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How AI Transforms Plant Process Management

As manufacturers digitize plant operations, they naturally create a vast organizational knowledge bank that can drive efficiency and performance improvement. Organizational knowledge—and harder-to-find tribal knowledge that is knowledge not written down like a best practice that an operator may use—can be transformed into job-specific knowledge and insights. With the assistance of artificial intelligence (AI), this data can be processed quickly and becomes a huge advantage for workers. Applications that offer intelligent features using natural language processing (NLP) and machine learning (ML) are the next steps in building people-centered plant process management (PPM) systems.

The Knowledge Problem in Process Manufacturing

Modern process manufacturing plants, which produce finished goods by combining ingredients or raw materials using a specific formula, generate thousands of data points every day—much more than any human could ever sift through. Hidden in all that data are answers to critical questions employees have on the job. Such as:

- How does the current performance of a piece of equipment compare to its historical performance?
- What is the likely cause of a product quality issue, and what is the best way to resolve it?
- What happened during the last shift that I need to know to do my job today?

In the past, tribal knowledge transfer was often person-to-person and informal. Long-time employees knew the history and typical behavior of the equipment they operated or maintained, and information between shifts was passed through informal conversations, logbooks, and standup morning meetings. Today, more plants are digitizing operations and knowledge transfer. PPM solutions act as a centralized digital database, collecting all information pertinent to operations, maintenance, and plant performance in one place.

A digitized PPM system is an important step forward for process manufacturing plants. Digitizing shift handover, equipment records, and other key data provides a central data repository, so information can be easily shared across shifts, teams, and areas of responsibility. It also ensures that critical organizational knowledge is not lost as experienced employees move on or retire, making it easier for new employees to get up to speed.

However, the volume of information contained in a PPM system creates challenges for the people who use it. Which information is most pertinent for my specific job? How do I search through all the data to find what I need? Where is the answer to the question I have right now?

> **This is the promise of Industry 5.0: moving beyond the digitalization of Industry 4.0 to create solutions that empower people.**

That's where NLP and ML can help. These AI tools transform PPM from a passive information repository to a smart, active knowledge system.
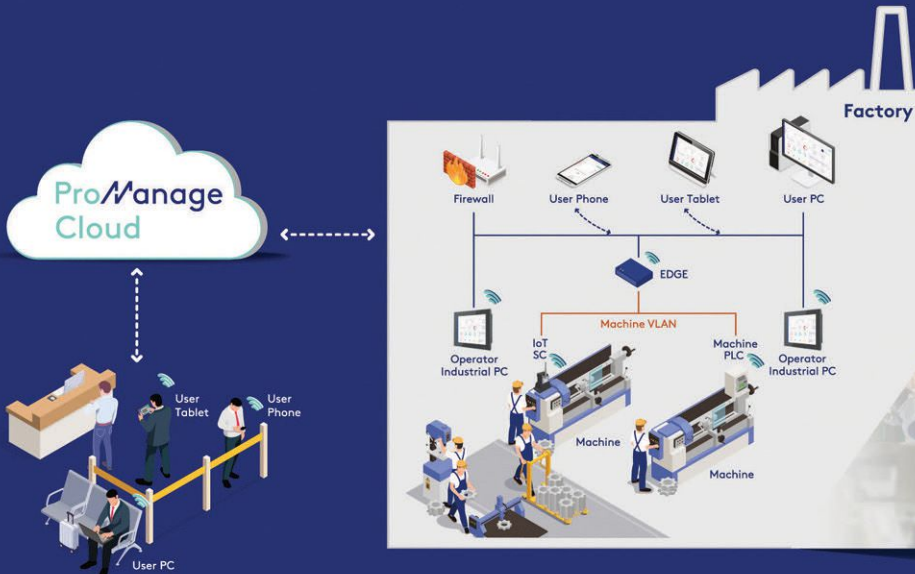
Building AI into Plant Process Management

Integrating such AI tools into PPM applications will make systems more responsive to human needs and priorities. AI-powered PPM has the potential to transform plant operations in many ways with the help of a few key digital tools.

A smart search engine powered by NLP allows users to extract relevant information using natural human language. For example, instead of searching for process records and then pouring through the history, a board operator could simply ask, "When was the last time the color of the product was out of specification?"

