C3.ai

Enterprise AI for Inventory Optimization

A world leader in the production of welding and cutting equipment and consumables offers products across personal protective equipment, filler metals, cutting and welding tools, gas control equipment, and related accessories. With over 40 global brands and 20 manufacturing plants, the manufacturer aimed to improve inventory management to efficiently meet customer needs.

The manufacturer used a Plan for Every Part (PFEP) approach to manage their inventory. This approach accounted for variables including cost of goods sold and order variability to determine replenishment strategies for each part in each location. The PFEP required time-consuming and manual data aggregation across multiple dashboards and spreadsheets, resulting in infrequent updates.

Part-specific replenishment strategies presented additional complexity since the manufacturer chose between demand-driven (safety stock) and reorder point-based replenishment depending on the product line and location. The manufacturer recognized the significant challenges PFEP presented and looked for a scalable alternative.

The manufacturer selected C3 AI Inventory Optimization to scale inventory optimization to reduce excess inventory while maintaining sufficient availability. Within 12 weeks, C3 AI Inventory Optimization identified a 26% overall inventory reduction opportunity while increasing material availability by 0.5%. With C3 AI Inventory Optimization, the manufacturer can rely on a unified view of their global inventory, optimize inventory for individual parts across locations, increase service levels, and lower working capital and inventory management costs.

Project Objectives

- Integrate and unify enterprise and external data to a unified federated data image
- Develop reusable extensible analytics to automatically update key KPIs and inventory status
- Configure the C3 AI Inventory Optimization user interface to enhance customer workflows
- Provide prioritized recommendations with explainable evidence package for user interpretability

Results

26%+
inventory reduction opportunity

0.5% increase
in material availability

$10 million
potential inventory reduction across 8 North American facilities

$100 million
potential inventory reduction across global facilities

Challenges

The global world leader in the manufacturing of welding and cutting equipment and consumables has operations in 9 regions worldwide, 140 countries and 10 different product lines with a market capitalization of $3 billion and annual revenue over $2 billion. As of 2022, the company had a global inventory value of $470 million, composed of raw materials, WIP parts, and finished goods. Facilities in North America account for 37% of global inventory.

The company identified roughly $100 million in excess inventory and was focused on reducing its inventory without compromising service levels. To combat this issue, the company started implementing a Plan for Every Part (PFEP) which uses Cost of Goods Sold (COGS) and Order Variability to put each SKU-location pair in 1 of 9 buckets, each with a different rule for setting inventory levels for the SKU-location pair. However, this approach still relied on manual updates at infrequent intervals (every 6 months at best) due to the time-consuming process of drawing data across systems and conducting analysis in spreadsheets - leading to inaccurate views of current inventory levels. Furthermore, multiple sources of information led to inconsistent management across different facilities. The information that inventory planners reviewed in one system wouldn't carry over to the systems used to push recommendations to their ERP tool.

They recognized the PFEP approach would be difficult to scale across ERPs and geographies and decided to use C3 AI Inventory Optimization to enable their teams to unify data from disparate data sources and automatically generate optimal recommendations for improved Safety Stock and Reorder Point levels. With C3 AI Inventory Optimization, the company's users receive prioritized recommendations alongside supporting analysis in a workflow-enabled application. Accepted recommendations then automatically flow back to the customer's ERP system – avoiding loss of information moving from system to system.

About the Company

- $2+ billion annual revenue in 2022
- Operating in 140+ Countries
- $470 million global inventory value
- 9,000+ employees

Project Highlights

- 12 weeks from kickoff to completion of pre-production application
- Generated over 25 million simulations to determine ideal Safety Stock or Reorder Point at a SKU-location level
- Three years of historical data integrated, comprised of 5 million rows of data across 8 North America facilities for 2 product lines
- Built an extensible data model with 18 C3 AI logical objects
- Configured the C3 AI Inventory Optimization application user interface to mirror SME workflows and flow of materials from suppliers, facilities, and distribution centers
- Fully automated the calculation of new reorder parameters
- Generated over 2 thousand ML recommendations

Approach

C3 AI configured C3 AI Inventory Optimization for 8 North America facilities, representing $45 million of inventory value for over 2 thousand fast-moving finished goods SKU-location pairs.

