

# Everything you need to know about predictive maintenance

A complete guide to predictive maintenance and the impact it can have on process manufacturing plants.

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## The Smart Manufacturing Trends of 2022

[Smart manufacturing](#) is one of the buzzwords in industry in 2022, referring to an almost fully-automated factory that keeps manual processes to the minimum, so as to reduce human error. It's characterized by the adoption of advanced technologies such as machine-to-machine communication, artificial intelligence (AI), machine learning (ML), and automation.

## 2022 is the year that smart manufacturing scales

Towards the end of 2021, Deloitte analysts [forecast](#) that 2022 would see smart manufacturing scale, with more companies emulating advanced "lighthouse" factories and ramping up isolated tech projects and pilots to cover the entire organization.

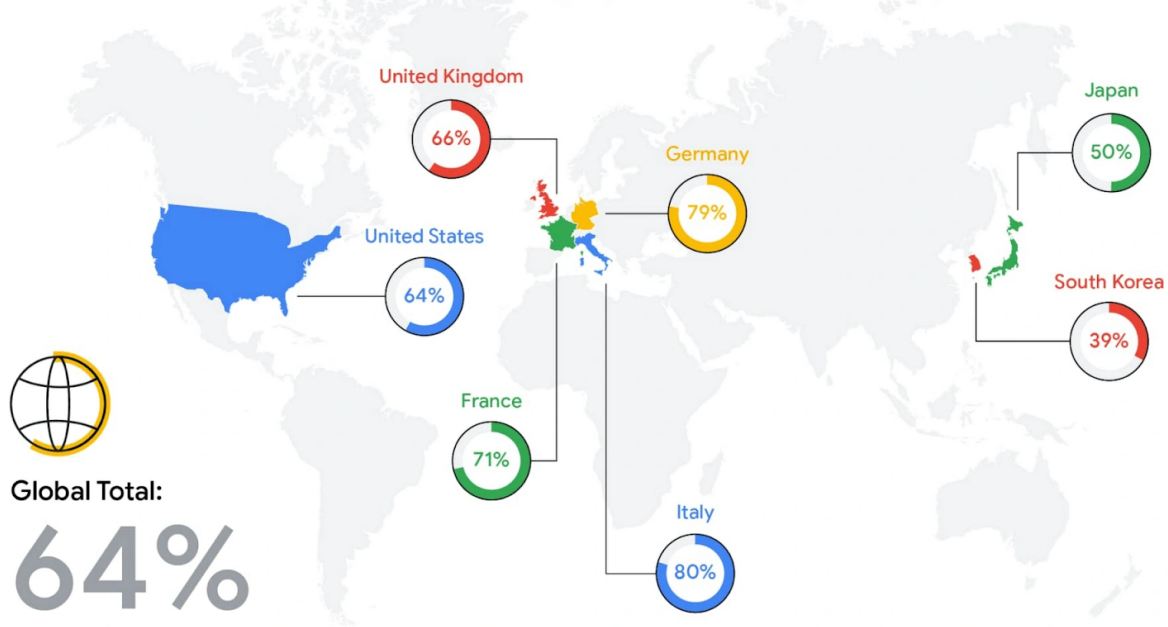
“Now that we have integrated smart factory solutions, I predict we’ll see a big evolution from organizations having a couple of smart factory components to whole production environments becoming smart,” [wrote Jason Bergstrom](#), smart factory go-to-market leader at Deloitte, adding that organizations will maximize the impact of big data by bringing it together from across the corporation, rather than being satisfied with connecting a single department or just one plant.

Indeed, this year we’re seeing increasing awareness that smart manufacturing is table stakes and that being left out means being left behind, with Plex’s 7th Annual State of Smart Manufacturing Report claiming that smart manufacturing adoption is rising [by 50% year-over-year](#). Having been [valued at \\$88.7 billion](#) in 2021 by ResearchAndMarkets, the smart manufacturing market is projected to reach \$228.2 billion by 2027, growing at a CAGR of 18.5%, and [\\$446.24 billion by 2029](#).

This shift owes a lot to groundwork laid by manufacturers over the last couple of years. Prodded on by the pandemic, most companies have completed basic digital transformation projects like deploying [Industrial Internet of Things \(IIoT\)](#) devices, establishing data gathering processes, and implementing cloud storage, and are moving on to more advanced projects that build upon that foundation.

By now, [more than 90%](#) of companies are using or implementing digital manufacturing technology, Fictiv reports, and 75% will have adopted at least some components of smart manufacturing by the end of 2022, according to the Plex Report.

