International Journal of Electronic Devices and Networking

E-ISSN: 2708-4485
P-ISSN: 2708-4477
IJEDN 2021; 2(1): 24-26

www.electronicnetjournal.com
Received: 09-11-2020
Accepted: 12-12-2020

B Ravindrakumar
Department of Electronics and Communication Engineering, TS Srinivasan Centre for Polytechnic College and Advanced Training Chennai, Tamil Nadu, India

K Mahesvari
Department of Electronics and Communication Engineering, TS Srinivasan Centre for Polytechnic College and Advanced Training Chennai, Tamil Nadu, India

P Dhivyabarathi
Department of Electronics and Communication Engineering, TS Srinivasan Centre for Polytechnic College and Advanced Training Chennai, Tamil Nadu, India

Corresponding Author:
B Ravindrakumar
Department of Electronics and Communication Engineering, TS Srinivasan Centre for Polytechnic College and Advanced Training Chennai, Tamil Nadu, India

Wireless sensors networks in heavy vehicle wheel-rim manufacturing industries

B Ravindrakumar, K Mahesvari and P Dhivyabarathi

Abstract
The Wireless Sensor Networks are major contribution of number of different applications domain. In this paper articulate an important role of Ad hoc sensors and networks applications in rim manufacturing industries. Ad hoc sensors and network systems can assimilate the heterogeneous collections of manufacturing tools, equipment and devices real time operation with data logging report. With the help of this technology we assure that rim manufacturing system monitoring the production counts with maximizing the quality of products of zero defects and zero down time operations. The rim manufacturing processes are under several processing units with more number of essential parameters. Those code converted parameters are clustered by Ad hoc Wireless Sensor Network. This facilitates researchers and engineers to evaluate their different communication network topologies in automated industrial applications like industry 4.0.

Keywords: Wireless sensors networks, heavy vehicle wheel-rim, manufacturing industries, Ad hoc sensors

1. Introduction
In today's world wide advance in sensing, automating, computing and communication technologies united with necessitate to constantly monitor physical parameters of predominant changes are lead the expansion of Ad hoc and Wireless Sensor Networks. An optimization of WSN is one of the best method is Ad hoc which simplest and less economical of automated industrial applications. The WSN major role in industries are sensing and controlling of their entire system with appropriately. And also it functions well and efficiently in a harsh and hazardous industrial environment. Normally the final product of rim manufacturing involves multi process of different sensing elements with physical quantities. This all the multi process quantity decoded and clustered by the WSN.
Trends like Industry 4.0 are shaping the factory of the future. Flexibility and mobility are central requirements for future production facilities. Wireless communication plays a central part in enabling mobility and facilitating flexibility. Automated guided vehicles (AGVs) for example, depend on wireless communication systems.
Research regarding wireless communication in industrial environments is challenging due to the limited accessibility of industrial facilities; thus, data from such facilities are sparse. This research aims to ease this challenge by publishing a data-set from a running production facility.
The contribution of this work may proceed in this manner

1. The applicability of an existing acquisition method for time-variant network topologies to the industrial use case should be analyzed.
2. A new method in the form of a custom protocol for recording time-variant network topologies can be described and published. An encounter is a continuous time frame in which a transmitter can send data to receiver and is the basic building block of a wireless network topology. A nodal encounter pattern (NEP) is a recording of the encounters in a specific scenario using a specific communication technology is NEPs describing the time-variant network topology of mobile industrial ad hoc networks are recorded and published for use by other researchers in further examinations and industrial and hoc network simulations.
3. The acquired NEPs are analyzed. Connection characteristics are extracted from these NEPs, and recommendations for suitable ad hoc networking solutions can be obtained.

2. Tracing protocol

The goal of this section is to introduce a protocol that can be executed on mobile nodes (e.g., AGVs in a production facility) and generate a NEP. The protocol and the required processing are described, and a simple implementation based on the Click-Router is published. The tracing protocol has the advantage that the real NEP can be directly recorded, but the protocol must be implemented and running on all observed nodes.

3. Protocol description

The basic idea of the protocol is to indicate the possibility of data exchange between a transmitter *T* and a receiver *R*. A number of nodes is placed in the examined environment. All nodes send data's with a certain frequency. The nodes are all identical in function. If any sensor data is received by any receiver, it is logged to a log file. After the recording is completed, the log files of all nodes are processed, and a NEP is created.

