sparkcognition™

AI-Based Total Plant Solutions

A PRIMER ON PREDICTIVE MAINTENANCE, QUALITY CONTROL, & KPI MANAGEMENT

While the consumer packaged goods (CPG) industry is often full of uncertainty, McKinsey & Company expects the global CPG sector to nearly double in size—to USD $14 trillion—by 2025. However, due to seismic changes in the industry, triggered by evolving consumer habits and needs, among other things, CPG companies must accelerate change to stay ahead.

"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

Strategic adaptability is key to consistent growth, business success, and resiliency. But in the era of transformation, CPG leaders are left walking a digital tightrope between opportunity and risk without a clear vision of what they can achieve with emerging technologies like artificial intelligence (AI). Facing rapidly changing market realities, executives and their teams stand to gain a wide range of benefits by leveraging AI-powered solutions to address inefficient operational processes.

ROADBLOCKS TO DIGITIZATION

Technological adoption and automation bring hopes of eclipsing business objectives, but CPG companies are often unclear on how to put their new plans into action to generate meaningful results. Unfortunately, these plans are destined to fail when not approached correctly—**a staggering 43% of CPG organizations fail to achieve their automation cost savings targets.**

The top five common pitfalls in automation projects for CPG processes are:

- Lack of overall digital vision
- Overstatement of the automation business case
- Picking the wrong process to automate
- Lack of leadership involvement
- Organizational fears

While not a comprehensive list, these pitfalls guarantee that CPG companies will not make it out of the pilot phase. In the face of health and economic shocks and stresses, whether expected or not, resilience is more important now than ever. According to the 2020 McKinsey Retail and Consumer Goods Bold Moves Survey, supply chain flexibility and digital capabilities (advanced analytics, machine learning, etc.) are among the top capabilities considered the most important over the next 12-18 months. However, these capabilities are limited—CPG companies allocate only five to seven percent of total resources to them, while 40% of peers believe they need to allocate two to three times more resources to increase these capabilities.

The need for a comprehensive AI strategy is clear, one that enables CPG companies to optimize operational performance through visibility, actionable insights, and continual learning. By unlocking the value of data, AI and machine learning empower CPG companies to:

- Assess operational performance
- Address process inefficiencies
- Improve reliability and safety
- Reduce waste and operational costs

THE CASE FOR PREDICTIVE MAINTENANCE

Equipment failures and unexpected downtime are significant problems that CPG companies face. When a critical asset breaks down, production must come to a halt, requiring expensive repairs using valuable resources. Historically, the industry has relied on preventive maintenance to address equipment health and potential failures, but running maintenance on a periodic schedule is a waste of time, money, and resources. What if an asset doesn't need attention? Instead, your data should ideally inform you when an asset is in need of repair.

CPG companies stand to gain a host of benefits by taking a predictive maintenance approach that's powered by AI and driven by data. By making better use of the sensor data they already have, CPG plant managers can start predicting and preventing asset failures before they occur, while leaving assets that do not need maintenance to continue running. The best way to truly derive value from predictive



VISIBILITY	ACTIONABLE INSIGHTS	CONTINUAL LEARNING
Provides layers of insight with operational metrics	Detects operational inefficiencies with a machine learning backbone	Learns and adapts to new situations and operation behavior with AI and humans in the loop
Assesses and addresses problems with process inefficiencies	Takes proactive actions to prevent production-impacting issues	Futureproofs the system with continually evolving models

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maintenance is by leveraging an AI-powered platform, such as SparkCognition's SparkPredict® product.

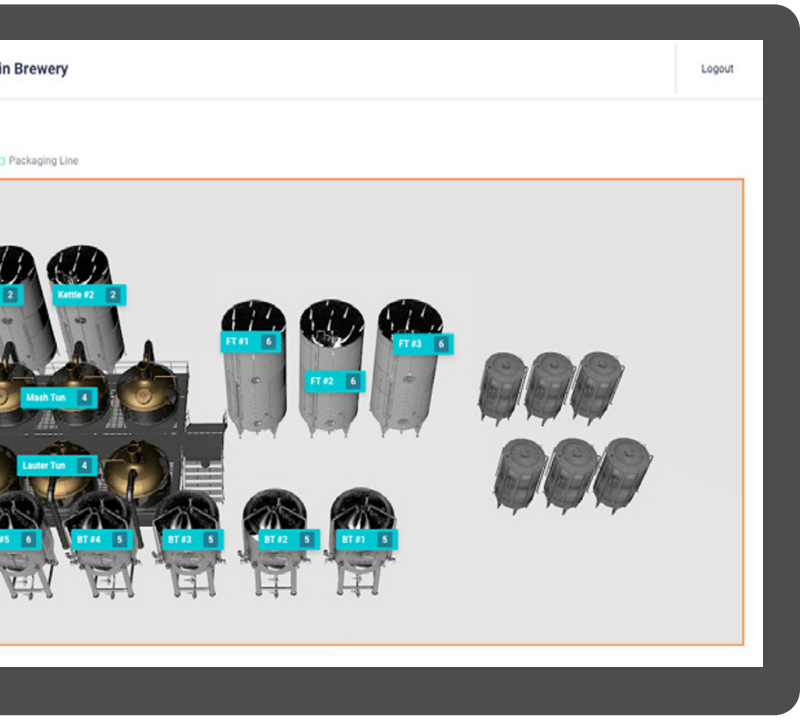
AI-powered predictive maintenance uses machine learning algorithms to analyze historical sensor data from a facility's operations, including critical pieces of equipment. Like the anomaly detection used for quality control above, this data is then used to build a model that simulates "normal" behavior. The normal behavior model can then analyze facility sensor data in real time, and identify any data points that deviate from the established norm. Rather than simply warning that a piece of equipment is at risk, the model will indicate when and how an asset failure will take place, allowing subject matter experts (SMEs) to take the necessary actions to perform maintenance before the equipment has a chance to break down.

