

ABSTRACT

In this article transformation of ceramic manufacturing factory into a smart ceramic manufacturing has been discussed. Based the unknown industrial visit and observation finding has been mapped with the proven generic smart manufacturing framework where the focus is to identify the types of sensors which need to be connected with the components of the machine real time monitoring and get the insights by utilizing these data through the big data analytics. To transform a old heavy industry In IoT based smart manufacturing, it's not needed to do everything from scratch and setup a new manufacturing plant, research efforts makes it flexible to just add the smart sensors, collect the data, use real time streaming analytics by available big data analytics technologies such Apache Spark streaming, Spark core,, Spark MLlib , Kafka, Flume can be used for preventive maintenance and real time analysis. Available operational technologies, business objective, sequential essential steps to implement IoT in ceramic processing, major steps IoT based big data analytics, Smart manufacturing generic framework has been mapped with existing ceramic industry.

KEYWORDS: Smart Manufacturing, Big data analytics, Ceramic process, Apache Spark, Spark core, Spark streaming, Spark MLlib , Flume , Kafka.

INTRODUCTION

In today's world, Internet of Things will get the popularity next to www, Samsung chief executive officer has revealed in one conference that, in next 5 years of period all his gadgets will be connected through IoT; either it's a washing machine or microwave oven, IoT is not only limited to the electronics or electrical gadgets but heavy industries can also extract the value from it. In this article ceramic industry has been chosen to implement the IoT. If will talk about the smart manufacturing, the basic layer is data acquisition, where we need to identified where we have the scope to add the sensors to collect the data from it. Usually people thinks that if they wants to add IoT in his industries they need to start from scratch , but the fact is machines is already telling lots to us we need to listen them. Once we added the sensors into the components, next question is how to collect the sensor data, to collect the sensor data lots of tools available such as kafka or flume, next is we need to get out these data through the IoT gateway then after, once data is collected we can use these data for analysis, and ultimately on real time these data can be visualize on the corporate dashboard or any other remotely accessible device [6].

Manufacturing have been gathering and putting away information for quite a long time, yet now huge information advances empower more helpful utilization of this data, for example, to expand throughput, support yields, enhance proficiency, and decrease downtime. Enormous information is described by immense information sets and shifted information sorts, such as log file, which the creation line is delivering at a much quicker rate than any time in recent memory. At the point when this information is broke down utilizing new apparatuses accessible available, producers can increase significant experiences got from discovering designs, extricating meaning, and at last settling on choices that prompt to more prominent productivity.

Be that as it may, many machine devices work in relative storehouses, so it is a noteworthy test to gather, break down, and follow up on information created over the processing plant floor. This is the reason Dell and Intel have amassed different Internet of Things (IoT) and huge information advancements that give the availability, security, interoperability, and investigation abilities that empower higher execution fabricating.

BACKGROUND**Available Operational technologies**

Gartner says that, Hardware and software that distinguishes or causes a change through the immediate checking and additionally control of physical gadgets, processes, & events in the venture. Data innovation is the basic term for the whole range of advances for data preparing, including programming, equipment, correspondences advances, and related services. In general, IT will just incorporate implanted advances that create information for big business utilize. A reasonable refinement of IT and OT can be best portrayed by referencing the ISA 95 standard, as abridged in Figure 1. The ISA 95 is the global standard. Levels 4 and 5 are run of the mill IT layers, while Levels 1, 2, and 3 are operational innovation gadgets and procedures to organizing the things [1].

Business objective

Our key targets are expanding creation line execution and enhancing all that really matters utilizing information that is created all through the generation cycle to decide, take care of business issues. Focus of work is to map the existing smart manufacturing concepts with Identified need of ceramic manufacturing.

Business objective

Data through the generation cycle contains hints that eventually clarify variety in output, need to furnish the valuable insight using big data analytics which will add great values to the ceramic industries such as real time alert if something goes wrong and helpful for preventive maintenance which will cause to cut the unwanted cost[1].

