sparkcognition™

EBOOK

AI IMPLEMENTATION IN MANUFACTURING

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Introduction

Rising competition, unexpected crises, and evolving consumer habits have ushered in the need for manufacturers to adopt innovative solutions. Artificial intelligence (AI), machine learning, and advanced analytics have been utilized across a multitude of industries spanning oil and gas, power generation, national defense, and many others. While applications of these technologies cover numerous areas, McKinsey & Company believes that AI can have a major impact on supply chain management and manufacturing (compared to service operations, product development, and other areas). Within the CPG sector specifically, this represents $200-500 billion in value for CPG companies.

However, it's important to acknowledge the challenges manufacturers experience when looking to realize this potential. According to research from McKinsey & Company, the stark reality is that approximately 70% of digital transformations fail. In a recent survey of consumer companies from McKinsey, respondents believe they need to allocate two to three times more resources to increase digital capabilities.

Bearing this, it's not surprising that digital capabilities (advanced analytics, machine learning, etc.) are among the highest priority areas of investment targeted by these organizations over the next 12-18 months. Moreover, a majority of manufacturers have sensors embedded in their operations' most critical assets collecting staggering amounts of data. With a spark of artificial intelligence layered with machine learning models and advanced analytics software, operators have the opportunity to extract unprecedented insights and drive meaningful change.

> **Adaptability is about the powerful difference between adapting to cope and adapting to win.**
>
> - Max McKeown,
> *Adaptability: The Art of Winning in an Age of Uncertainty*

How Manufacturers Can Benefit From This Ebook

This ebook highlights how manufacturers can gain comprehensive visibility and reduce uncertainty across operations with AI-based predictive analytics to:

Prevent unplanned downtime

Maintain quality control

Reduce operating costs

Improve production efficiency

Common Pitfalls in Adopting AI Solutions

Even when manufacturers adopt AI and machine learning solutions in hopes of exceeding key performance indicators, they're hampered by five common pitfalls:

Lack of overall digital vision

Overstatement of the automation business case

Picking the wrong process to automate

Lack of leadership involvement

Organizational fears

All five of these, in one way or another, stem from uncertainty. Historically, manufacturers have taken a largely reactive approach to address operational inefficiencies, the deterioration of critical assets, quality control, and other challenges. Health and economic crises such as COVID-19 have accelerated the need for next-gen solutions including advanced analytics to quickly navigate a changed environment. With an AI-powered solution, manufacturing managers are positioned to gain improved control of their operations.

With a clear strategy in place, manufacturers can rise above uncertainty with the power of AI at scale, and it all begins with effectively leveraging the data they already have. In particular, manufacturers can utilize these emerging technologies to curb machine downtime and maintain quality control.

Predictive Maintenance for Manufacturers

Critical asset failures and accidents are often unexpected and can grind operations to a halt for extended periods of time. As we mentioned in a previous section, manufacturers largely take a reactive—or routine—approach to maintenance. Not only is this approach potentially wasteful of raw materials and valuable production and personnel time, it often fails to catch unexpected or unusual failures.

By leveraging the data collected from sensors embedded in the assets, manufacturers can take a more proactive approach with predictive maintenance using AI and predictive analytics. According to research from McKinsey, predictive maintenance generally reduces machine downtime by 30-50% and increases asset life by 20-40%.

While predictive maintenance can be done without the use of AI and machine learning, these technologies alleviate many of the difficulties associated with predictive maintenance:

Unlocking data insights at speed and scale that humans may struggle to keep up with

Maintaining models over time. Machine learning models dynamically learn and maintain themselves by adjusting to any component or asset and adapting to changes over time

Deciphering and analyzing unstructured data, including using sources of data beyond sensors like maintenance records

Predictive Maintenance for Manufacturers

So how does AI and machine learning specifically enable predictive maintenance? The key lies in outlier detection capabilities known as anomaly management, which refers to the identification of events or observations that differ significantly from the data set. For example, a manufacturing facility has multiple assets with numerous sensors embedded in them that constantly collect data, such as pressure or temperature data. The manufacturer must ensure that the temperature remains between 55-56 degrees Fahrenheit to meet quality standards. After a few weeks of data collection, machine learning algorithms detect an unusual pattern of temperatures deviating from the established range: 52 degrees, 63 degrees, and so on. Predictive analytics software determines that a particular asset is not operating correctly and may break down in four days if not addressed, thus requiring maintenance. This amount of lead time ensures that operators can fix the asset before it has a chance to break down and potentially cease production for extended periods of time.