Filtering search results from logged entries for relevance saves

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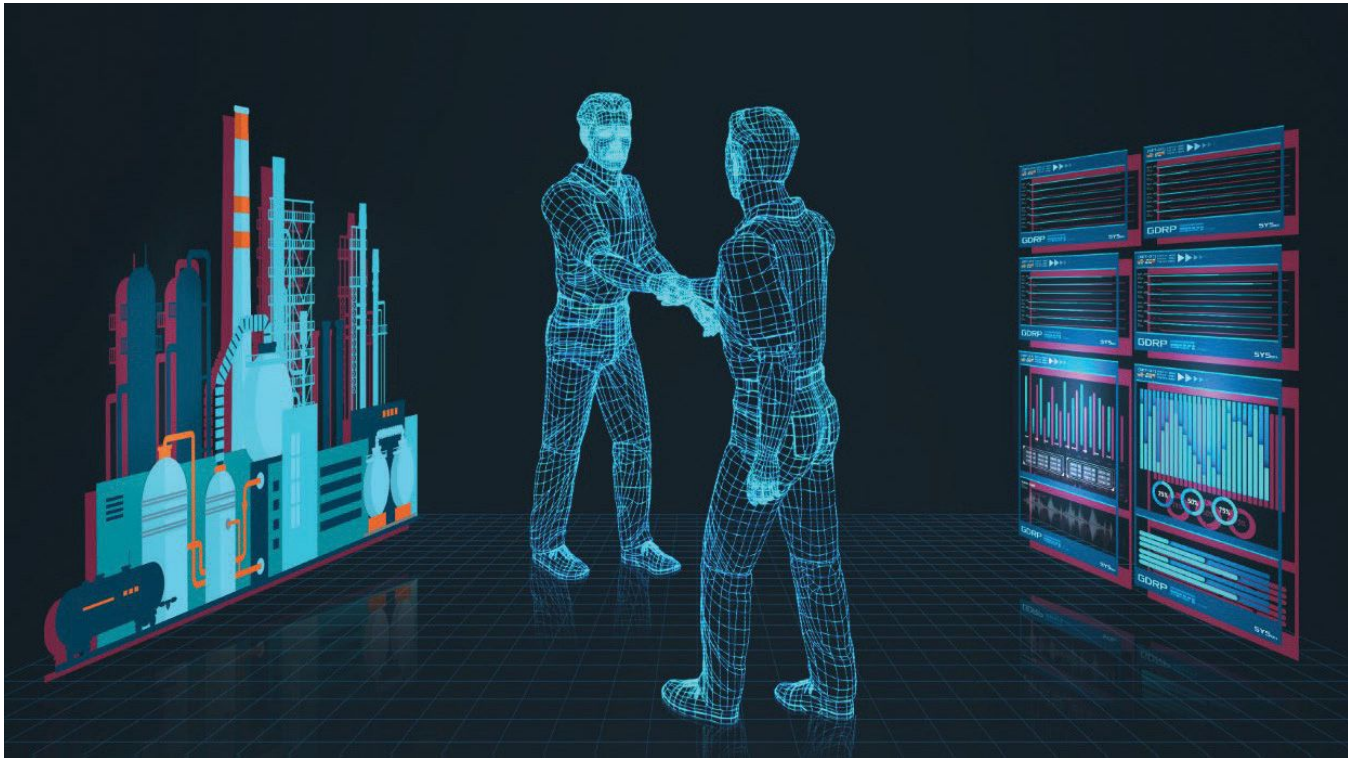
considerable time by putting the information team members most likely need in front of them when they need it. In this way, a smart search engine provides a night shift operator access to all relevant historical knowledge of the teams within a second.

Going a step further, AI will help diagnose issues with equipment, processes, or products and suggest solutions based on what has worked for similar problems in the past. Often, an issue that seems novel has precedents that can be found in maintenance or operational records—if you know where to look and what to ask for.

A solution suggestion system powered by ML can sort through years of history—even history across plant locations—to identify patterns and suggest a potential solution. As new issues and their resolutions are logged, that data becomes part of the knowledge bank for the future.

The Future Smart Factory: People + Machines

With AI-powered PPM, people and machines can work together to improve operational efficiency, quickly solve emerging problems, and accelerate the pace of improvement. These systems have the power to capture the full organizational knowledge of the workforce across multiple systems and sites and make that knowledge available to others in the way that they need it. This is the promise of Industry 5.0: moving beyond the digitalization of Industry 4.0 to create solutions that empower people.

As AI tools evolve, smart PPM applications will help workers make quicker decisions and solve problems faster, as well as optimize the performance of equipment and processes. This leads to safer, more resilient, and efficient plant operations.

Implementing smart knowledge management systems will also help process industries address some of the biggest challenges of today. As plant systems and organizations have grown in complexity, the industry is also facing an exodus of experienced workers who are reaching retirement age. PPM solutions with built-in AI will facilitate capturing and documenting their tribal knowledge. Hence, AI-powered PPM will allow companies to quickly get new workers up to speed and maximize the effectiveness of every worker. An AI assist will help companies stay safe, productive, and competitive while adapting for the future. ⌆