

Monitoring the Environmental Parameters of Ring Conner Unit of Cotton Industry Using Wireless Sensor Network (WSN)

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Abstract: *The industrial sector is demanding sophisticated electronics system, wherein the industrial parameters should be centrally monitored. In cotton yarn manufacturing industry, monitoring of the environmental parameters such as environmental temperature and relative humidity is essential to maintain the quality of the cotton yarn. The environmental temperature and relative humidity is maintained at the précised level in cotton industry. In fact, these parameters depict site specific variability (SSV). For monitoring the indoor environmental parameters of ring conner unit of textile industry, deployment of the Wireless Sensor Network is most suitable solution. To monitor such parameters the wireless sensor network is implemented. With the greater reliability and flexibility the wireless sensors nodes are designed, wherein ARM 32-microcontroller, ARM LM4F120H5QR, is used as a core for computational task and RF transceiver module Xbee chip, from DIGI International Inc, is used for Wireless communication. Deploying embedded technology the sensor nodes have been designed for monitoring of the two parameters such as, environmental temperature (⁰C) and relative humidity in ring conner unit of the textile industry. The sensors, SY-HS-220 for humidity measurement and LM-35 for temperature measurement are deployed. Deploying such sensor nodes and the coordinator node along with the base station(BS), the wireless sensor network is established by employing Zigbee technology and implemented for monitoring of the devoted parameters of the textiles industry. The results of implementation of WSN for monitoring of environmental parameters of ring conner unit of textile industry are interpreted in present paper.*

Keywords: *wireless Sensor Node, Wireless Sensor Networks, RF Module, ARM microcontroller.*

I. INTRODUCTION

The industrial parameters such as environmental humidity, temperature, leakages of hazardous gasses from process plants etc are widely distributed and depict spatio-temporal variations. The industrial environmental pollution monitoring has global significance. Therefore, emphasizing present needs of the industries, it is proposed to develop the Wireless Sensor Network (WSN), wherein typical industrial parameters are precisely monitored at base station. In fact, the WSN consists of autonomous sensor nodes, battery powered, connected to the base station using wireless networking topology[1-3]. Deploying a ubiquitous embedded technology the sensor nodes of required features can be designed. Recently, ARM technology is resulting into the microcontrollers of promising features, deploying which the wireless sensor node can be designed. The Zigbee technology is

pervasively advancing. Therefore, to overcome present day problem of industrial sector and to ensure wireless data transfer with high accuracy and reliability, it is proposed to design Wireless Sensor Network and implement the same for industrial applications. The WSN is developed to monitor typical parameters of the devoted industries and design issues are presented in this paper. Present paper encompasses the field such as WSN, Zigbee, IEEE 802.15.4, embedded design etc. Therefore, it becomes possible to design the intelligent, autonomous and energy efficient wireless sensor nodes to facilitate the desired WSN. Emphasizing an implementation at textile industry, the WSN is designed and results of investigation are presented in this paper. The paper is organized such that, Section 1 is of introduction. Section 2 is devoted for design and establishment of the WSN. Results of on-site implementation are interpreted in section 3 and 4 and conclusion is given in section 5.

II. WIRELESS SENSOR NETWORK (WSN)

Wireless sensor network (WSN) is the distributed network of large number of wirelessly connected autonomous devices, called Wireless Sensor Nodes, which collaboratively collects the information about physical world and disseminates the same towards the monitoring stations called Base Station (BS) for the deterministic analysis and presentation [4-6]. The WSN is an infrastructure comprised of sensing, computing and communication elements, which provides the information about area and process of interest to the administrator, to ensure the sustainable management [7]. The WSN comprises an assembly of distributed Sensor Nodes, an interconnecting wireless network in suitable protocol, smart base station etc.

2.1 Development of Wireless Sensor Network for Industrial Applications:

The processes of the textile industries were studied and it is observed that, to maintain the quality of the cotton yarn, the parameter such as environmental temperature and relative humidity etc should be precisely controlled. To optimize the quality of the cotton yarn, essentially, the temperature is maintained precisely at 32⁰C [8-9]. The relative humidity of an environment should be controlled at 55%RH [10-11]. At present, for monitoring of temperature and humidity, electronic and monitoring units, are installed, wherein usually only local values of these parameters are displayed. This unit