This approach can be boiled down to six steps:

1. **Machine learning algorithms ingest historical data from a facility's operations**
2. **The data is then used to build a model that acts as a profile of what normal operations look like**
3. **The normal behavior model analyzes facility data in real time. The model analyzes tagged deviations from the norm to determine when to raise an alert**
4. **The model identifies tags that are highest contributors to the raised alert**
5. **The software provides the user with a variety of diagnostic features including tag plots, comparisons to prior alerts, and failure model labels, to determine the root cause of failure and corrective actions needed**
6. **The software continuously learns from user input to capture subject matter expert knowledge**

While somewhat oversimplified, this general process has the potential to bear significant implications through the strategic planning of maintenance activities. Preventative maintenance (performed on a scheduled basis) may or may not catch impending failures like in the above scenario when analyzing temperatures. This forces a reactive approach when the asset does fail, bringing production to a halt and requiring expensive maintenance repairs.

Conversely, what if the sensors reported normal temperature patterns and determined that the asset was not at risk of failing? An operator may go about performing asset health assessments on their regular maintenance schedule anyway, which is a waste of time, money, and resources. AI, machine learning, and predictive analytics, on the other hand, essentially take the guesswork out of predicting when an asset requires maintenance, ensuring fluid operations that remain both productive and cost-effective.

Other industrial verticals, including oil and gas and power generation, have already found value in adopting AI, machine learning, and predictive analytics to proactively address maintenance needs.

Case Study

SparkCognition worked with a major oil and gas operator to minimize downtime and maximize production potential.

PROBLEM

The offshore platform operator observed five to 10 unique failure events per year, resulting in 10-15% downtime and up to $8 million in lost production potential per event.

PROJECT

Identify anomalies, minimize machinery downtime, and maximize production.

RESULTS

Our SparkPredict® predictive analytics product curbed downtime and increased production by 4%, or up to US $30 million annually per platform.

Manufacturing companies have a clear opportunity to capitalize on these same benefits.

Quality Control for Manufacturers

Consistently delivering high-quality products is one of many factors that are responsible for driving brand equity and differentiating yourself from competitors. Manufacturers with effective quality control procedures are far less likely to face recalls or risk a compromise of consumer safety. Emerging technologies such as AI, machine learning, and predictive maintenance can help them maintain production consistency.

For example, manufacturers must use large volumes of fresh water to create their products. The US Census Bureau has estimated that the US manufacturing industry requires 18 billion gallons of water per day during daily operations. In some cases, hundreds of gallons of water are needed for just one dollar's worth of output. For beverage manufacturers, it is often critical to carefully monitor how much water they're using to create their products. Using too much is a waste of precious resources, and too little will compromise the quality of the product that consumers expect. However, AI-based predictive analytics promote better visibility into operations that lend to greater efficiency, sustainability, predictability, and—in the case of maintaining quality control—production consistency.

Just like how AI, machine learning, and predictive analytics can be used to predict unexpected downtime, they also have the ability to predict operational inefficiencies with normal behavior modeling and anomaly detection. Also, as we've already discussed, the majority of manufacturing operations are already outfitted with sensors to monitor a broad range of data including temperature, pressure, water usage, quality inspection results, and more. By leveraging these emerging technologies, manufacturers can better understand whether their operations are performing at peak levels or if they need to fine-tune performance to improve output quality. In particular, the answer lies in normal behavior modeling through anomaly management.