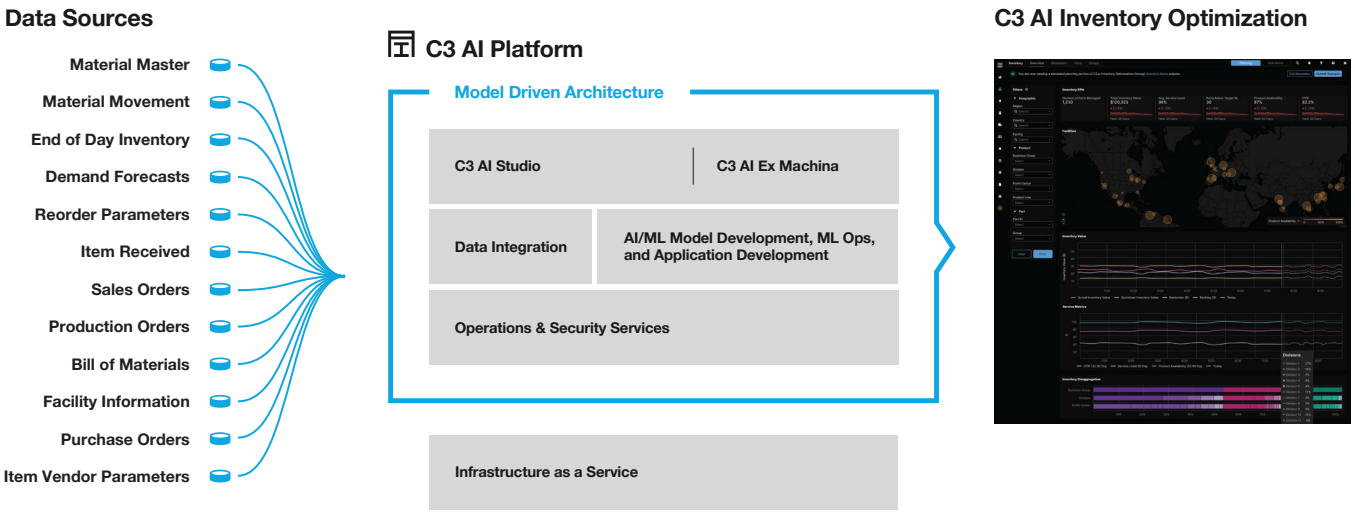
In the first three weeks, the C3 AI team mapped three years of historical data to C3 AI's pre-built data model, and integrated 5 million rows of data. The C3 AI team ingested data from 12 sources from the customer's ERP system into a unified federated image. The unified federated image stored critical data on material movement, end of day inventory, sales orders, demand forecasts, reorder parameters, facility information, items received as well as other relevant data. Users could leverage the unified federated image in C3 AI Inventory Optimization to easily access a time-series view of data necessary to conduct inventory planning. The unified data is now reusable for any future analytics and adjacent applications in supply chain including demand forecasting, production schedule optimization and supply network risk - accelerating the time to deploy these applications and realize value.

C3 AI Inventory Optimization leverages stochastic optimization to learn from historical uncertainties to optimize inventory levels. C3 AI trained, tuned, and validate 2 optimization pipelines to recommend optimized safety stock and reorder point parameters. For the 2 thousand part-location pairs, the C3 AI team conducted 25 simulation runs to optimize inventory with over 500 simulations per run. This resulted in over 25 million simulations with hyperparameters tuned to achieve optimal inventory reduction recommendations – while maintaining the target service level. The optimization aims to reduce inventory while meeting a desired service level, and Material Availability, a measure of the company's ability to fulfill an order from existing inventory when the order is placed.

To support recommendation acceptance and decision-making for the company's inventory planners, C3 AI configured the C3 AI Inventory Optimization user interface to include a clear workflow that enables inventory planners to easily view and act on recommendations with explainability. Users can develop a deep understanding of uncertainty in their supply chain through rich evidence packages that detail the leading cause of uncertainty – empowering planners to make better informed decisions. For additional evidence, the company's inventory planners can check the recommendation history of inventory levels and evaluate how recommendations were actioned in the past. C3 AI Inventory Optimization also includes what-if analysis capabilities, enabling users to see how accepting or rejecting recommendations would impact material availability and inventory savings. The application provides the ability for users to conduct analysis to answer common questions from company leadership, automating a currently time-consuming manual process of generating BI reports from raw data.

The C3 AI and company team jointly designed the recommendation engine so that new recommendations are automatically generated with configurable frequency that can be done as frequently as daily. C3 AI Inventory Optimization will automatically persist accepted recommendations to customer systems (e.g., the customer ERP for safety stock and reorder point recommendations).

Solution Architecture



Benefits

By using C3 AI Inventory Optimization, the global welding manufacturer is able to:

- Generate up to $100 million of potential annual economic benefit across all facilities
- Achieve beyond the goal to reduce inventory by at least 10%, generating 26% overall inventory reduction
- Improve material availability and service levels to customers by optimizing safety stock and reorder point
- Capture working capital savings from inventory reduction and value from inventory burn down
- Reduce carrying costs from excess inventory holdings
- Streamline inventory management processes, reporting, and customer satisfaction
- Leverage C3 AI Supply Chain Digital Twin that enables rapid development and extension for a suite of supply chain AI Applications (e.g., C3 AI Demand Forecasting, C3 AI Supply Network Risk, C3 AI Production Schedule Optimization, C3 AI Sourcing Optimization)
- Monitor critical KPIs to act on inventory recommendations for inventory planners with a summary view on cumulative value captured

Proven Results in 8-12 Weeks | **Visit c3.ai/get-started**