## AI use in day-to-day operations by country:



## Smart manufacturing adoption drivers

Not surprisingly, the pandemic has been a major driver for smart manufacturing adoption, which has compounded these primary factors that motivate smart manufacturing in 2022:

- Supply chain issues;
- Remote work and labor shortages;
- Sustainability and ESG demands;
- The need to keep up and communicate with customers. Research by Fictiv found that 97% of manufacturers say that customer demands are shifting, specifically towards improved sustainability and quality.

Here are the top 2022 smart manufacturing trends.

## Production monitoring

New solutions use [AI and ML together](#) with data gathered by IIoT devices to offer advanced levels of production monitoring. Deloitte notes that this type of close monitoring may be required to help organizations keep up with the fast-moving ESG landscape and quantify moves to lower energy consumption.

Production monitoring includes [predictive monitoring](#), [predictive maintenance \(PdM\)](#), and [PdM as a Service](#), an important new trend which helps plants onboard to predictive maintenance faster and with less hassle.

These technologies can detect the earliest signs of impending failures, leaks, or bottlenecks in processes, assisting employees to identify wasteful inefficiencies, spot environmental hazards, and correct them before they become serious.

## Automation

Automation is rapidly spreading across entire organizations, using AI and ML for robotic process automation (RPA) for soft administrative tasks like invoicing, vendor management, and inventory management, as well as automating manufacturing processes. Plants are adopting collaborative robots, or cobots, which work together with human employees to extend

their capabilities and deliver a safer working environment.

Taking it a step further, one of [Gartner's Top Strategic Technology Trends for 2022](#) is [hyperautomation](#), which involves rapidly identifying, vetting and automating as many business and IT processes as possible, using a combination of technologies including AI, IoT, and digital twins.

## **Digital twins**

[Digital twins](#) is one of the leading smart technologies, with ResearchAndMarkets' predicting the digital twins' market to grow at a CAGR of 68.9% between 2022 and 2027, reaching an estimated value of \$43,614.8 million. Digital twins use AI and ML to crunch data from IIoT devices and plant sensors, creating an exact digital copy of the factory which is constantly updated according to real time changes in the plant.

Digital twins are used to optimize layouts and planning for new factories; by remote engineers to carry out root cause analysis using VR and AR headsets, and even to fix issues in the bricks and mortar factory by changing the configurations on the digital version.

## **Supply chain management**

Supply chain is the enduring problem child of the pandemic and previously fractured global manufacturing norms, and thus near the top of the list for smart manufacturing solutions. Plex's

study reports that the percentage of plants using a supply chain planning software solution jumped from 30% in 2017 to 78% in 2022.

Tools tackle a number of aspects, including delivering end-to-end supply chain visibility and automating supply chain decisions. Solutions draw on various technologies, including blockchain for transparency and accountability; AI-powered data processing to pull together data from disparate sources, and cloud computing so that data is accessible from anywhere and at all times.

## **Data visualizations**

The rise of the connected factory and preponderance of IoT devices have gifted manufacturing companies with a tsunami of data, with plants that have advanced IIoT systems receiving as much as [70 terabytes of data per day](#) from a single assembly line. This data is highly valuable, but only when organizations have the capability to access insights from it.

Advanced data visualizations, such as 3D visualizations, offer a clearer view of changing metrics and a deeper look into shifting business and plant conditions. With such visualizations, plants can achieve a more accurate understanding of processes and root cause analysis, often in real-time.

## **Additive manufacturing**

3D printing is almost standard for producing exact replacement parts when equipment fails, thereby reducing delays in dealing with incidents, but additive manufacturing is mastering new techniques that support process manufacturing to meet its goals. Additive and conventional manufacturing are “now starting to connect and create a more integrated production environment,” [in the words of Bart Van der Schueren](#), CTO of Materialise.

New 3D printing materials are recyclable and reusable, helping plants improve sustainability, while micro 3D printing can produce ever-more complex and hard-to-source production components, assisting in shortening the supply chain and ensuring that plants have all the items they need. By integrating additive marketing, plants can ensure smoother production runs and fewer interruptions.

