

# Fero Labs

## Industrial Use Case Playbook

### Continuous Process Soft Sensor

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# Introduction

Welcome to the **Industrial Use Case Playbook**, crafted by [Fero Labs](#) for the forward-thinking professionals dedicated to enhancing factory production optimization.

Whether you're a Data Scientist, Process or Production Engineer, or Plant Manager, this playbook is tailored to equip you with the strategies, insights, and tools necessary to drive transformative change within your organization.

In today's rapidly evolving industrial landscape, maximizing production efficiency and minimizing operational costs are imperative for maintaining competitiveness and sustainability.

Within each of our industrial playbooks, we present a curated collection of use cases designed to address the specific challenges faced by modern manufacturing facilities. Each use case is meticulously crafted to deliver tangible outcomes, ranging from increased productivity and quality to reduced waste and energy consumption to help achieve sustainability goals.

Featured within these pages is a use case which spotlights **Continuous Process Soft Sensor optimization for chemical plants**. This case exemplifies how to tackle complex production optimization challenges head-on, leveraging data-driven approaches to drive measurable improvements in operational efficiency and cost-effectiveness.

As you embark on this journey for operational excellence, we encourage you to approach each Fero Labs use case scenario with curiosity, a willingness to embrace innovation and change.

By harnessing the power of your production data, domain knowledge, and collaborative problem-solving, we believe that you can unlock the full potential of your factory's production capabilities.

Together, let's redefine what's possible in industrial manufacturing and pave the way for a future of unprecedented productivity and sustainability.

Welcome aboard,

Fero Labs



# Industry Overview

The global chemical industry plays a pivotal role in driving economic growth and innovation, serving as a cornerstone for various downstream industries, including pharmaceuticals, agriculture, automotive, and consumer goods. With an ever-increasing demand for specialty chemicals, polymers, and advanced materials, chemical manufacturers face mounting pressure to enhance production capabilities while minimizing their environmental impact.

However, the chemical manufacturing process is inherently complex, characterized by stringent safety standards, strict regulatory compliance, and the need for precise control over chemical reactions and process parameters. Challenges such as raw material variability, energy-intensive operations, and waste generation pose significant hurdles to achieving operational excellence and cost-effectiveness.

One crucial aspect of optimizing chemical manufacturing processes lies in the implementation and optimization of **Continuous Process Soft Sensors**. These advanced analytical tools utilize machine learning algorithms and data fusion techniques to infer critical process parameters from indirect measurements, such as temperature, pressure, and flow rates.

Continuous Process Soft Sensors enable real-time monitoring and control of key process variables, enhancing process stability, product quality, and yield while reducing the need for costly manual interventions. By leveraging historical process data and advanced modeling techniques, manufacturers can develop accurate soft sensor models that adapt to changing operating conditions and equipment dynamics.

Moreover, optimizing Continuous Process Soft Sensors will contribute to sustainability goals by optimizing resource utilization, reducing waste, and minimizing a plant's environmental footprint.

By reducing energy consumption, minimizing raw material usage, and optimizing waste management practices, chemical plants can demonstrate their commitment to sustainable manufacturing practices while enhancing their bottom line. At [Fero Labs](#), we refer to this as [Profitable Sustainability](#).

# Industry Challenges

In Industry 4.0, the promise of digital transformation often gets stuck in **"pilot purgatory,"** with **70% of initiatives failing to progress beyond testing phases**. McKinsey's research highlights that the choice of use case significantly impacts this phenomenon.

**Selecting use cases that lack strategic alignment, clear value propositions, or encounter technical barriers contributes to pilot initiatives' failure.**

Pilot purgatory not only wastes resources but also risks eroding confidence in digital transformation efforts. To navigate this challenge, organizations must strategically select use cases closely aligned with their objectives, offering clear pathways to value creation and scalability.

In each **Fero Labs Use Case Playbook**, we explore industrial use cases designed to address modern manufacturing challenges. Leveraging advanced analytics, AI, and machine learning, these use cases aim to drive tangible improvements in operational performance, cost-effectiveness, and sustainability.

By focusing on strategic and transformative use cases, organizations can break free from pilot purgatory and unlock new opportunities for growth and innovation.