To build on our manufacturer example above, perhaps a certain production line is using an abnormal amount of water. The normal behavior model utilizing machine learning will be able to detect such anomalies and alert operators, allowing them plenty of time to quickly discover the root cause of the issues and address them before resources are wasted and low-quality goods are produced.

Case Study

SparkCognition worked with a Fortune 50 beverage manufacturer to address operational inefficiencies, including optimizing water usage.

PROBLEM

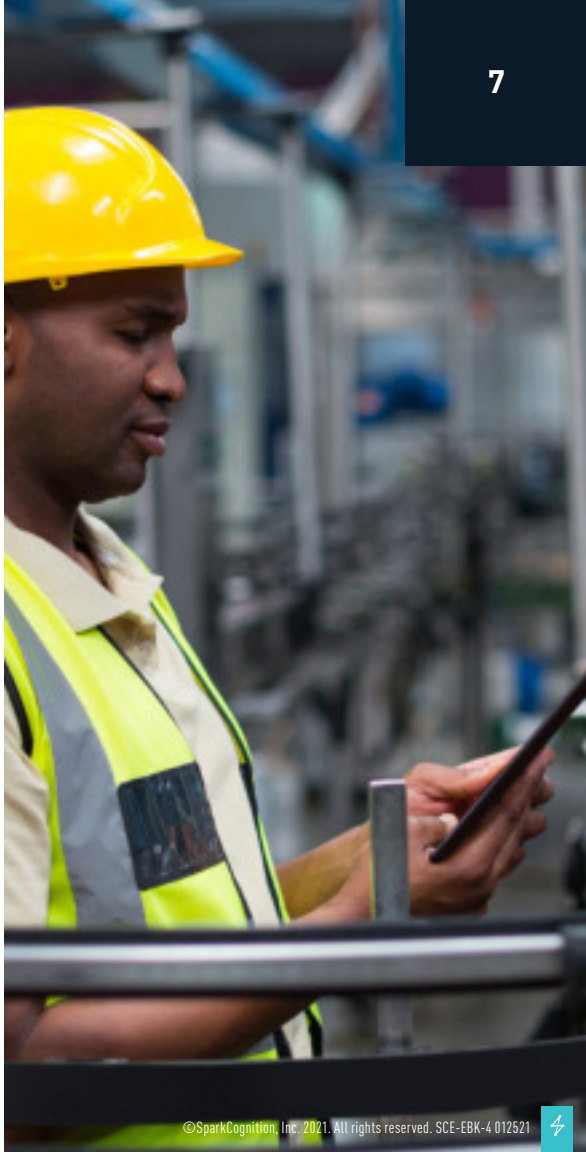
With no way to detect production anomalies, the producer lacked the capabilities to confidently ensure they're producing the high-quality products their consumers know and love.

PROJECT

Identify anomalies and flag quality issues.

RESULTS

Our SparkPredict predictive analytics product kept plant managers appraised of the current status of production and of any signs of process drift that may lead to substandard quality.



SparkCognition's Leading-Edge Solution

SparkCognition, a leading industrial AI company, builds AI applications to help customers adapt to a rapidly changing digital landscape and accelerate their business strategies. Our proven AI applications, including our SparkPredict predictive analytics product, unlock the power in the data you already have to help you rise above uncertainty. With the SparkPredict product, manufacturers will benefit from three key differentiators that can empower them to deliver optimal performance: visibility, actionable insights, and continual learning.

SparkPredict®
by SparkCognition

About SparkCognition™

We catalyze sustainable growth for our clients throughout the world with proven artificial intelligence (AI) systems, award-winning machine learning technology, and a multinational team of AI thought leaders. Our clients partner with SparkCognition to understand their industry's most pressing challenges, analyze complex data, empower decision-making, and transform human and industrial productivity. To learn more about how SparkCognition's AI applications can unlock the power in your data, visit www.sparkcognition.com.

Rise above uncertainty in manufacturing with the power of AI at scale.

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