## Wearables

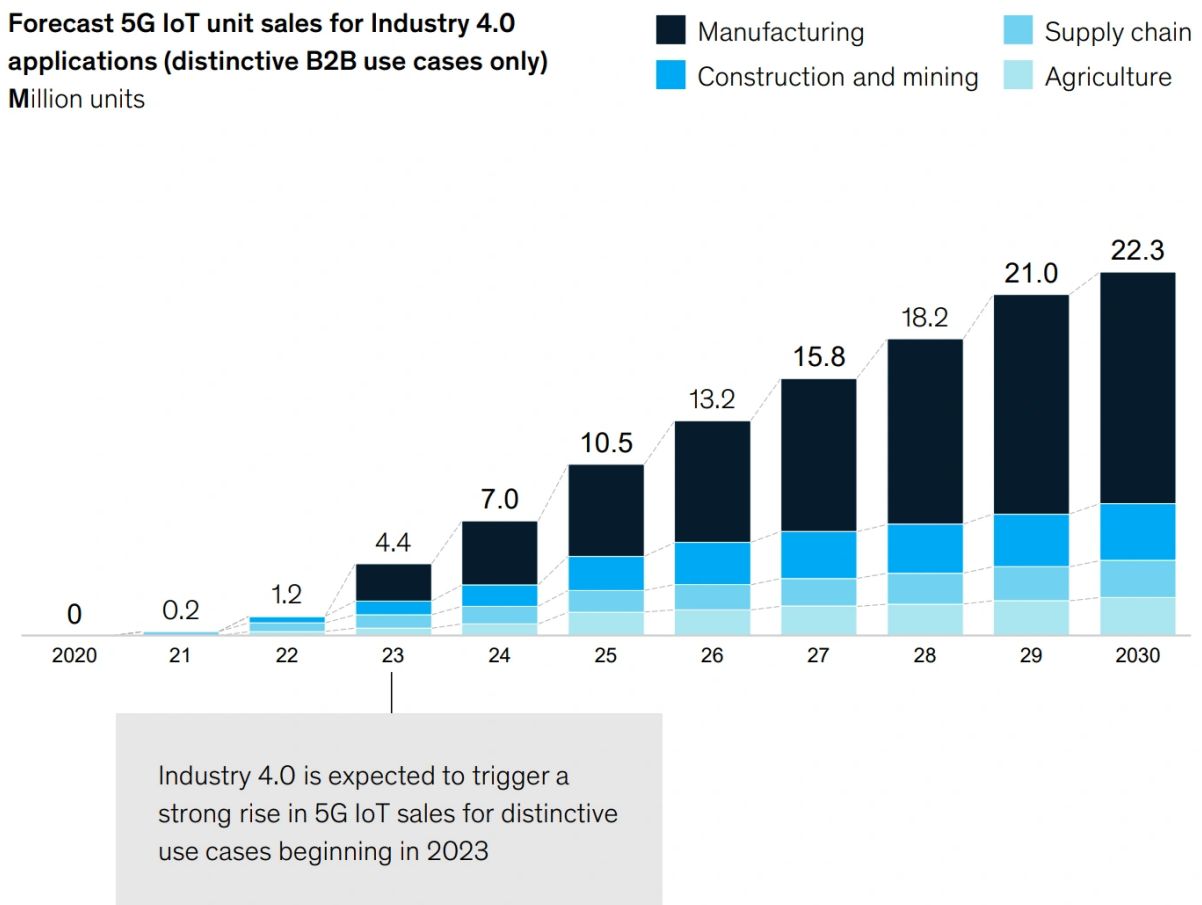
Wearables use data from IIoT devices, GPS location data, and AI to deliver alerts to employees that warn them about potential hazards, remind them about safety or compliance requirements, and notify them about significant changes in the plant.

For example, smart wristbands can alert the wearer if a surface is too hot to touch or a piece of equipment is malfunctioning, and GPS-embedded items monitored employee movements to enforce safe distancing during the pandemic. The market for industrial wearables is [predicted](#) to grow at a CAGR of 25% between 2021 and 2026, rising from an estimated \$2 billion in value to \$6.1 billion in that timeframe.

# Edge computing

Edge solutions, wireless connectivity, and 5G/6G system go hand in hand with delivering the latency-free connections needed by IIoT devices, and the systems that rely on them. Digital twins, predictive analytics, supply chain monitoring dashboards, and other smart manufacturing technologies depend upon near-instant data from IIoT systems.

Research by McKinsey [predicts](#) a sharp rise in 5G IoT sales from 2023, with units sold reaching over 22 million by 2030.



Source: McKinsey analysis

# Smart manufacturing is taking off

As Fictiv CEO and co-founder [Dave Evans put it](#), “2020 was about seeing the problems, 2021 was about finding the solutions, and now in 2022, we see companies are making progress towards a future-proofed industry.”