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

- Unlocking data insights at speed and scale
- Maintaining models over time
- Deciphering and analyzing unstructured data, including using sources of data beyond sensors like maintenance records

In addition, solutions that leverage AI can move beyond predictive maintenance and into prescriptive maintenance by incorporating natural language processing technology (NLP), such as SparkCognition's DeepNLP™ product. Maintenance solutions that make use of these technologies are able to ingest historical records and service manuals, as well as past courses of action taken by subject matter experts. Using this bank of information, the software can speed up maintenance processes by listing possible next steps and suggesting corrective measures.

IMPLEMENTATION AND BENEFITS



The best way to truly derive value from predictive maintenance is by using an AI-powered platform like the SparkPredict product. Predictive maintenance can be (and has been) done without the use of AI and machine learning, but machine learning alleviates—or even eliminates—many of the difficulties associated with predictive maintenance.

Addressing speed and scale

Predictive maintenance requires large amounts of data, at a scale that is cumbersome and prohibitively time-consuming for human analysts, particularly at the scale of a large operation. But AI can handle the vast quantities of data humans may struggle to keep up with.

Alleviating the cost and burden of model upkeep

Another problem machine learning addresses is maintaining the models over time. With traditional predictive models that don't employ AI, a change in even a single variable, such as a replaced part, necessitates reworking the entire model. This also applies to the normal changes an asset goes through over time as it is used; a pump that has been in service a long period of time is not going to run the same as when it was brand new. Machine learning models avert these problems because they dynamically learn and maintain themselves by adjusting to any component or asset and adapting to changes over time.

Overcoming the lack of sufficient, structured data

Not all systems or subsystems have the sensors to provide the amounts of data predictive maintenance requires. Machine learning alone can't solve this dilemma, but machine learning-powered NLP can. Most software is only able to analyze structured data, or data containing numbers or categories. AI-powered NLP platforms, like the DeepNLP product, can decipher and use unstructured data as well—be it PDFs, books, journals, audio, video, images, notes, analog data, or any other source imaginable. This capability is valuable for CPG operators because with NLP, predictive maintenance models can use sources of data beyond sensors. This includes all manner of associated data about an asset, such as maintenance records. By extracting facts, figures, entities, and contextual data from an asset's maintenance history, predictive maintenance solutions outfitted with NLP find causal patterns that indicate potential failures, even in so-called dark subsystems that lack sensors.

Realizing the potential of predictive + prescriptive maintenance

Predictive analytics, while invaluable, is only part of the value that machine learning delivers. After all, predictive maintenance doesn't absolve operators from having to perform maintenance. By incorporating NLP technology, maintenance solutions are able to ingest historical records and service manuals, as well as past courses of action taken by subject matter experts. Using this bank of information, the solution can speed up maintenance processes by listing possible next steps and suggesting corrective measures.

RELIABLE CPG PRODUCTION FOR A STRONGER BOTTOM LINE

Research from McKinsey suggests that predictive maintenance generally reduces machine downtime by 30-50%, and increases asset life by 20-40%. A wide array of industries has already adopted

predictive maintenance, to dramatic results. One hydropower utility was able to use this technology to avert a failure that would have cost an estimated USD $1.5 million. An oil and gas supermajor's use of predictive maintenance has increased their production by about $30 million per year on each of their offshore platforms. And a major electric utility was able to avoid a major maintenance event and avert roughly $500,000 in repairs within a single month of implementation. An airline in eastern Asia has implemented this technology, reducing their maintenance time by 20 minutes. In doing so, along with fewer false positives and other benefits of predictive maintenance, they've saved roughly $40 million a year.