ROAD MAP TO IMPLEMENT IOT IN CERAMIC INDUSTRY

Step 1 - Data Acquisition: Tools and sensor systems send production line information to mechanical review IoT entryways that channel and secure the data before sending it to the information store stage. [5]

Step 2 - Data Collection and Aggregation:

The information store stage in view of the Hadoop center gathers information from all through the processing plant, including organized information from existing databases and unstructured information from instrument sensors, log documents, and SMS instant messages. It then cleans, removes, changes, and combines the information.

Step 3 - Data Analytics: The information is examined by examination programming and abnormal state industrial facility applications running on the information store stage.

Step 4 - Data Visualization: The consequences of the examination are introduced to clients by means of natural perception capacities in the business insight layer of the system, which may live outside of the processing plant, in this way requiring firewalls and different measures to defeat programmers.

Step 5 - Data Collection and Aggregation: The Data Collection and Aggregation and Data Analytics capacities can keep running in the cloud, the undertaking server farm, or in another classification of figuring foundation, called a modern server farm (IDC). The IDC is a stage arranged on the processing plant floor—between production line hardware and the undertaking server farm—intended for examining fabricating information in movement. It bolsters a concentrated assembling information store, fabricating investigation, and workload combination.[5]

MAJOR STEPS IOT BASED BIG DATA ANALYTICS

Step 1: Data sources consistently send data to a gateway.

Step 2: The gateway channels the information and safely sends it to the information store stage.

Step 3: The information store stage ingests time arrangement Information and keeps in touch with the database.

Step 4: Analytics programming bolsters intelligent, iterative, And graphical information experimentation.

Step 5: Visualization programming underpins custom business knowledge dashboards [1].

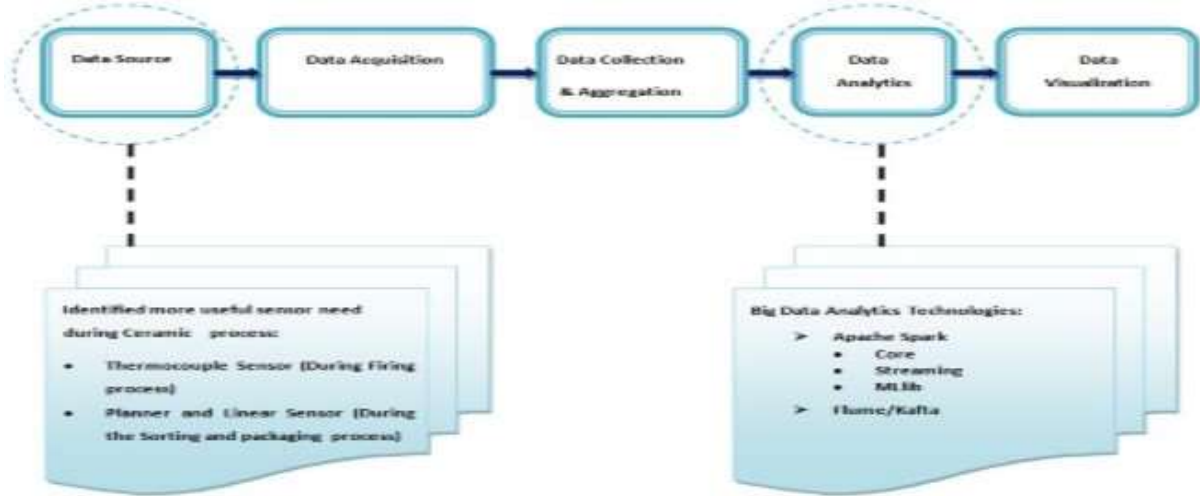


Fig 1: Abstract Mapping view of Big Data Analytics in Ceramics Process

MAPPING THE SMART MANUFACTURING BIG DATA ANALYTICS IN CERAMIC INDUSTRY

A. Identification of Data Source: With reference to Fig 1 to find the data source, as per the real observation at an anonymous ceramic industry [4], finding related to identification of sensor to get the insights through Big Data Analytics are as follows:

Ceramic Manufacturing Stage	Name of the Sensor	Description
Firing / Flourishing	Thermocouple Sensor	Used to monitor the temperature
Firing / Flourishing	Proximity Sensor	Used to measure the and control the rotational speed
Sorting / Packages Stage	Planner Sensor	Used to check the surface planarity
Sorting / Packages Stage	Linear Sensor	Linear sensor used to check the linearity of the ceramic biscuits

Big Data Analytics:

Data is our most profitable asset. Associations utilize this information for upgrading situational mindfulness among individuals market flow in money related administrations, for early identification investigation in wellbeing mind.

