Fero Labs

Industrial Use Case Playbook

Batch Release Testing

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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, Quality 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 **Batch Release testing for CPG manufacturers.** 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

In the realm of **Consumer Packaged Goods (CPG) manufacturing**, ensuring product quality, safety, and sustainability are paramount for maintaining consumer trust and brand reputation. CPG manufacturers operate in a dynamic and competitive landscape, producing a wide range of products, including food and beverages, personal care items, household cleaners, and more.

The global CPG industry plays a crucial role in meeting consumer needs and preferences, driving economic growth, and shaping consumer behavior worldwide. With **increasing consumer demand for sustainable and environmentally friendly products**, CPG manufacturers face mounting pressure to innovate their production processes while minimizing environmental impact.

One critical aspect of CPG manufacturing lies in **Batch Release Testing**, a process essential for ensuring that finished products meet quality and safety standards before being released to the market. Batch Release Testing involves rigorous testing and analysis of product samples to verify compliance with regulatory requirements, label claims, and internal quality specifications.

While Batch Release Testing is essential for upholding product quality and safety, it also presents opportunities for driving sustainability efficiencies within the manufacturing process. By optimizing testing protocols, reducing testing waste, and leveraging data analytics, CPG manufacturers can streamline batch release processes while minimizing resource consumption and environmental impact.

Through the adoption of advanced analytical techniques, automation, and digital technologies, CPG manufacturers can enhance testing efficiency, accelerate time-to-market, and reduce waste generation. Additionally, by integrating sustainability criteria into batch release testing protocols, manufacturers can ensure that products meet not only quality and safety standards but also environmental sustainability objectives.

CPG manufacturers are increasingly investing in sustainable practices, including eco-friendly packaging, renewable energy sources, and waste reduction initiatives. Batch Release Testing presents an opportunity to further enhance sustainability efforts by optimizing resource utilization, minimizing waste, and improving overall operational efficiency. 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

Before the release from production facilities, newly produced batches of consumer goods products such as shampoos and body wash products, must pass rigorous quality assurance testing. This end-of-line testing often involves manually taking samples and testing them in labs. Quality assurance tests are critical to ensure that products meet the required stability and safety specifications, and that they possess properties such as viscosity, pH, odor, and feel to meet consumers expectations.

Problem

Batch release protocols **significantly influence the daily production capacity of manufacturing facilities** due to the time, effort, and complexity involved in completing quality assurance tests. Furthermore, **batch release testing can be costly** with lab facilities, capital expenditure, and many Full Time Employee (FTE) positions needed to carry out these tests. Batches that do not meet batch release criteria may require reworking or disposal, further affecting profits.

Problem Summary

Optimize production parameters in real-time to maximize batch acceptance rates.

Typically, beauty care production plants have a batch acceptance rate around 95%. However, this rate can vary significantly across different facilities. Batch acceptance can be affected by the type of formula being produced, the stability of raw materials in different environmental conditions, and the experience and quality standards of the production plant. Consequently, despite several plants producing identical products and operating under the similar operational procedures, the final quality of these products can differ substantially.

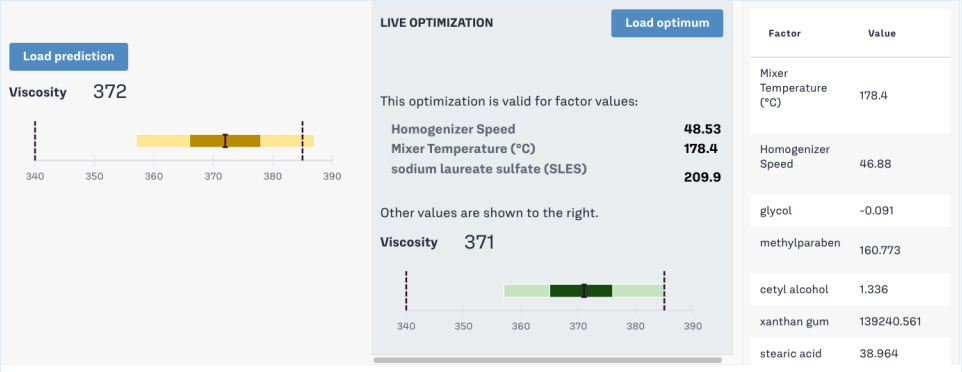
Fero Labs Solution

Process engineers can use Fero Labs software to adapt process parameters during online production, adapting to variation in raw material and target product specification.

