# 5 Important Use Cases for AI in Manufacturing

The introduction of Industry 4.0 in 2011 and the digital transformation that enables it led to an influx of new technologies to optimize traditional processes in the manufacturing industry. Artificial intelligence, which was predominantly utilized in computer science and software engineering fields, was also introduced into the manufacturing industry because to achieve the 'lights out' factory manufacturing equipment must become independent thinkers.

The lights out factory was coined to describe the Industry 4.0 powered facility where human operators are reduced to the barest minimum while automated processes take place. For example, imbibing equipment with AI should enable it to diagnose its faults and order replacement parts or schedule a maintenance date to fix defects.

Today, AI has been applied across the manufacturing sector to support multiple Industry 4.0 initiatives. These initiatives cut across the major Industry 4.0 business models or concept shared in the official proof of concept document developed by the founding team of German engineers.

## Industry 4.0 Business Models

Highlighting the advantages and use cases of AI in the manufacturing sector requires a brief explanation of the important Industry 4.0 business models they support. These business models include:

- Data-Driven Plant Optimization
- Predictive Maintenance
- Validation and Testing
- Machine as a Service

Implementing these 4 Industry 4.0 business models can improve manufacturing processes and lead to revenue growth as statistics have shown. A Deloitte research highlights the fact that predictive maintenance strategies can reduce unplanned downtime by up to 70%.

The implementation of Industry 4.0 business models using disruptive technologies also enables enterprises to protect themselves and pursue innovative solutions to traditional manufacturing problems.

56% of C-level executives intend to implement Industry 4.0 business models to protect their operations from external disruptions while 33% intend to use it as a disruptive innovative force. Regardless of application choice, leveraging AI makes it possible to devise Industry 4.0 business models that meet your organization and operational goals.

Starting with data-driven plant optimization, AI provides the support data-producing assets require to gain contextual insight from captured data. The contextual insight data analytics provide is required for decision making by both C-level executives and assets primed for automation. With AI, data-producing sources can analyze situations in real-time to make the right decisions which lead to an optimized plant.

For example, an automated mobile robot (AMR) with the capacity to navigate shop floors without pre-installed magnetic tracks makes use of AI. The robot captures data concerning the shop floor layout in real-time and applies machine learning to analyze data and take action in real-time. This is why AMRs can apply machine vision to avoid obstacles as they navigate the factory floor. In this case data is analyzed, materials get to workstations quickly, and materials are received in one piece. This is what data-driven plant optimization Industry 4.0 models intend to accomplish.

Comprehensive predictive maintenance strategies that meet advanced Industry 4.0 standards do not stop at creating an optimized maintenance schedule. For the lights out factory to function at its optimal capacity, manufacturing assets must be capable of taking decisions such as ordering spare parts and scheduling maintenance without human support.

Improving the analytical powers of manufacturing assets through the implementation of AI and deep learning capabilities ensure assets can access vast repositories of data to make optimized choices.

Validating and testing new ideas before implementation ensures costly Industry 4.0 strategies are evaluated to avoid resource and capital waste. Technologies such as simulation modeling software are digital transformation solutions that play important roles in validating ideas. These technologies leverage AI in multiple forms. Examples include leveraging AI to automate the development of accurate simulation models by non-technical end-users of simulation software and developing intelligent agent-based entities to improve simulation results.

The servitization of manufacturing equipment has become a source of revenue generation for heavy-equipment original equipment manufacturers (OEMs). OEMs that choose to offer expensive machines to

end-users through subscription fees take advantage of advanced servitization to generate other sources of revenue.

The equipment involved in Machine as a Service subscription plans must function optimally to meet the requirements of diverse end-users. OEMs leverage AI to analyze end-user data to develop optimized usage plans that ensure that a paid hour is an optimized hour. Thus, with benchmark data and machine prompts powered by AI, subscribers get the most mileage out of machines they subscribe to.

## 5 Use Cases of AI in Manufacturing

The theoretical application of AI to support Industry 4.0 initiatives in the manufacturing industry have corresponding real-world examples which will be explored here. These use cases cut across utilizing AI to optimize plant performance to implementing predictive maintenance strategies.