The CPG industry can and should be enjoying these same benefits, without wasting unnecessary resources, time, and manpower on scheduled maintenance or having to scramble to recover from unexpected failures. Industrial operations are often full of uncertainty—but they don't have to be. Machine learning technologies are already allowing major operators to truly leverage the potential of their data, enabling safer and more predictable operations.

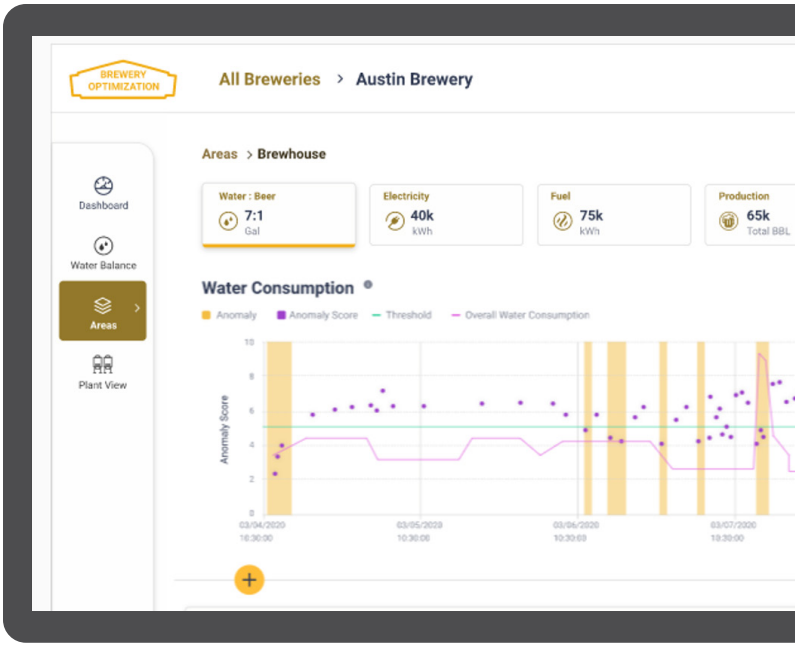
THE CASE FOR AI-POWERED QUALITY CONTROL

Producing consistent, high-quality products is essential to customer satisfaction and building a positive brand identity. Products that are low quality are a waste of production resources, money, and operating time, as well as a threat to the company's reputation, and CPG companies need to be certain that they can meet and exceed expectations every time.

Data is the lifeblood of digital transformations and successful daily operations, capable of ensuring resilience in volatile markets. Even though most CPG facilities are heavily outfitted with sensors to collect and monitor data, **plant managers lack the tools to extract real value from this data.** Plant managers need to know whether operations are running at peak performance, or if processes need to be fine-tuned to prevent process drift and the creation of low-quality goods. When deviations in the data go undetected, problems arise: Critical pieces of equipment break down, output quality falters, and operational costs increase.

CPG companies must invest in AI-powered technologies to gain insight and total visibility into their data to ensure consistent, high-quality output. The SparkPredict product's normal behavior models can analyze sensor data in real time and flag any values that deviate from the established norm. For example, if a certain production line is using an abnormal amount of water (a waste of resources and a sign of potential process drift), the normal behavior model will alert SMEs of the anomaly, allowing them to quickly discover the root cause of the problem and fix it in a timely manner.

Research from McKinsey has shown that AI adoption in the CPG sector will likely create USD $200 to 500 billion of additional value each year through optimizing supply management and management processes, including quality control. By leveraging the SparkPredict product, CPG companies can gain greater insight into operations, identify anomalies, and implement better quality control to realize this value. A Fortune 50 beverage producer struggling with operational efficiencies has leveraged the SparkPredict product to detect anomalies in the production process and ensure quality control. As a result, the beverage producer expects to be able to achieve and ultimately exceed its production goals while ensuring consistent quality.



CASE STUDY: IMPROVED QUALITY CONTROL FOR A FORTUNE 50 BEVERAGE PRODUCER

The beverage producer in question manufactures several different types of products in a typical facility, and operations are known to be inefficient. With no way to detect anomalies in the production process, the producer lacked the capabilities to confidently ensure quality control.

In response to this need, SparkCognition implemented its SparkPredict product to identify anomalies and flag quality issues. This solution was then used to calculate an efficiency score metric for the facility designed to detect anomalies in operations, and keep plant managers appraised of the current status of production, and of any signs of process drift that may lead to substandard quality. Managers can then quickly qualify root causes and take corrective action, and all without retrofitting existing processes. This implementation will also continue to learn and adapt to the plant's operations over time, ensuring that the model is future-proofed and will continue to provide value even as operations evolve.

As a result of this implementation, the beverage producer has the confidence and capabilities to achieve and ultimately exceed its production goals, and directly improve its bottom line. **Similar deployments in manufacturing have realized a one to three percent overall improvement in efficiency from increased production, reduced downtime, and decreased maintenance costs, creating a massive ROI for large operations.** It's time to stop reacting and start anticipating.

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.