# Review on smart manufacturing based on IoT: An Industrial application

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**Abstract -** *This paper presents the literature study on Internet of thing based manufacturing and planning process in the smart industries. This paper gives the complete study on cloud control system in industries, rapid prototype, just in time manufacturing using internet of thing. This paper also gives some case study on modern technique followed in the industries.*

*This survey paper gives the detailed description on the wireless sensor monitoring and time saving techniques over internet of things. From this we can understand the various modern techniques used in the modern industries to increase the rate of production.*

***Key Words***: smart factory, cloud manufacturing.

## 1.0 INTRODUCTION

Industry 4.0 is the main reason for the evolution of smart manufacturing and smart industries .This revolution was introduced in German to increase the production rate. This revolution gives the path way to the smart industry, internet of things and cloud manufacturing systems .These tools helps the company to increase their production and easy monitoring. This paper gives the detailed survey about the smart manufacturing tools.

## 2.LITERATURE SURVEY

### 2.1 IoT based manufacturing

**Abdullah Mohammed** said that Cloud manufacturing (CMfg), supported by cutting-edge technologies and advanced concepts, refers to a new manufacturing paradigm which enables full sharing manufacturing resources that are encapsulated as services. Cloud computing and Internet of Things (IoT) are core supporting technologies in CMfg where typical resources such as workers, machines, materials, logistics items, and production jobs are converted into smart manufacturing objects (SMOs) so that they are able to sense and react with each other in a cloud based intelligent environment.[2]

First of all, IoT devices, specifically RFID readers and tags are systematically deployed in typical manufacturing sites like shop floors so that various resources could be identified. After that, they are able to sense with each other automatically to get the real-time information[3-4]. Secondly, the sensed and captured information will be organized by a set of data models which are able to identify, process, and format the key data into a standardized scheme for further usages such as production planning and scheduling.

### 2.2 Overall architecture

**Mohammad Givehchi** suggested that the architecture of the cloud based manufacturing that, they are smart machines, smart conn, data model and smart view. Service-oriented architecture (SOA) is used for designing and developing various services that could be deployed in a cloud so that end-users are able to access them easily. SOA is able to facilitate data resources and computational functions as services available on a network so as to support the distributed cloud manufacturing.[5]

### 2.3 Smart machines

This layer includes several sub-layers which are consisted on different categorized components. First of all, various sensors such as RFID readers and tags, vibration sensors, temperature sensors, and force sensors are deployed into various components and machines. Secondly, critical components, cutting tools, machine controllers, and data acquisition devices are included in this layer. They may carry different sensors so that their statuses could be real-time tracked and traced. Finally, typical machines and robots may use different tools (e.g. cutting tools) for different processes. Thus, they are identified by RFID devices. For example, RFID tags are attached to each individual machine so that it can be uniquely identified.

### 2.4 Smart connection

Smart machines should be connected so that they can collaboratively work. Smart connection layer uses various communication standards for this purpose. Wifi and Bluetooth may be used for vibration and force sensors which can real-time send the data to a central computer. Wired connection fashions like TCP/IP and RS232 are used for connecting machines, robots, and central computers. Radio waves are used for data transmission between RFID readers and tags. 4G is used for smart phones or handheld PDAs (Personal Digital Assistants).

**2.5 Smart view**

Smart view layer was designed as an end-user interface for visualizing various captured and collected data from manufacturing frontlines such as shop floors. Three key views of data are included in this layer. Firstly, real-time machine status monitoring uses captured data from various sensors deployed on smart machines to graphically display the machine states. This view not only reflects the real-time working status of a smart machine, but also shows the sensed information like who is operating this machine, which component is being processed, etc. Secondly, statistics report uses collected historic data for generating various reports with a graphical approach, which includes bar charts, pie charts, and so on.

**2.4 Creation of a Cloud Manufacturing shop floor.**

Deployment of IoT devices. Various IoT devices are deployed in the test bed which is converted into a Cloud Manufacturing environment. Firstly, each machine tool like milling machine is equipped with a RFID tag so that it could be uniquely identified. Work pieces such as raw materials, WIP items, and cutting tools are bound by RFID tags too.[6]

(1) Deployment of communication networks. Different communication networks are used for different purposes. NFC with 13.56MHz is used for communicating between smart phones and tags
(2) Installation of designed system. An IoT-enabled real time machine status monitoring platform is designed and developed as an entire solution for the test bed. This platform uses SOA-based implementation so as to achieve easy-to-deploy and simple-to-access fashions. The designed services are deployed in a cloud server which hosts the databases, server-side applications and all web services..

