

C3 AI Process Optimization for Steam Allocation Efficiency

Increase Cogeneration Efficiency with AI-Based Steam Allocation

C3 AI® Process Optimization for Steam Plant Efficiency is an AI application that uses advanced analytic techniques to improve turbo generator (TG) power output. C3 AI Process Optimization enables users to identify opportunities to improve process efficiency and investigate performance issues by providing a single-view dashboard of all process conditions. The application integrates near real-time data with first principles models such as thermodynamics libraries to provide explainable and actionable recommendations.

With a holistic view of the steam power generation process, C3 AI Process Optimization applies machine learning techniques to monitor and predict TG performance and recommend opportunities to improve power output. The application generates recommended set points that maximize power output in near real-time based on a set of configurable process and equipment constraints. The action-oriented insights are flexible and scalable to accommodate many operating scenarios.

C3 AI Process Optimization unifies data from multiple operational systems (e.g., OSI PI, Historian, planning spreadsheets) and process flow diagrams. C3 AI Process Optimization is part of the Reliability Suite and leverages the unified data image with asset hierarchy, a system-of-systems approach, to enable a unified view of process and asset operations.

Feature Summary

- **Near real-time process optimization** – Configure and run optimization models to find TG setpoints that optimize power production even as process objectives change.
- **Turbo generator machine learning** – Use ML models to predict TG power output for enabling optimization of power production.
- **Recommendation frequency** – Configure cadence of AI optimized setpoint recommendations and alerts to improve power production.
- **KPI dashboard** – Utilize executive level overview of critical process information such as facility KPIs, process flow diagrams, steam allocation, and AI recommendations in a single pane of glass.
- **Cost savings tracking** – Track individual and cumulative cost savings from improved power output via the AI recommendations to track ROI.
- **Performance tracking** – Continuously improve AI recommendations by monitoring and re-training ML models based on actual power output compared to optimized output over time.
- **Data integration and setup** – Pre-built data connectors enable rapid integration and configuration (e.g., OSI PI).
- **Turbo generator analysis** – Flexible user interface to investigate TG performance and degradation using thermodynamic libraries and compare against other turbogenerators.

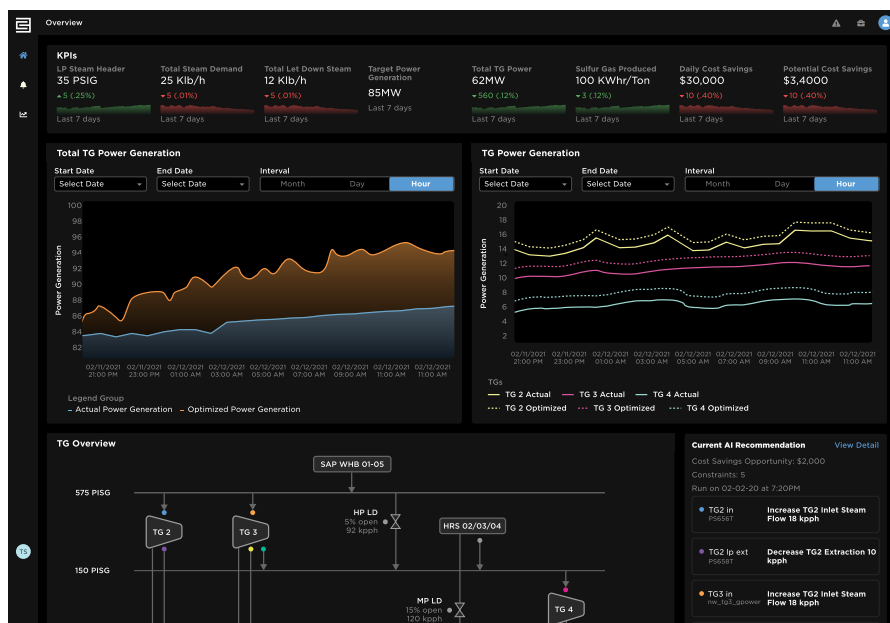


Figure 1. C3 AI Process Optimization enables users to maximize power output from steam TGs, combining advanced AI with first-principles models for near-real-time recommendations

