BakerHughesC3.ai

BHC3 Reliability

Take Early Action to Identify and Prevent Anomalies

BHC3™ Reliability is an AI application that provides reliability engineers, maintenance managers, and executives with AI-based monitoring across the entire operational footprint and enables proactive, predictive, and prescriptive strategies to maximize uptime. BHC3 Reliability identifies anomalies across systems and assets, provides prioritized alerts, recommends prescriptive actions, and enables collaboration across the enterprise. BHC3 Reliability improves production uptime, reduces maintenance costs, extends equipment life, and improves operational safety.

BHC3 Reliability leverages the BHC3 AI Suite to integrate enterprise-scale data from disparate sources such as data historians and sensors, operational systems, and maintenance records into a unified data image. Users can apply industry-agnostic predefined asset templates and ingested engineering diagrams to create and configure a digital representation of physical asset hierarchies and operational dependencies.

Using unsupervised and supervised machine learning techniques, BHC3 Reliability identifies risks across systems, subsystems, and asset fleets in advance of a production-loss or downtime event. All AI models are traceable and explainable, allowing operators to pinpoint risk drivers down to individual sensors and first principles-based monitoring metrics via interpretable evidence packages. Comprehensive ML model configuration and ML Ops features allow users to monitor production models, modify model parameters, and retrain models.

BHC3 Reliability enhances maintenance efficacy with failure mode recommendations and remediation actions. Failure mode libraries combine cross-industry diagnostics with AI models to prescribe actions that help reliability engineers diagnose and resolve failure risks quickly. Bi-directional integrations to existing systems and closed-loop case management workflows enable users to review past actions, launch work orders, inspect AI alerts, and collaborate directly within BHC3 Reliability.

BHC3 Reliability can address reliability risks for various asset types, such as valves, compressors, pumps, and turbines, and across the entire oil & gas value chain, from upstream, midstream, to downstream operations.

Figure 1. *BHC3 Reliability helps operators anticipate, prioritize, and take action to address equipment risks*

Feature Summary

- **AI across systems, fleets, and complex assets** - Leverage AI to identify equipment issues that impact aggregate asset health and operational performance. Understand how individual sensors and performance metrics across inter-dependent assets are related to overall reliability.
- **Anomaly detection** - Utilize cutting-edge deep learning and machine learning technology to identify anomalies in equipment and estimate time-to-failure or remaining useful life. Continuously improve AI models with new data and user feedback.
- **Sensor health** – Leverage ML techniques to monitor performance of sensor networks, identify malfunction sensors, and diagnose the root cause of sensor failures.
- **Prioritized alerting and case management** - Focus operations on prioritized, actionable alerts and reduce the number of unnecessary alerts through AI-enabled detection and categorization of equipment risks.
- **Failure mode identification and recommended actions** – Leverage a rich failure mode library and prescriptive insights that guide reliability engineers to enable faster, more consistent, and traceable root cause investigations.
- **Asset templates** – Leverage pre-defined templates and physics-based models codified in BHC3 Reliability to rapidly construct a digital representation of your facility's asset hierarchy, calculate KPIs & KOPs, and equipment monitoring metrics.
- **Diagram parsing** - Generate machine-readable asset hierarchies and sensor-to-tag mappings. Users can ingest and parse P&ID diagrams using machine vision, NLP and graph search to detect tags, tag names and connections to equipment.
- **Visualization across interconnected assets** - View and traverse unified data at the aggregate system or facility level or drill down to understand individual equipment performance.
- **Bi-directional integration with work order management systems** - Create work orders and launch investigation cases directly in BHC3 Reliability.

Open AI Energy Initiative

BHC3 Reliability is a foundational application in the Open AI Energy Initiative (OAI), the first open ecosystem of AI-based solutions for the energy industry, and is interoperable with current and future OAI solutions from other members of the OAI such as Shell. Shell has made available several add-on OAI modules for BHC3 Reliability that provide specialized functionality in areas such as Control Valves, Rotating Equipment, and Subsea ESPs. Find out more at https://bakerhughesc3.ai/products/bhc3-oai/reliability-solutions/.

Anticipate Equipment and Process Risks, Investigate Issues, Prioritize Actions, and Enable Closed-Loop Feedback

- **Detect and respond to risks and anomalies** in equipment performance.
- **Investigate and take action** using AI-recommended failure mode assessments for each identified risk. Conduct root cause analyses and failure mode effects analysis with all relevant data.
- **Assess system and subsystem health** trends over varying time intervals across configurable risk indicators.
- **Monitor sensor health** by applying machine learning techniques to network communication and device management data to identify and diagnose malfunctioning sensors.
- **Aggregate operational data** to view all relevant data for interdependent equipment. Understand how tags from independent systems correlate to distinct production steps.
- **Collaborate across the enterprise** with case management tools, including data investigations, messaging, user tagging, file upload, and external messaging (e.g., email or text).
- **Track, benchmark, and rank performance** of regions, facilities, systems, and equipment based on configurable health and reliability metrics.
- **Optimize operations and capital** expenditures by proactively planning reliability improvement projects and minimizing unplanned downtime.
- **Scale swiftly across the enterprise** to large fleets and multiple types of assets using asset templates and end-user configuration of asset hierarchies, failure mode libraries, and ML models
- **Codify and leverage subject matter expert knowledge** through proven and customizable domain-specific libraries (e.g., failure mode & thermodynamics), KPIs, and KOPs.
- **Enable end-to-end ML Model Ops** to automate model tracking, review inference statistics, identify model drift and monitor feature relevance over time.

BHC3 Reliability Delivers Value Across Entire O&G Value Chain

- **Reduce unplanned downtime and outtages** by proactively addressing production and equipment reliability issues. Arm operators with prescriptive actions to change operating conditions and reduce upset risks.
- **Improve recovered production** due to early identification, prioritization, and resolution of equipment and system risks.
- **Extend asset and equipment life** by improving operating conditions and turnaround decisions with data-driven history and risk predictions.
- **Improve safety** with reduced high-risk emergency repairs.

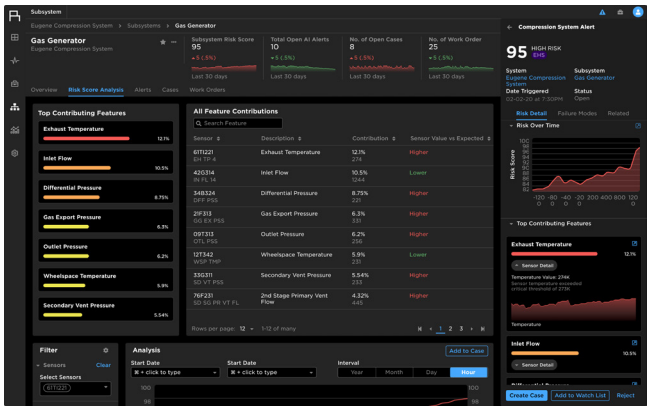

Figure 2. *BHC3 Reliability provides a comprehensive set of visualization, diagnostic, and collaboration tools for operators to investigate and address system and subsystem risks*

Proven Results in 8-12 Weeks | **Visit BakerHughesC3.ai/get-started**