### 3.Real-time machine status monitoring

**Sami Kara** suggested the eight way of machine monitoring in his paper that:

(1) A machine operator uses his smart phone to download the services. He uses the username and password to login his working dashboard where he is able to check the task assigned or historic production records.
(2) He selects one of the tasks from a job pool and the task associated information will be downloaded from the cloud. Thus, he can check the job instructions, technical figures, quality criteria, etc.
(3) He approaches the assigned machine and uses his smart phone to detect the tag deployed on the machine for indicating the attendance.
(4) After the attendance, some critical information such as required cutting tools and materials will be sent to him from the cloud
(5) He installs the cutting tools with vibration sensors attached on the machine and fixes the work piece by clicking a button on the mobile APP After the processing, he presses a button on the APP to inform the completion of a task. Another task will be updated on his smart phone instantly.
(6) The finished work piece will be sent to robotic assembly work-station. A worker uses his smart phone to detect the work piece and places on the conveyer
(7) Finally, the robots can detect the required work piece and pick up for final assembly through IoT facilities.[7]

### 3.1 cloud based manufacturing

**Lihui Wang** said, that In recent years, Cloud has become a popular technology which gains huge market success globally. Cloud concept indicates a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storages, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[8]

### 3.2 Cloud computing in manufacturing industry

**Xun Xu had** said that ,the Cloud technology offers on-demand service access and resource pooling on the computing market. Thus it is a natural thinking to utilise Cloud applications in manufacturing directly. In the type of 0research, computer-aided or web-based manufacturing applications are deployed in the computing Cloud, which could be considered as a manufacturing version of computing Cloud. These applications are implemented at two levels of system, which matches two service levels of 0Computing Cloud, i.e. Software and Platform levels.[9]

### 3.4 Cloud robotics

**Dr. Norbert Jesse** said in his paper that ,in the past years, the Cloud robotics research had been conducted worldwide. Many approaches are proposed in different sectors. In this section, research related Cloud robotics are reviewed and discussed from two perspectives, i.e. robotics system and application.[10]

However this system structure was challenged by technical issues, e.g. real-time control, synchronizations and stability risks. As an intermediate solution, Cloud-based robotics is able to resolve the conflict between heavy computing needs and local controlling requirements. Information sharing and data management was able to be implemented remotely in the Cloud, while the physical applications are imaged and maintained in terms of virtual Cloud services.

### 3.5 Cloud robotics at application level

At the application level, numerous Cloud-related robotic applications are developed. Kamei et al. discussed networked robotics connected to the Cloud. New fields were predicted, e.g. daily activity and accessible support. Some of the issues were identified as future challenges including multi-robot management, multi area management, user attribute management, and service coordination management.

## 3.6 Cloud-based manufacturing chain

**Xi Vincent** Wang proposed the case study on cloud manufacturing chain that:

A user firstly accesses to the Cloud environment through VPN over the Internet. Command dashboards were developed for Cloud administrators and users respectively. A Cloud administrator is able to manage broadcasted services, customer orders and user profiles remotely. After the product 3D design is uploaded to the Cloud, the user's requirements of machining service are interpreted by the smart manager mechanism. Multiple candidate solutions were identified in Cloud database. Among multiple machining providers, the user is able to filter the candidate pool based on different preference criteria e.g. price, duration and quality priority.[10]

## 4.0 IoT-enabled Smart Factory

**Mu ChenAn** said in his paper that RFID reader is specifically design and developed for facilitating various operations in a smart factory . It includes 7 major components like ARM central processor, RFID module, wireless network service, Data input module, display service, working status module, and memory module. The detailed functions of each component are described as follows.[11]

- **ARM central processor**: It works as a main CPU unit in this reader, which is responsible for processing the data and enable the functionalities of other modules. It is the brain of RFID reader which could be programmed through C language.
- **RFID module**: It uses high frequency in this modular with RFID reader antenna equipped. This module uses EPC (Electronic Product Code) standards to enable the function of reading and writing in RFID applications.
- **Wireless network service**: This service uses 433MHz wireless communication standards to send the captured data into a central computer. Standard transmitter and receiver modules are used and ASK encoding is adopted.
- **Data input module**: It is mainly used for data input like a small keyboard designed for end-users. There are six group of buttons: numbering system (0-9), hot keys (plans, technique figures, machine management, and performance), major functions (login/logout, front-page, confirm, backspace), cursor locating, F1-F3, and symbols.
- **Display service**: It is a screen control module which is designed to display all the information through a 12×16 inch screen. End-users could configure the display area through this service.
- **Working status module**: It indicates the working status of a RFID reader. Several statuses are considered: power on/off, 422 receiving, network receiving, external devices, processing/halt, RFID status, and quality checking.
- **Memory module**: This module is mainly designed for keeping some data in specific units so that the internal modules could be worked properly. EEPROM memory chip with 128KB size is used for this reader.

## CONCLUTION:

Hence this paper gives the detailed survey of the smart manufacturing and IoT in modern manufacturing field for the improvement in production. This gives the complete detailed study in the various techniques and methodology followed in the modern smart industries. This paper introduces study of an IoT-enabled real-time machine status monitoring approach for Cloud Manufacturing. Machine tools, as one of the key shared resources in manufacturing should be real-time monitored. By making full use of IoT technology, various manufacturing resources are identified and their statuses could be then captured.

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