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Artificial Intelligence: A Tool for Predictive Maintenance

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Abstract: In manufacturing industry, machine maintenance is key space which can contribute production saving and unwanted cost along with it. Conducting maintenance intelligently with scheduled plan and advanced technology can directly increase profitability and margins. This article will help everyone to understand the current applications of AI and Machine Monitoring techniques in Manufacturing Industries.

Introduction:

Having unscheduled breakdown of the machine in a manufacturing plant stops the production without any prior notice. Which results in ample amount of production loss until the repairs are done. Such machine downtimes convert into high losses. According to the International Society of Automation, $647 billion is lost globally each year. And a study shows that due to unplanned downtime industry loses 5% of production a year. Analytics India magazine and INSOFT states, that data science and data industry is going to be $2.71 billion with healthy growth rate of 33.5 per cent CAGR.

Figure 1 Unplanned Downtime - event that causes your manufacturing process to stop

Predictive Maintenance:

Often in manufacturing industry, machines are operated without planning of it's maintenance systematically. The results? Unexpected downtime. Such unplanned events can be prevented with scheduled maintenance work prior to it's unexpected failures. With predictive maintenance techniques it is assured the smooth working of machine with ability to tell the possible errors prior it occurs. With condition-based logic and alerts, predictive technique indicates maintenance need when machine is about to go down. Thus, it helps you maximize your machine run time and minimize the risk of unwanted breakdown.

Predictive Maintenance and Industry:

Most manufacturing machines contains critical component which perform important tasks to carry out at peak efficiency. By default, most industry relies on corrective maintenance, where the process of repair only to be carried out when the machine fails to run. The only benefit is, the parts are used at it's full of lifetime. But the losses are more than those benefits. As the down time, production loss and the labour cost is causing much higher.

At one step further comes predictive maintenance, where based on prediction, possible future failures are determined and part's life is measured. And before it happens to breakdown the machine, the changes are made. But still it costs production loss of scheduled maintenance and labour costs.

That's where AI comes into picture with advanced solution to do predictive maintenance and parts replacement with just in time method to minimize the losses.

The whole industry is being reimagined with the help of smart Artificial Intelligence (AI) software's. It's data driven ways are taking over the old speculative ways of industrial problems. Companies now can confidently improve the conventional operations of predictive maintenance.

Figure 2 Reduce Bottlenecks with Real-time Production Visibility & Predictive Analytics

With the help of advance software's, it is possible to identify the pattern of root cause issue and diagnose with timely actions to change the outcome. It will help to maximising equipment reliability and operating profits of manufacturing industry. AI enabled predictive maintenance is advance with recommendations of operations to take against impending failures instead of just predicting them.

A big manufacturing lines with similar make and models will have access to huge data with the smart factory methods. Arranging and analysing those data can predict issues and suggest fixes. A smaller firm with lower production ability might not have similar data to predict the machine fixes and downtime. This problem makes conventional predicative maintenance only big fish's win. While the AI changes the game by optimal use of data no matter how small the firm might be.

With the help of AI, equipment sensor data can be converted into meaningful and actionable insights. Which can forecasts when the equipment or a part of it will fail, so repair work can be planned in advance. Cutting edge technologies with big data analytics and cloud knowledge create fault detection a lot of sensible.

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Few Facts about AI in predictive maintenance:

AI has created unprecedented savings for manufacturing industry. As most of manufacturers are using some form of predictive maintenance, AI can take it to the next level. Manufacturing industry is now turning towards AI based predictive maintenance with widespread connectivity and easy data availability. Tools like analytics, IoT, machine learning and AI are way more effective due to it's deep analysing nature with accuracy. They allow manufacturing companies to integrate business process with massive structured and unstructured data of working plant. Then to get the core new insights, advanced analytics can be embedded into data and focus on important and necessary outcomes.

Machine learning have captured data science by wind. Where the data analysis task is repetitive and labours, AI driven technology can help develop and adopt the models faster. Where a data scientist has to make selection and create analytics model, machine learning can do that selection instead.

With so many data simplified, maintenance worker will already be equipped with information about evolving failure. Which changes the game as it will be known failure instead of surprise. And they will have enough time to be prepared for it and collect necessary parts. With AI being involved, data of machine performance can be easily derived. Which makes everyone responsible for machine health and it's performance. Thus even machine operators can carry out maintenance work instead of specialised team. And as operators doing regular maintenance, technicians will have extra time focusing on increasing overall reliability.