# Use Case Description

## Background

Virtual soft sensors are models designed to predict and monitor “hard-to-measure” quality parameters in real-time, such as laboratory analysis results from samples taken from the process. Implementing soft sensors enables plant operators to improve efficiency, reduce costs, and enhance product quality by leveraging real-time insights with fewer physical sensors required. This strategy streamlines operations, reduces maintenance needs, and increases productivity, empowering plant operators to proactively modify process parameters and efficiently identify abnormalities in production.

## Problem

In many continuous process production facilities, ensuring the final product consistently meets established industry standards is crucial. Typically, this involves operators manually collecting samples from the final or near-final stage of production and sending them to the lab for analysis. The sampling frequency might range from several hours to daily, with the duration dependent on the particular lab tests performed.

Such intermittent sampling can lead to significant **operational delays**, particularly during the phases of startup or shutdown or when the process is no longer running in stead-state.

Moreover, the complex relationship between chemical reactions and process variables, including time delays and material flow residence times, presents a significant challenge for plant operators, who must:

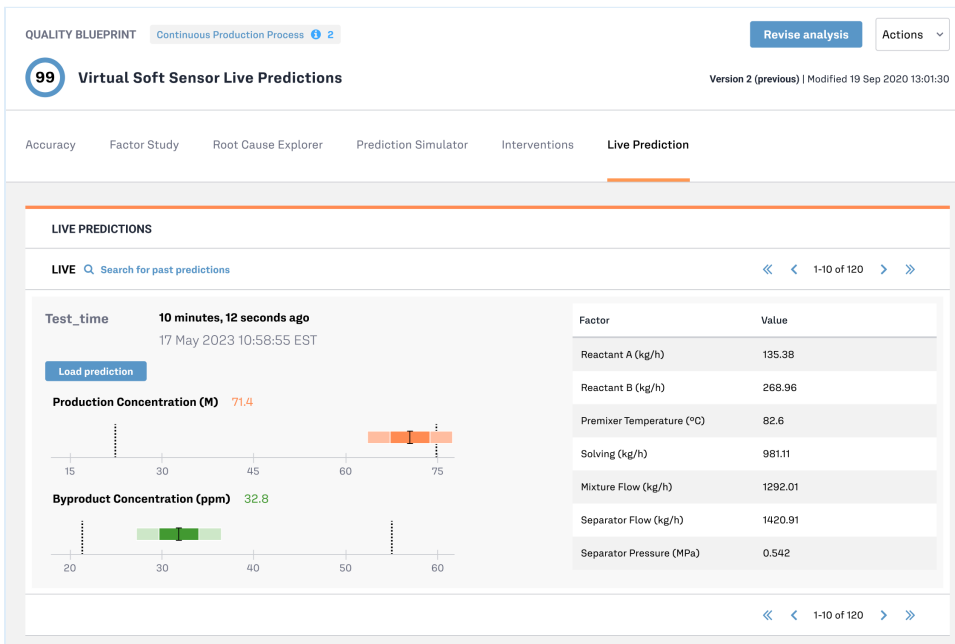
### ***Problem Summary***

*Monitor variations in upstream process conditions and proactively take action to ensure these variations do not adversely affect the final product quality.*

The prevailing method of course-corrective action when the final product quality falls short of expectation often leads to **resource wastage** and **reduced production efficiency** due to extended downtime for inspections, as well as **increased environmental and energy costs** from frequent stops and restarts of the production cycle.

## Fero Labs Solution

A virtual soft-sensor can be configured to predict and monitor the hard-to-measure quality related parameters, such as the outcomes of laboratory analyses of samples collected from the manufacturing process. This soft-sensor equips plant operators with **real-time insights** into the production process, helping them to monitor whether the quality related parameters meets industry specifications. Furthermore, it is instrumental in detecting ongoing quality issues, especially when lab results show that the product fails to meet the quality standards. This is critical in guiding plant operators to make informed decisions on making operational changes or initiating an unplanned shutdown, thus minimizing production losses.



# Process & Business Outcomes

## Real-time monitoring of production quality

Plant operators can gain real-time insight into production quality without having to wait for lab analysis results. They will also have a direct root-cause insight into how operational changes such as changes in raw material flow rates or temperatures can affect production quality.