There is some wanted esteem is gotten from the boundless measure of information called as Big Data by the legislature associations and private firms[3].

Some Big Data Facts-

1. 2.5 Quintillion bytes information is made each day.
2. 90% of the world information is made in most recent two years
3. 80% of the world's information is unstructured.
4. Facebook forms 500 TB for each day.
5. 72 hours of recordings are transferred to YouTube each minute. [5]

This information must be broke down to pick up the bits of knowledge and to follow up on complex issues this is the thing that huge information analytics is. Enormous Data analytics is the way toward gathering, sorting out what's more, examining the huge arrangements of information i.e. Big Data to find the examples and other helpful data. The enormous information analytics can be arranged into taking after classifications:

- 1) Descriptive analytics: what was the deal? 2) Diagnostics analytics: What did it happen?
- 2) Predictive analytics: What is probably going to happen? This analytics will be used for preventive maintenance. [4]
- 3) Prescriptive analytics: What should I do?

What makes the Big Data analytics decisive?

- 1) Data volume is vast and it is relentlessly increasing.
- 2) Data volume has assortment of information i.e. organized, unstructured and so forth.
- 3) Volume and speed of the information makes Challenge for engineering administration and Analytics administrations [3].

C. PRIORITY CONSIDERATION TO TRANSFORM SMART MANUFACTURING

Acknowledge new esteem from legacy resources and framework. This is a major ordeal:

Regardless of the possibility that your devices and frameworks weren't initially intended to interface with the Internet and share information, despite everything they can. By connecting clever gateways to existing resources, you can gather information from these already undiscovered assets. So actualizing an IoT arrangement doesn't mean beginning sans preparation. Your legacy things have bounty to state; you simply need to give them a voice.

Increase significant data: IoT arrangements associate, oversee, and secure gadgets that gather information from things like sensors, engines, apply autonomy, and cameras. The crude information is then secured, separated, and oversaw. Now and again, information can be prepared right where it's gathered and used to direct machine activities; generally, it's sent to the cloud for capacity and further investigation. In any case, you increase new floods of data that you and your frameworks can follow up on.

Increment proficiency: Many machine instruments work in relative storehouses, making it troublesome—or unthinkable—to gather significant information from over the plant floor.

Enhance specialist security: Sensor-inserted

wearable's can give ongoing perceivability into specialist exercises around the plant, following stance, developments, heart rate, and breathing, and demonstrating introduction to lethal exhaust or scathing chemicals. Data is handled first on the laborer; then occasion data can be transmitted to a plant chief dashboard for prompt reaction, and to the server farm for hazard component and pattern examination.

Make quicker, better-educated choices: Makers have been utilizing factual process control and information examination to enhance creation for a long time. Presently, with enormous information analytics, you can put that information to stunningly better utilize—and increase it as you interface new endpoints. It's about utilizing information to discover designs, extricate significance, and drive better present and future business choices.

Save cash: The data gathered from an IoT arrangement can help you spare cash. You can decrease item test time, minimize yield misfortunes, enhance hardware part uptime, improve utilization of advantages, diminish vitality utilization, and that's just the beginning. You'll have the hard information, understanding, and control to lower costs, acknowledge new efficiencies, and react all the more rapidly to both issues and openings.

Create new income streams and experience: The recently discovered availability, sensibility, and proficiency gave by the IoT can prompt to new offerings. Are there administrations you can offer? An information stream you can adapt? Could you present new items? On the other hand give better client encounters, with enhanced customization? What about enhancing preparing or wellbeing administration? You'll see your business through totally new eyes.

Empower advancement: The IoT gives a definitive stage to dream, think, and act enormous. Advance your R&D. Make new offerings. Accomplish close to 100-percent stock exactness. Make your operations more supportable. The continuous information and knowledge gathered from an IoT arrangement can help you change your plan of action and increase focused edge. It's evaluated that by 2020; there will be upwards of 50 billion associated

devices, 2 producing trillions of dollars of significant worth[2].

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