper presents a study of new design of rollers. The study focused on the measurement of static and dynamic resistance of rotating rollers and the impact of new construction on the power consumption of the belt conveyor. Rollers have been modified through the use of class C4 bearing seals and labyrinth seal U4Exp 62/65 with a cover 2LU4 of runner construction. Measurements of static and dynamic resistance of rotating rollers were made on a universal rollers stand and power measurements were carried out on a belt conveyor power supply system Gwarek 1200 No. TW in mine KWK Mysłowice–Wesoła.

VI. Conclusion

The system is designed to identify the faults automatically in the conveyor belt. The Conveyor belt is used for industrial area, bottling plants, mining industries, railway stations, airport etc. for various purposes. This system is designed such a way it can detect and also resolve faults in a belt without manual efforts and time delay. This system calculates the temperature, vibration, speed of conveyor belt using temperature sensor, vibration sensor, and accelerometer sensor. If the conveyor belt is having any kind of faults then automatically the notification is send to the admin or supervisor of system, so that they can take corrective actions.

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