### Schneider Electric Implements Predictive Maintenance with AI

– Schneider Electric, headquartered in Paris produces solutions to optimize industrial operations, had developed an IoT solution and strategy to monitor and configure rod pumps used in the Oil and Gas Industry. The IoT solutions ensured Oil and Gas enterprises could remotely configure and monitor offshore operations without having to send technicians to monitor processes.

**The Challenge** – Schneider Electric wanted to provide users of its IoT monitoring solution, Realift, with advanced capabilities such as the ability to predict problems to rod pumps and other operations before failures occur.

**The Solution** - The enterprise leveraged the machine learning capabilities Microsoft's Azure Machine Learning provides to enhance the abilities of its Realift solution. With AI capabilities the IoT solution provided Oil and Gas enterprises with the tools to predict failure with accuracy and to develop mitigation plans.

### Optimizing Material Handling with Cobots

– Optimizing material handling systems ensure manufacturers and warehousing facilities reduce accidents on the shop floor while optimizing material flow. XPO Logistics, a warehousing operations enterprise, struggled with optimizing its material handling processes.

**The Challenge** – Traditional material handling systems can be inefficient due to the manual labor involved with transporting materials across the shop floor. The transported materials sometimes reach workstations late and with defects.

**The Solution** – XPO logistics turned to Cobots, a material handling robot that leverages AI, to automate the order picking and material handling process. With Cobots, XPO logistics was able to improve its material handling and make just-in-time deliveries that increase customer satisfaction levels.

### Meister Group Employs AI to Develop Visual Inspection Strategies

– Inspecting finished products before shipping them out to the end-user is an important aspect of manufacturing go-to-market plans. Proper inspection strategies reduce recalls and the financial costs that come with it.

**The Challenge** – Meister Group, a Belgian automobile parts manufacturer, processes millions of parts that are sold to enterprises in the automobile industry. The traditional process of inspecting parts is manual, repetitive and time-consuming thus, defective parts may sometimes escape the production floor.

**The Solution** – Meister Group turned to an AI-enabled sensor camera to automate its inspection process. The Cognex In-sight 1000 Camera utilizes a visual sensor to inspect produced parts and compares captured data against benchmark data before assigning a status to the inspected part. With the AI-powered visual sensor, the enterprise can accurately inspect thousands of parts in a day.

### Siemens Gamesa Leverages AI to Improve Inspection Time

– Siemens Gamesa manufactures turbine blades to support the renewable solutions it offers to its customers. To reap the benefits of its renewable solutions, components such as turbine blades must be manufactured to perform optimally.

**The Challenge** – Siemens Gamesa required a process to inspect its blades during manufacturing and also monitor deployed blades. With over a thousand turbine blades under its jurisdiction, the organization required an automated inspection process to handle the monitoring process.

**The Solution** – Siemens Gamesa sought an AI-powered advanced image recognition system with the capacity to capture turbine blade images and compare them with historical data. The data analysis audit provided details on which blades required maintenance in real-time.

### Mitigating the Effects of Oil and Gas Pipeline Disruptions using AI

– Stoppages in oil and gas pipelines lead to unplanned downtime and affects the service levels enterprises provide end-users in the

industry. Understanding the effects of stoppages and increased demand provides the foundation for developing solutions to mitigate these effects.

The Challenge – The Oil and Gas enterprise was interested in understanding how increased demand and stoppages may affect its ability to meet customer demand. Mitigating this risk would protect its revenues and improve the services it provided its customers.

The Solution – The enterprise built a digital twin model that considered various mainline batch sequenced inputs and outputs in a first in – first out manner (FIFO), scheduled maintenance, and random service slowdowns or failure events. The digital twin leveraged AI to analyze historical data. The client was able to use the model scenario analysis output to confidently move ahead with recommendations for tankage requirements and operating philosophies to achieve desired levels of service.

## Conclusion

AI supports the implementation of Industry 4.0 business models within the manufacturing industry. The above use cases provide a glimpse into how AI can be applied alongside digital transformation solution to optimize planning and solve complex operational challenges. The use cases also serve as inspiration for manufacturing enterprises as they highlight the fact that AI can be leveraged in diverse ways to solve problems peculiar to your manufacturing niche.