## In-process optimization based on product quality predictions

Soft sensors can enable plant operators to make adjustments to operational conditions based on product quality predictions. This can increase production throughput by **up to 15%**. In a market heavily limited by production capacity, this improvement could also translate into a top-line benefit of **up to 15%**.

## Informed decision-making to mitigate unplanned shutdowns

Plant operators can be more confident when deciding to initiate an unplanned shutdown or make an operational change when process abnormalities occur. Similarly, they can be more confident of when they achieve steady-state conditions and production quality within spec during plant startups.

With a full adoption of Fero Labs software, plant operators can expect to experience up to **36%** decrease in unplanned production shutdowns and startups.

## Reduced lab measurement frequency

A virtual soft sensor can reduce the frequency of lab measurements needed and provide estimates for them at consistent time intervals. This can relieve any laboratory driven process bottlenecks and reduce the total annual lab measurements by as much as **20%**, while providing additional visibility into production.



# Fero Adoption Timeline

Plant teams can collaborate to set up and deploy Fero Labs. Below is a timeline highlighting typical steps. With Fero's easy-to-use, no-code interface, this can be achieved in a matter of weeks, not months or years.

Time	Process & Quality Engineers	Data Scientists / IT	Operators	Management
Week 1	Pull data	Pull data		
Week 1	Upload to Fero			
Week 1	Configure Fero	Configure Fero		
Week 2	Corroborate results	Receive example report showing accuracy		
Week 2	Set up Fero Prediction	Set up Fero Prediction		Receive example report showing savings
Week 3	Live data connection	Live data connection		
Week 3	Live Prediction screen		Live Prediction screen	
Going forward	Monitor deployment	Monitor deployment	Follow Fero Optimization recommendations	Receive regular reports showing savings
Going forward	Run "what-if" scenario simulations, spot check production, run root cause analyses		Follow Fero Optimization recommendations	Receive regular reports showing savings

# Use Case Data Requirements

The Fero Labs Platform has convenient integrations into common process information management systems, such as Aveva PI System, AspenTech, Wonderware, and SQL databases, as well as laboratory information management systems, such as SAP, Oracle, and other ERP systems. Initial data exploration can be done either through direct integration into these services, or data file uploads in Excel and CSV data formats.

The data requirements for this use case typically involve the following sources:

## Lab Analysis Data

- Product quality lab analysis results, regulated byproduct concentrations, etc.

## Mixer Tank Process Data

- Reactants, solvents, operating conditions, etc.

## Reactor Process Data

- Mixture feeds, catalyst feeds, operating conditions, etc.

## Separator Process Data

- Feed temperatures, product flows, separator pressures, etc.

# Activating This Use Case

Consider our **Industrial Use Case Playbooks** as inspiration and tactical ideas for your team to align on to maximize the efficiencies of your plant. Each Playbook has a matching **Use Case Blueprint** which provides detailed steps to activate each use case within the Fero Labs platform.

If you're curious to see these in action please [book a use case demo](#) with our team!

Together, let us continue to push the boundaries of what's possible, driving towards a future where industrial manufacturing is not just efficient and sustainable but truly transformative in its impact on society and the world at large.

Thank you for joining us on this journey, and we look forward to continuing to partner with you in your pursuit of excellence.

Sincerely,

Fero Labs

## About Fero Labs

Fero Labs helps factories work better together by bridging the gap between the disconnected goldmine of production data and industrial knowledge inside every plant.

The Fero Labs Augmented Intelligence Platform collects data and knowledge, and augments it with powerful Fero ML so factories can make more confident changes that drive profit and sustainability.

Harnessing Fero Labs, a factory creates an augmented workflow which allows for better use of raw and recycled materials, production time, and energy utilization. Teams can work 90× faster, using Fero's AI powered simulated predictions or live optimizations. They can run root cause analyses in minutes, and make continuous process improvements that drive [Profitable Sustainability](#).

Fero Lab's white-box explainable ML makes decisions clearer by showing the context and confidence levels behind every prediction and recommendation. This expands a plant's production knowledge and drives better production results for manufacturers, all while minimizing emissions. Together we'll build a sustainable tomorrow.