4. Examination of the industrial AD HOC channels

Measurements by tracing protocol were performed in different environments and under varying conditions. The goal of the measurements and the analysis is to characterize the industrial environment in terms of effects on ad hoc communication channels. Knowing the characteristics of a communication channel allows for a more effective selection and configuration of applied routing solutions. The networks examined by the number of clients, the kind of mobility, and the environment are the most obvious differences. Different metrics for these network characterizations are therefore applied in this work. The industrial environment where the measurements took place involves electric drives and production that adhere to Industry 4.0 paradigms, although it is a RIM production factory. Thus, a typical industrial environment by means of the amount of mobility and conductive material is present. The AGVs that were equipped with the measurement equipment facilitate intra-logistic processes of half-finished and finished products and drive up to by 1.2 m/s of wireless sensors. They cover an area of «25, 000 m2.

Table 1: Measurement parameter description

Parameter Name	unit	Reference Test	Static Industry Test	Mobile Industry Test	Description
dt	s	0.2 s	0.2 s	0.2 s	Time resolution of the NEP
T	s	>11,800 s	8800 s	>10,400 s	Run time of measurement
N		6	7	8	Number of nodes
Mobility	Type	None	Group	AGV	Type of mobility
Environment	Type	Office	Industry	Industry	Environment description

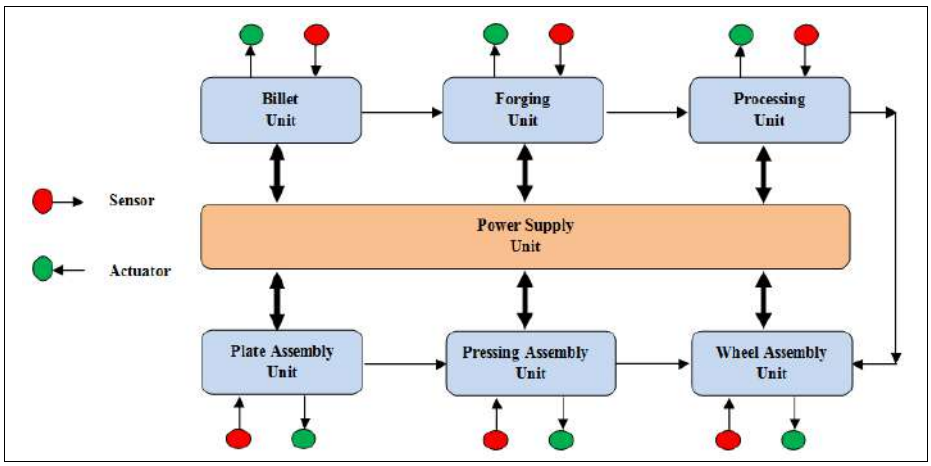

Fig 1: Block diagram of sensor nodes of industries

5. Interfacing of rim manufacturing process with WSN

Step by step of process

There are following two major processes 1. Disk Unit and 2. RIM Units are followed in the Rim Manufacturing with controlled and monitoring by WSN. Those step by step process assigned various measuring parameters are controlled and monitored through the WSN.

A. Disk unit

In this unit sequential process equipped by the Billet, Forging and processing unit.

Billet

This is a beginning process of Rim, the material of billet is continuous casting or Direct or indirectly of hot rolling the material. Here the temperature sensed by the RTD or thermocouple. And also pressure decoded/sensed by the node sensors. The node sensors respond the default programmed or setting of parameters.

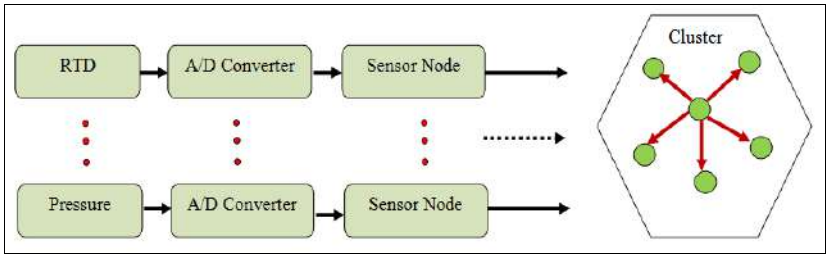

Fig 2: Rim Manufacturing Process with WSN

Forging

After the processing of billet it stretched using the flow-forming process with stretch material in the same direction identified by the node sensors. The most important is the granular flow of the wheel is aligned with critical points of the wheel monitored and controlled by the sensor nodes.