Businesses now have access to AI driven software which makes maintenance work really easy. Main machine operator will understand the working of their machine closer than before. And all the data shown on easy to operate dashboard of software will get more people engaged with machine servicing. Now that company knows expected failure time and cause of the machine, they can pre-equip operators with right kind of tools.

This AI based predictive maintenance can also help equipment manufacturers that sell manufacturing machines and it's equipment. They are also taking active part in maintenance of their machinery and it's future diagnostics. Companies like Siemens are understanding and prototyping the models from data generated with sensors and it's usage to OEM (Original equipment manufacturer) to take responsibility of maintenance work. A new sales models HaaS (Hardware as a service) is rolling out. As part of this OEMs lease machinery to industry and dispense continuous maintenance services and support.

Before a short period, data science was just a thing for academics. A major shift have happened since that era about the operations and getting insight of generated data. And as a result one does not only gain in financial and business regarding updates, but the core change in how manufacturing companies work and maintain their machinery.

Important features that can foresee problems or breakdowns are generally resides in structured data like year of manufacturing, make, model, and warranty details. And also in unstructured data like maintenance history and repair logs. Though cutting edge technology of machine learning and AI have data analysing system which makes problem finding easier and more practical.

As Aerospace manufacturing industry looking for optimising their production costs and profitability will make North America biggest market for predictive maintenance solution. With an estimated market share of 31.67%, North America is expected to grow its predictive maintenance solutions at a compound annual growth rate (CAGR) of 24.5%, maintaining its lead from 2017 through 2022. Key players include Bosch, GE, Hitachi, Honeywell, and Rockwell Automation.

The key and important question an industry need to ask themselves is what type of answers they are looking for in predictive maintenance. What already occurred last year and its repercussion? Or what new to come and how to lower the costs making work faster and easier? As new technology like AI seems to emerge, transforming business end to end, optimizing procedure and leveraging preventive maintenance is turning into table-stakes to survive. Such technology is not opulence but a handy tool to control the conditions and drive profitability.

Following is the basic components which are involved in predictive maintenance.

- **Root cause analysis**: With the help of tools of data analysis, engineers dig to the main cause of problem and put corrective actions in motion.
- **Central data storage**: Singular collection source of data to be used for storing all data related machinery and business.
- **Sensors**: To collect the data from desired physical machine
- **Predictive analysis**: The software and it's dashboard to sort out and aggregate data to identify patterns from the collected data from sensors.

Data required for AI based predictive maintenance:

AI and machine learning are data-based implementations. Basically, AI works in this way: when you provide the data and conditions, it grasps and use it to learn. Predictive accuracy depends upon data provided. Which makes data the most important part of the whole process.

First of all the data should be relevant to the problem involved. And instead of creating large subsystem, small component is suggested to target as they can provide more accurate result. Also the data should be sufficient enough to predict the desired result of the problem. The quality of the data is critical portion and it is well-studied in statistics and data management.

Conclusions:

In India it is estimated to reach 20-billion-dollar industry by 2025 growing 7 times in next seven years. According to Analytics India Magazine, 64% of analytic revenue in India comes from export to USA, which is $1.7 billion. UK comes on second with 9.6% of market shares. Romania, UAE, Belgium, New Zealand, & Spain have doubled in revenue since last year but still minuscule compared to USA. Bengaluru in India have increased revenue in the industry with 37% from $539 to $739.

AI has nearly revolutionised every industry and manufacturing industry can benefit the same. As big pain for manufacturer is coping with maintenance and related costs, AI is here to rescue them. With the better understanding of types of failures and the root causing pattern one can easily put together the changes need to be made.

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About Author:

Yadu is a recognized leader, Technology Consultant and business development specialist with over 15 years of experience overseeing business optimization, expansions, streamlining of Sales and Product innovation. Introducing strategically designed technical solutions to meet a client need in Enterprise Solutions such as Artificial Intelligence, IoT and other technology platforms. Possessing an outstanding track record of understanding, defining and shaping capital, and the creation of potential framework for the startup's.

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