

Vaccine Manufacturer Expects €10M+ in Annual Economic Value with AI Predictive Maintenance



Value-Driven Benefits

€10M+

Estimated annual economic benefit with C3 AI Reliability deployed across 40+ assets at each facility

200+

Machine learning models configured, trained, and evaluated to determine the best-performing model

12 weeks

To initial production deployment across two facilities

Introduction

A major biopharmaceutical company operates advanced manufacturing facilities for vaccines and biologics medicines across multiple continents. To drive continuous improvements in production efficiency, the company sought to implement AI solutions aimed at reducing unplanned downtime – a key contributor to costly product discards and manufacturing disruptions.

Challenges

In pharmaceutical manufacturing—particularly for vaccines and biologics—equipment reliability is essential to maintaining both production output and product quality. Failures can lead to delays, batch losses, and resource-intensive investigations. However, prior to engaging with C3 AI, the company relied on traditional and rigid time-based maintenance strategies and lacked both integrated data access and the tools needed to predict emerging downtime risks. These challenges led to excessive interventions, extended turnaround times, and difficulties in scaling production efficiently.

Solution

To address these challenges, the company partnered with C3 AI to implement an AI-driven predictive maintenance application, C3 AI Reliability, at two lighthouse facilities in Canada and Belgium. Within 12 weeks, the team deployed C3 AI Reliability at the two sites – reducing deployment time at the second Belgian facility to just 4 weeks, unified previously siloed data, and configured out-of-the-box machine learning models to predict emerging downtime risks and deliver prioritized, explainable alerts for engineers.

Results

By shifting to an AI-enabled, predictive maintenance approach with C3 AI Reliability, the company expects to realize an estimated annual economic benefit of over €10M per facility. Building on the success of the initial deployment, the company is expanding its partnership with C3 AI and scaling C3 AI Reliability deployment to additional facilities and a broader set of assets.

Challenges

Before partnering with C3 AI, the company relied on traditional time-based maintenance strategies that limited their ability to proactively detect and address equipment issues. Maintenance teams followed fixed schedules, leading to over-maintenance, longer turnaround times, and reduced operational agility. These constraints made it difficult to scale production while maintaining high uptime, resulting in avoidable discards and inefficiencies.

Further complicating matters, engineers and reliability teams lacked access to integrated equipment data. Critical equipment data — from conventional sensors to wireless vibration monitors — was siloed across disconnected systems, making it difficult to build unified models for accurate risk prediction. Additionally, the existing infrastructure lacked predictive or AI capabilities, and valuable data sources such as PI system were underutilized. However, high-value assets such as centrifuges required advanced data processing to enable failure prediction - a capability that wasn't in place. As a result, the company faced limited operational insight, a higher risk of unplanned downtime, and constrained ability to implement proactive maintenance strategies.

Approach

Over a 12-week period, the company partnered with C3 AI to configure and deploy the C3 AI Reliability application across two lighthouse facilities representing a diverse range of assets. The joint team began by unifying over 400 OSI PI time-series tags, Hexagon work order data, third-party vibration signals, and other asset metadata into a unified data model.

With the unified data in place, the team configured out-of-the box machine learning algorithms to identify high-risk system behaviors and generate prioritized alerts for engineers. These models are traceable and explainable, offering the sensor-level drilldowns that engineers need to understand the specific drivers of each alert. For a particularly dynamic centrifuge, the team developed a high-frequency model capable of processing one-second sensor readings — over 60 times the volume of standard models — to detect emerging issues in windows as short as 20 seconds.

Next, the team configured the user interface to support efficient decision making. For each identified risk, the application surfaced likely failure modes and recommended actions, drawing on a combination of C3 AI failure model libraries and institutional knowledge. The application demonstrated rapid time-to-value by accurately predicting downtime risks for two critical production and utility assets – the feed pump of an ultrafiltration unit and the ambient water injection sanitation cycle – using the configured machine learning models and unified data foundation.