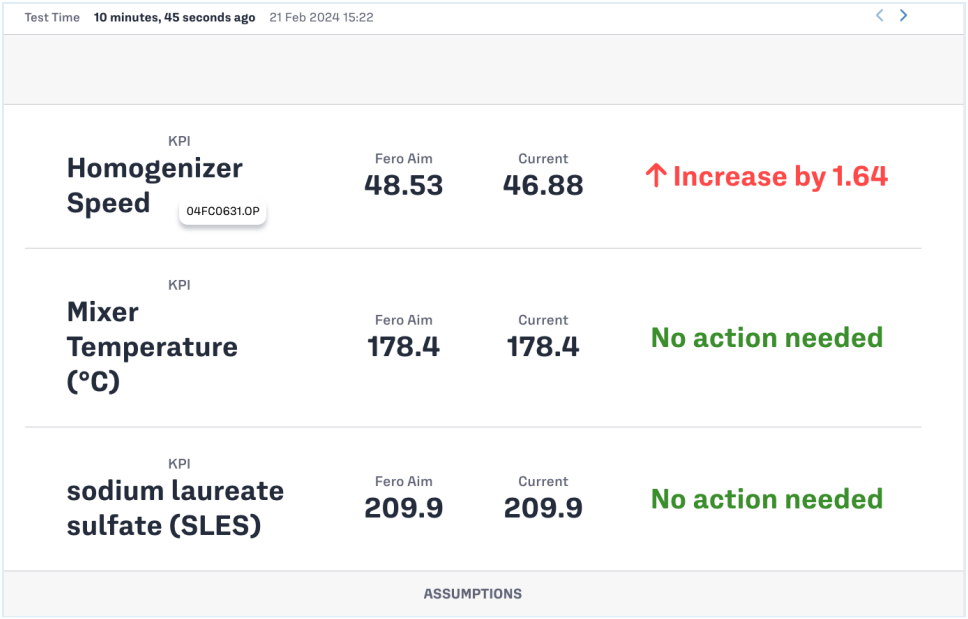
As a specific example, Fero Labs software can be used to predict the viscosity of a final shampoo batch during production. Optimizations are then configured to share process recommendations with **plant operators** so that they can take concrete steps in real-time to **control for final product viscosity and ensure batch release criteria are met**.

A Live Fero Analysis for this use case presents two screens:

- Detailed View: for production and quality engineers to monitor production and take action at any moment. In this example we see that Fero predicts it is possible that the final product viscosity will exceed the upper limit and as such recommends changing homogenizer speed to ensure in-spec production



- Simplified View: for plant operators, with critical information clearly presented to prompt them to make changes to the process.



Process & Business Outcomes

Reduced lab measurement frequency

Successful real-time prediction of batch release criteria properties means that in lab measurements and testing are no longer necessary and can be used in conjunction with Fero Labs's predictions. This will drive productivity as it will enable plants to produce more batches per day as manual and ponderous batch release testing can now be done with Fero Labs during production. 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.

Cost savings

As the need for in lab measurements is reduced, plants save on capital and labor costs. Furthermore, issues with batches detected by Fero can be fixed during production, saving on losses associated with the cost to rework or dispose of out-of-spec batches.

With full adoption of Fero, plant operators can expect up to **10% increase in annual revenue**, based on a reduction of costs associated with reworking out-of-spec batches and losses in raw material.

Reduced waste and minimize Scope 1 and 2 footprint

Monitoring plant performance and predicting final product quality enable plant operators to minimize off-specification production, alleviating the operational challenge of managing excess off-spec batches and mitigating issues related to storage, waste, and environmental concerns. Minimizing off-spec batch accumulation through real-time optimization supports more **sustainable operations,** reducing the plants **Scope 1 carbon footprint** through waste reduction and lowering its **Scope 2 carbon footprint** by reducing the processing need to reworking an off-spec batch.

Fero Labs Adoption Timeline

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 Optimization	Set up Fero Optimization		Receive example report showing savings
Week 3	Live data connection	Live data connection		
Week 3	Live Optimization screen (Detailed view)		Live Optimization screen (Simplified view)	
Going forward	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:

Laboratory Quality Measurements Data

Property of product and by products per batch (in this example viscosity)

- Source: typically LIMS or ERP (e.g., SAP)
- Content: for example, viscosity data from quality laboratory testing.
- Index: Indexed by Batch ID

Raw Material Data

- Source: typically LIMS or ERP (e.g., SAP)
- Content: Raw material characterization data per batch, including chemistries, recipe data, etc.
- Index: Indexed by Batch ID

Production Data

- Source: typically PIMS (e.g., PI system, Aspen)
- Content: Batch definition tag, phase definition tag, feed volumes, operating conditions, process parameters, temperatures, mixing speeds, etc.
- Index: Indexed by time

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 Profitable Sustainability 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.