Processing

The Forged wheels are involved under by the various processes, these all are valued by adequate physical parameters with the help of sensors. The sequential processes are controlled by the sensor nodes with data logging process. Finally it's ended with wheel assembly unit.

- Hot forging
- RM Forging
- Cold spinning
- Machining
- Surface finishing/Powder coating

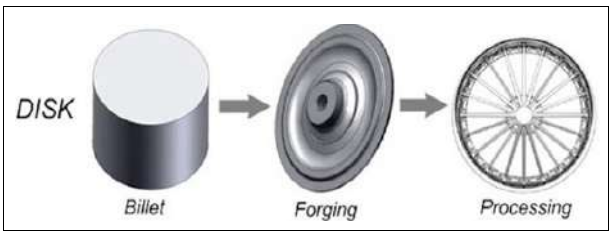

Fig 3: Disk unit

B. RIM Unit

In this unit there are two processes plating and pressing. A product of these two processes completed with wheel assembly units.

Plating

A vehicle wheel polishing and buffing process to chrome plating with crystalline tip is pressed with uniform pressure values are detected by the different sensor nodes operations.

Pressing

For pressing process the valve hole punching press operated by the sensor nodes, from the sensor node signal is used for the flat pressing.

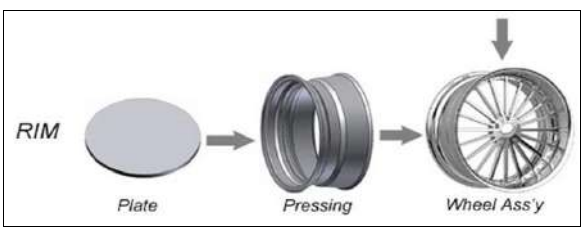

Fig 4: RIM Unit

6. Conclusion

This paper has discussed the WSN with different sensor nodes used in the Heavy vehicle rim manufacturing industry, specifically in smart industries. Currently the industries are focused for semi automation process only because of a multiple physical parameters like temperature, pressure, force, and strain integrated most difficult for normal communication process. By integrating wireless sensor networks with multiple sensor nodes we assure them to make complete fully automated factories.

7. References

1. Kim BS, Kim S, Kim KH, Sung TE, Shah B, Kim KI. Adaptive Real-Time Routing Protocol for (m, k)-Firm in Industrial Wireless Multimedia Sensor Networks. Sensors 2020;20:1633. [CrossRef] [PubMed]
2. Peng M, Li B, Yan Z, Yang MA. Spatial Group-Based Multi-User Full-Duplex OFDMA MAC Protocol for the Next-Generation WLAN. Sensors 2020;20:3826. [CrossRef] [PubMed]
3. Koulamas C, Lazarescu MT. Real-Time Embedded Systems: Present and Future. Electronics 2018;7:205. [CrossRef]
4. Koulamas C, Kalogeras A. Cyber-Physical Systems and Digital Twins in the Industrial Internet of Things, CPS in Control. IEEE Comput 2018;51:95-98. [CrossRef]
5. Seferagi´c A, Famaey J, De Poorter E, Hoebeke J. Survey on Wireless Technology Trade-Offs for the Industrial Internet of Things. Sensors 2020;20:488. [CrossRef] [PubMed]
6. Park B, Nah J, Choi JY, Yoon IJ, Park P. Transmission Scheduling Schemes of Industrial Wireless Sensors for Heterogeneous Multiple Control Systems. Sensors 2018;18:4284. [CrossRef] [PubMed]
7. Wang H, Ma J, Yang D, Gidlund M. Efficient Resource Scheduling for Multipath Retransmission over Industrial WSAN Systems. Sensors 2019;19:3927. [CrossRef] [PubMed
8. Industrial exposure and project experience at A-MAT, an industry in Peenya Industrial Area, Bengaluru, KA, India.
9. Pramodh S, Raghunandan GH. Proceedings of International Journal of Earth Sciences and Engineering, Special Edition; "Industrial Communication through mobile base station" 2012.
10. Dr. Shivanand HK, Nanjundaradhya NV, Prabhakar Kammar, Divya Shree S, Keshavamurthy YC. Proceedings of the World Congress on Engineering; E-Manufacturing a Technology Review 2008;2.
11. José Gutiérrez A, David Durocher B, Bin Lu. Presented at the 2006 IEEE IAS pulp and paper industry conference in appleton, wi: © IEEE 2006, Applying Wireless Sensor Networks in Industrial Plant Energy Evaluation and Planning Systems.