These 8 smart manufacturing trends, from predictive monitoring and digital twins to wearables and edge computing, build upon the digital transformation foundations laid in the last few years and are set to continue to strengthen throughout this year and beyond.

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**Watch: SAM GUARD Human  
Enhanced Machine Learning**

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**Virtual Sensors - Tracking  
Quality in Real-Time**

Manufacturers must strive for a high level of [Overall Equipment Effectiveness, or OEE](#), which is the product of three

parameters: availability, quality, and performance. We are excited to announce the brand-new virtual sensors feature in the SAM GUARD [predictive monitoring](#) suite designed to help you diminish the challenges that come with measuring quality in real-time, ultimately improving your plant's overall OEE.

# VIRTUAL SENSORS

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Based on our clients' needs and many customer requests, we developed the new virtual sensors feature to improve the quality issues which commonly arise during batch production processes. With the assistance of SAM GUARD's virtual sensors, your plant will be well on its way to increased plant efficiency with high quality finished goods, and less wasted materials and their associated costs.

## **What are Virtual Sensors?**

Virtual sensors allow the SAM GUARD system to predict and monitor a sensor that doesn't actually exist, based on data from other, physical, sensors. It works by adding a virtual tag value to historical data, then when the data is live, the virtual sensor value is "collected" based on a pre-defined formula applied to data coming from the physical sensors and their predefined tags.

SAM GUARD's machine learning algorithm learns the correlations between the existing data and this new value and builds a model automatically.

## Why Implement Virtual Sensors?

Without the help of virtual sensors, it would be nearly impossible or highly cost-prohibitive to manage and retrieve quality information in real-time. Prior to virtual sensors, tracking the quality of materials throughout the manufacturing process was not a simple undertaking, as there was no single sensor that could trace it accurately.

What's more, inspecting quality in the lab is most often completed post production rather than during the manufacturing process – leading to wasted time, materials, and costs if the batch turns out to be of poor quality. Discovering poor quality finished products after the fact can be a huge drain on profitability, and if they have somehow been released already to a customer, the domino effect can lead to lost customers.

Virtual sensors provide plant management with the ability to identify if quality is declining in real-time. They can then change the process accordingly, or even halt the production line if it is due to something major, thus preventing unnecessary waste.

## Always Produce the Golden Batch

By utilizing the data tracked in the [data historian](#), you can set your ideal quality parameters based on previous production processes. When you know you have a high-quality batch, you then go back to the history and identify the specific parameters that went into creating this so-called “golden batch.”

Whether those criteria include specific temperatures, vibrations, flows, or precise measurements of ingredients, the system can use this information to generate the ideal parameters that lead to the perfect finished product.

Once these parameters are set, the virtual sensor simply tracks the quality of the products throughout the process, making sure each element matches the pre-chosen constraints from the data history.

No matter where the materials are in the production process, SAM GUARD uses the data from the virtual sensor to alert if the process is straying from the Golden Batch, in other words, if a potential quality problem is arising. It compares the values to the best-case scenario and can identify what may be going wrong, preventing wasted materials and time.

The plant manager will be notified if the quality of the product quality is diminishing, where and why it's occurring, and how to change the parameters to match the golden batch quality.

Precognize's virtual sensor software thoroughly understands the plant based on its historical data, and it allows the manufacturing managers to get to the root cause of why and if the plant is not meeting the "golden batch" or perfectly pre-crafted parameters.

## **Chemical Plant Turns to Virtual Sensors, Improving its Quality**

One of our trusted chemical manufacturing clients struggled with quality issues leading to a huge waste of chemicals and money, and at times up to 10% disposal of their finished goods. They discovered numerous quality issues far too late in the process to modify and perfect the product before it reached its final stages of production.

After much frustration, they turned to Precognize to see how we could help them reduce their quality problems in the manufacturing process. Virtual sensors were the answer to their issues with quality, and according to the chief engineer, “after running virtual sensors in a beta trial for two months, we now have almost 100% quality assurance in our plants prior to reaching the laboratory test phase.”

## **Quality Monitoring is the Future**

SAM GUARD’s virtual sensors can help you to advance the predictive monitoring of your plant, leading to smoother operations and higher accuracy according to your batch production needs.

By continuously monitoring quality, you can drastically improve your plant’s OEE.

Welcome to the next phase of [industry 4.0](#).

To learn more [GET A DEMO](#)