Dashboard Provides Actionable AI Recommendations and Critical Power Production KPIs

The C3 AI Process Optimization dashboard provides process engineers with a detailed summary of the steam plant performance and empowers them to improve operations:

- 1 **Facility level KPIs:** View all key facility data in a single pane of glass, such as steam headers, steam available, current and target power generation, cost savings, etc.
- 2 **Power generation charts:** Compare historical power generation with optimized power generation for the entire facility and individual TGs.
- 3 **Process flow diagram:** View steam flow across the entire facility with tool tip insights into current TG and valve readings.
- 4 **AI recommendations:** Review prioritized list of current AI recommendations to drive swift action and rapid investigation.
- 5 **Steam allocation diagram:** Visualize steam allocation between TGs and let down valves for plant-specific context.
- 6 **TG degradation:** Analyze impact of ongoing operations on TG degradation and initiate maintenance requests when required.

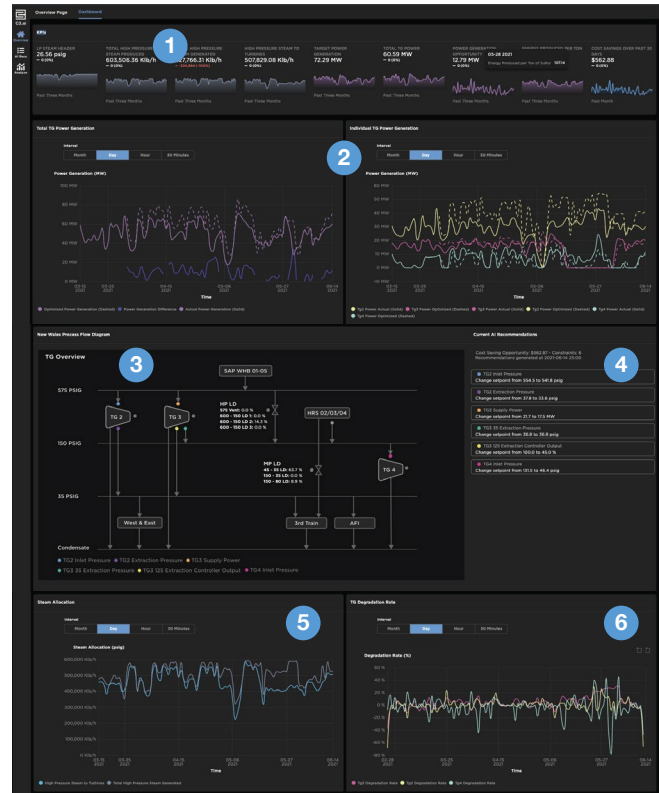


Figure 2. C3 AI Process Optimization Dashboard

With C3 AI Process Optimization engineers can:

- **Perform near real-time process optimization** to quickly identify inefficiencies and opportunities for increased power generation
- **Fully manage optimization models** including updating their constraints given new process requirements or equipment availability and their frequency of updates
- **Monitor key operating data** of the entire process over time to detect efficiency problems
- **Train and operate ML models** to predict TG performance
- **Track AI recommendations over time**, view how often they were implemented, and how well their implementation increased power relative to the optimized values

Benefits of C3 AI Process Optimization include:

- **Increase in power generation** – optimization of TG set points paired with machine learning unlocks additional power production
- **Reduction of energy spend** – the increase in power generation reduces the amount of electricity that must be purchased from the grid
- **Reduction of dependency on grid** – requiring less energy from the grid increases plant operations autonomy and reduces susceptibility to external disruptions
- **Reduction in CO2 emissions** – purchasing less power from the grid due to more efficient power generation reduces carbon emissions connected to plant operations
- **Flexible foundation** – C3 AI Process Optimization contains a unified data model that can be extended for future digital transformation expansion
- **Codification of engineering knowledge** – process efficiency improvements are recorded by the software and the workflow can be followed by future engineers and operators

Proven Results in 8-12 Weeks

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