People are increasingly turning to tools like ChatGPT and Copilot to get quick answers, draft content or spark new ideas. But artificial intelligence (AI) is doing much more than offering guidance — it is reshaping some of the world's most complex and safety critical industries.

In the refining and petrochemical industries, companies are leveraging AI's capacity to analyze massive streams of data, identify subtle patterns and predict operational risks before they escalate. These advances are not just about improving efficiency — they are about safeguarding people, protecting the environment and securing essential infrastructure.

Much as AI tools like ChatGPT aid people in decision-making, AI-assisted solutions are supporting refining professionals in continuing to improve safety within the industrial automation space. In October 2024, Chevron and Honeywell announced a collaboration to create a new generation of AI-Assisted alarm management solutions to help operators make decisions to increase the efficiency, safety and reliability of process operations and industrial assets. The new solutions are expected to include an Alarm Guidance application that provides operators with guided and specific actions to effectively respond to alarms and operational events, helping to reduce lost profit opportunities and process safety incidents.

AI's ability to analyze vast datasets, predict patterns and spot emerging trends is revolutionizing facility maintenance. Instead of relying solely on routine schedules or manual inspections, leading companies now utilize AI systems that continuously monitor sensor inputs and historical performance data. These systems precisely predict where and when maintenance is required, allowing operators to shift from reactive repairs to predictive interventions, thereby addressing potential problems before incidents occur. This form of predictive maintenance saves time, money and avoids incidents that might cause emissions or put our people at risk. Industry leaders such as ExxonMobil, Chevron, Phillips 66, Flint Hills Resources, LyondellBasell, and BASF have all implemented AI-enabled predictive maintenance programs at their facilities.

Beyond maintenance, AI enhances safety with advanced video and camera monitoring. Its capability to process countless surveillance feeds far exceeds human limitations, and companies are putting that ability to work spotting potential safety hazards. For example, ExxonMobil uses machine learning and computer vision to analyze real-time footage in its refineries, alerting staff to potential hazards or behaviors and helping prevent incidents before they escalate. And Marathon Petroleum uses Flyscan, an AI-driven threat- and leak-detection technology to monitor its pipeline rights of way. From a patrol plane, technology scans the landscape for hydrocarbon leaks and mechanical equipment threats, performing surveillance with greater sensitivity and accuracy than is possible with human observers.

> "AI is helping us move from reactive to proactive safety — identifying risks before they escalate and guiding proven responses. But these technologies don't operate in isolation. It's the combination of intelligent systems and skilled people — those who bring insight, empathy, and accountability — that creates a truly resilient safety culture. Together, they're enabling a step-change in how we protect workers, communities, and critical infrastructure." **— Lara Swett, Vice President of Technical and Safety Programs, AFPM**

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About AFPM Editorial:

The American Fuel & Petrochemical Manufacturers (AFPM) is the leading trade association representing the makers of the fuels that keep us moving, the petrochemicals that are the essential building blocks for modern life, and the midstream companies that get our feedstocks and products where they need to go. We make the products that make life better, safer and more sustainable — we make progress.

Topics

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