5 Ways AI is Optimizing Manufacturing Processes

Realizing the dreams of a fully automated factory floor starts with utilizing the structured and unstructured data captured from manufacturing processes. Once captured, data-producing sources and assets on the shop floor must be capable of decentralized analysis to take accurate, independent decisions. For that, you need artificial intelligence.

Applying AI to optimize or automate manufacturing process is one of the hot topics of the moment. However, the implementation rate within the industry is still abysmal. A PWC study highlights the fact that only 9% of facility owners leverage AI and the adoption rate needs to increase exponentially to achieve Industry 4.0 goals.

What Drives the Need to Adopt AI?

Blanket terms such as 'utilizing AI to analyze shop floor data' do not capture why manufacturing needs to up its AI adoption rate. Details into the driving factors include the following:

- Shorter production lead-times – The need to take products to market quicker provides manufacturers with a competitive advantage. Manufacturing solutions such as rapid prototyping helps reduce lead-times. Equipment and processes utilizing AI can also shorten production lead-times.
- Inspections and Compliance Implementation – Quality throughput is important to achieving profitability and thorough inspection is required to ensure quality control. Speeding up inspection time means getting to marker quickly without reducing quality.
- Capacity planning and supply chain demands – Meeting fluctuating customer demands require the ability to develop optimized capacity plans and manage supply chains in real-time.
- Predictive Maintenance and Condition Monitoring – Reducing unplanned downtime is crucial to achieving productivity goals and predictive maintenance and condition monitoring provide the needed support. AI leverages historical data to develop predictive maintenance strategies and implement condition monitoring strategies.

Important Use Cases for AI in Manufacturing

Deploying AI is integral to achieving your Industry 4.0 adoption goals and enterprises must determine how to utilize AI to optimize manufacturing processes by themselves. To help you get started, here are some important use cases for AI.

1. Quality Assurance – Inspection time within the production cycle is crucial to determining which products makes the move to the finished batch and which goes back in the pole for further work. Getting inspections right is also important which is why human operators spend hours inspecting products on the factory floor. Generally, inspection processes are tedious and consist of repetitive tasks. Of course, daily repetitions create avenues for error and this affects the quality of throughput.

   Equipping inspection robots or robotic vision provide manufacturers with a means to speed up inspection processes and reduce errors due to human inspectors. These robots rely on image processing algorithms to translate processed data to discover defects. Sorting is then done with AI-enabled precision which eliminates errors.
2. Predictive Maintenance – Applying predictive maintenance strategies is expected to reduce unplanned downtime by 75%. However, the goal of predictive maintenance within the smart factory context is to equip shop floor assets with the ability to make decisions that optimize the lifespan of assets. Examples of decision-making include equipment shutting itself down and sending out notifications for spare parts and a schedule for its maintenance.

   Equipping machines with decision-making capabilities are AI's bread and butter. Thus, comprehensive predictive maintenance applications will rely heavily on successfully integrating shop floor assets with AI.
3. Building Management and Physical Security – Screening access to different sections of the manufacturing floor has become an integral path of setting manufacturing niches. For example, Apple divides its manufacturing operators into specific categories to ensure trade secrets are not leaked from the factory floor to competitors. Relying on human gatekeepers to manage access and security is a flawed process.

   AI provides security cameras, scanners, and other security solutions with the capability to make decisions in real-time. Although access cards may limit entry to anyone without a card, AI-enabled cameras can analyze patterns to recognize more advanced security incidents. Real-time

analysis then makes it possible to forestall security incidents before they spiral into something more harmful to the organization.

4. Machine Vision – Like robotic vision, machine vision refers to imaging-based analyses that empower machines to take accurate decisions. Thus, with machine vision, an inspection robot automates the sorting process while an automated guided vehicle or automated mobile robot takes navigation-related decisions in real-time.

   Intelligent AGVs or AMRs scan their environments in real-time to navigate through shop floor layout and bypass obstacles. The data collected by the image processing cameras attached to the AGV is constantly analyzed as the AGV navigates its path. Machine learning and AI comes into play when the automated robot makes accurate decisions when navigating the shop floor.

5. Planning, Scheduling and Risk Management – Manufacturers can leverage AI-enabled solutions to enhance risk management strategies within the shop floor. Risk-based scheduling is an example of how AI can be leveraged to reduce production cost overruns, plan around unplanned machine downtime, and challenges with staffing.

   Risk-based scheduling leverages real-time data to access current manufacturing situations and provide optimized results to manage specific situations. In the case of a defective workstation, the scheduling solution takes the defective workstation as a constraint and produces a real-time schedule that ensures production continues to meet specific deadlines.

6. Limiting cybersecurity incidents – Adoption of Industry 4.0 means the manufacturing industry has increased its cyber presence to include the application of edge and cloud computing-powered solutions to meet its goals. Increased online participation calls for a special focus on maintaining secure IT infrastructure because the manufacturing industry is fast becoming a target.

   Mitigating the risks that come with utilizing IT infrastructure requires solutions that can analyze big data sets to discover erratic patterns that highlight cybersecurity incidents. The application of security event and information management (SEIM) tools provides manufacturers with operational centers to deal with cyber-attacks. SEIM tools leverage AI to analyze the big data sets from IoT, cloud, the digital twin, and other IT infrastructure deployed to support industrial initiatives in real-time. The AI-enabled analysis empowers SEIM solutions to take actions that mitigate cybersecurity risks.

Conclusion

The interconnected and smart factory will rely on artificial intelligence to support human effort on the factory floor. Manufacturing enterprises that intend to take advantage of AI are expected to highlight the pain points AI can solve. Highlighting these challenges is the first step to creating a roadmap for improving productivity and managing risk with artificial intelligence.