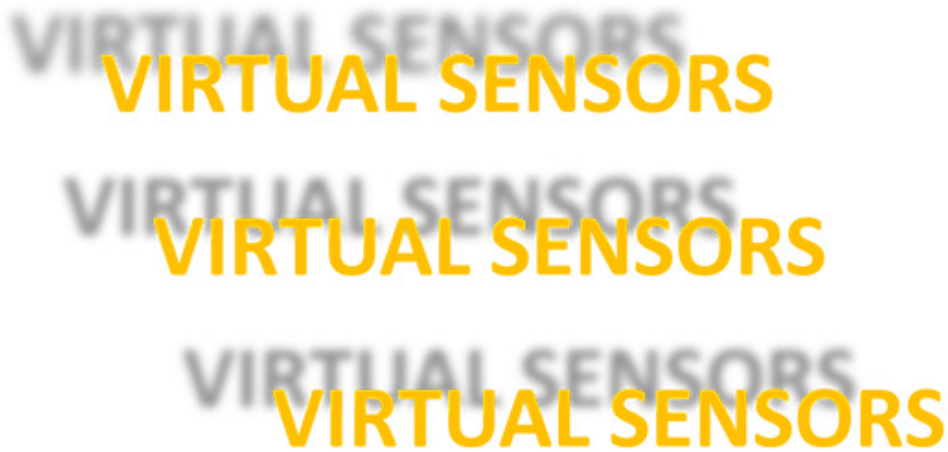


# Virtual Sensors- Tracking Quality in Real-Time

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.



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](#)

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# The full potential of combining sensor data and automated expert knowledge is yet unknown

*In a unique interview, Dr. Hila Nachlieli, Head of Research at Precognize, reveals what motivates her, how Precognize is making the world a better place, and why women should practice sports*

## **Q. What is your role at Precognize?**

**A.** Precognize has a unique combination of both sensor data and automated expert knowledge. We have the unique ability to transfer experts' knowledge into an automated model within a period of two weeks, which makes it possible for us to obtain this new type of information. The full potential of this combination is yet unknown. As the chief researcher, my role is to identify the benefits that can be harvested from this unique combination.

One such benefit is overcoming the “no free lunch” theoretical limit, which enables us to harvest the data beyond traditional data mining, cracking yet unsolved challenges. True [predictive maintenance](#) monitors the system as a whole, since one-sensor detections are bound to miss the non-trivial problems. In systems with thousands of sensors, the number of possible states is bigger than the estimated number of atoms in the universe. In such a big state-space it is unlikely that a specific state occurred in the past, and differentiating a normal state from an anomaly is prone to error, which is a challenge we can overcome. Another important benefit is our ability to accumulate many anomalies into a few informative issues.

## **Q. What is your expertise?**

**A.** My expertise is machine learning and data mining. My PhD is in physics, in Non-Equilibrium Statistical Mechanics. My advisor was Prof. Dov Levine, who provided the mathematical explanation for the development of quasicrystals. I then worked at HP Labs Israel, focusing on image processing and machine learning.

## **Q. How do you see Precognize's technology changing the process industry?**

**A.** The aspect which is most important to me is preventing accidents: zero casualties in system malfunctions or explosions, a pollution-free environment, and the reduction of related health problems. With continuous predictive maintenance, equipment will last longer, which is the ultimate recycling, as there is no need for replacements. Moreover, the more you are able to trust your equipment, the less backup equipment you need and the leaner your factory is, and regions that were once occupied for redundant facilities can host trees and foliage.

Precognize provides the quality alerts required for predictive maintenance in complex factories, but full integration of its capabilities by industry goes far beyond predictive maintenance: imagine a compressor that gradually stops to avoid pressure building up to a possible explosion, as the following valve in the pipeline behaves suspiciously; or a tap that closes automatically because of a detected danger of oil leakage in the pipe; or a forge that cools itself because something in the input flow is just not right.

Precognize's real strength is beyond focused alerts – it is in its ability to automate expert knowledge and build a computer model of the facilities. Advanced use of these models borders on science fiction, such as the automatic design of machines, a factory that changes its manufacturing lines to address

changes in product specification, or to adapt the production mix to changing product prices.

**Q. Do you see Precognize's technology being applied to other industries? If so, which?**

A. Sure. Precognize technology is general, and can be applied to any system. Precognize's focused alerts and short integration time are crucial in complex systems, but they are beneficial in simpler machines as well, as it replaces the long customized development of a specific alert system or rule design. Instead of building an alert system from scratch, all the customer needs to do is to insert the expert knowledge into the Precognize system, which will take far less than two weeks for a simple system. On the other side of the scale, it would be highly beneficial, though far from the company's focus, to apply the technology to the ultimate machine: the human body.

**Q. Where do you see the predictive maintenance industry ten years from now?**

A. In ten years, maintenance will include small adjustments and tunings, yielding zero accidents, zero casualties, and a pollution-free environment. Precognize will be embedded in the factory work routine, structures, and machinery, resulting in increased security. Machines with potentially life-threatening problems will not start, and planes with a significant alert will "refuse" to take off, until the problem is fixed, which will be fast because the problem has already been identified.

**Q. And on a more personal note, how has your experience been as a woman in traditionally male-dominated STEM?**

A. There are semi-cultural differences between a man and a woman, where women are much more likely to think and talk in "we" terms than men. This makes men's contributions much more visible, recognized and compensated, which serves as feedback

for women. As women adapt to the male-oriented culture, we learn to suppress our collaborative tendencies, which is a big miss. One thing I like about Precognize is that we are a one big team, where each person has his or her unique role and expertise, and it is the combination of all these qualities that enables us to act on important goals, such as helping to reduce the pollution in our city.

**Q. What would your advice be to women who are interested in getting into STEM?**

**A.**

1. Learn mathematics. Besides being the core of the STEM subjects, it will teach you to exercise perseverance and dedication to the completion of challenging missions.
2. Practice sport and take part in competitions to experience a competitive environment.
3. Your obligations are just as important as those of your spouse, and you are both equally obligated to your kids. Make sure you fulfill all of your obligations, and do not hesitate to hire professional help.