With C3 AI Reliability, the company can shift to a proactive and preventative maintenance approach to reduce unplanned downtimes and related quality issues. Given the success of the initial production deployment, the company is now expanding its partnership with C3 AI to additional facilities and assets.

About the Company

- €40+ billion in annual revenue
- 4.8+ billion units of medicine, vaccines, and healthcare products produced annually
- 170+ countries served
- 90,000+ employees

Project Highlights

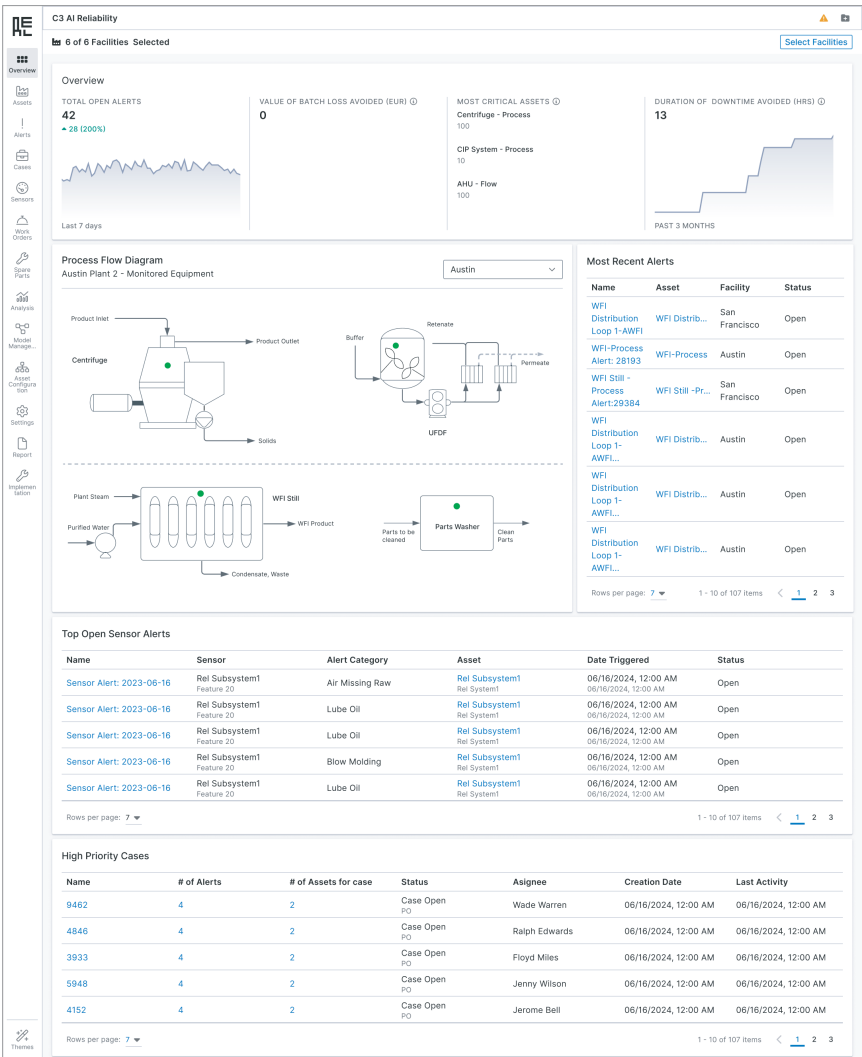
- 12-week initial production deployment to two facilities
- 4-week deployment timeline for the second site
- 200+ AI/ML models developed, trained, and evaluated
- 400+ time-series tags integrated across assets at two sites
- C3 AI Reliability application user interface configured
- 14 users trained

Solution Architecture



Enterprise Data

- Sensor Data
- Hexagon Work Order
- Third-Party Vibration Data
- Standard Operating Procedures
- Asset Framework
- Batch Data
- Maintenance Logs
- Equipment Drawings
- Process Simulation Data
- Engineering Constraints



Proven Results in Initial Production Deployment

Visit C3.ai/get-started