

EmiratesGBC Technical Workshops

EmiratesGBC X Johnson Controls

Digitalizing Sustainability: Integrating IT with OT

presented by **Raghav Rao Parnandi**, Presales Leader, Digital Solutions -
MEA, **Johnson Controls**.

11th August 2023

The Beauty of Operational Technology.

Building operational technology

Building Automation System



Energy



Safety & Security



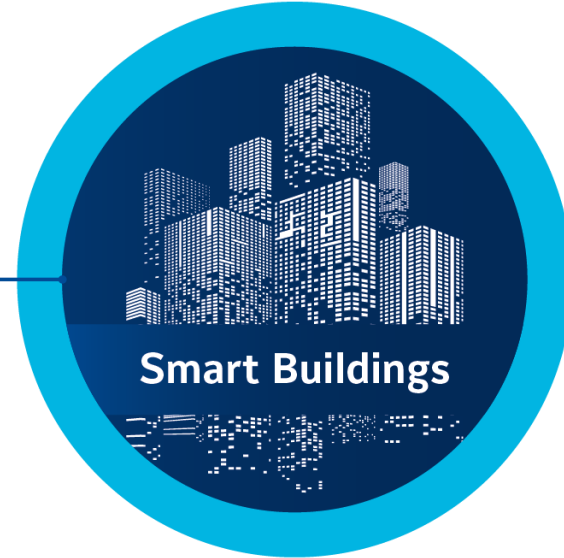
Fire



HVAC



Customer Experience Dynamic Spacing



Analytics to Drive
Higher Value Outcomes

External information technology



Weather



Health & Wellness



Work Order



Business Data



Cloud to Cloud Services

You have sustainability goals to achieve — and challenges to overcome

Major goals



Meet regulatory requirements, decarbonization targets and certifications

Reduce energy consumption and emissions

Ease burden of mandatory sustainability reporting

Improve building performance and value

Major challenges



Develop transparent sustainability initiatives

Identify metrics and adopt tools to manage data and measure progress

Streamline/automate sustainability reporting

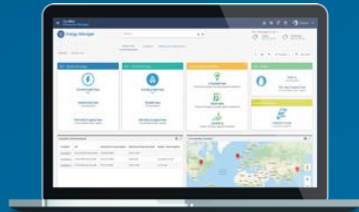
Scale efforts across the enterprise

Single-pane-of-glass experience moves you toward desired outcomes



Sustainability

Achieve energy savings, carbon footprint reduction and net zero goals while ensuring tenant comfort and experience.



**Sustainability
Manager**



**Utility Bill
Manager**



**Plant
Optimizer**



Asset Health & Service

Optimize asset performance, reliability and compliance while reducing operations costs through proactive and predictive maintenance.



**Asset
Manager**



**Service
Manager**



Healthy Buildings

Improve space value and occupant productivity by creating healthy spaces, balancing energy spend with space utilization and indoor air quality.



**Space
Performance**

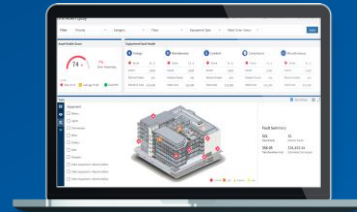


**Performance
Advisor**



Integrated Workplace Experience

Leverage advanced smart edge, digital twin and mobile to enable a productive, secure and engaged workforce & customer experience.



**OpenBlue
Viewer**



**Data
Auditor**

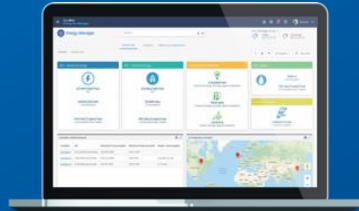
Designed for multiple data maturity levels

Single-pane-of-glass experience moves you towards desired outcomes



Gather

data on energy, emissions, and water to set achievable goals and targets



Net Zero Advisor



Energy Manager



Utility Bill Manager



Recommend

new projects to save energy, emissions, water, and more



Energy Manager FDD



Asset Manager FDD



Control

my building in real time to automatically optimize utility costs and/or reduce energy and carbon



Plant Optimizer

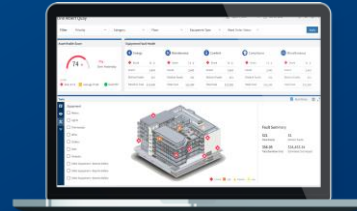


Performance Advisor



Automate

response to electricity grid signals, market pricing, and Demand Response events



Grid Optimizer



Data Auditor

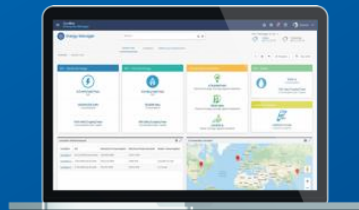
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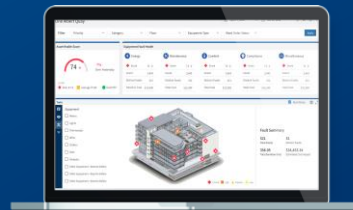


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Data Auditor

Net Zero Advisor

Gather data on energy, emissions, and water to set achievable goals and targets.



Monitor energy and carbon footprint against baseline years and goals



Track portfolio-wide Scope 1 & 2 greenhouse gas emission trends

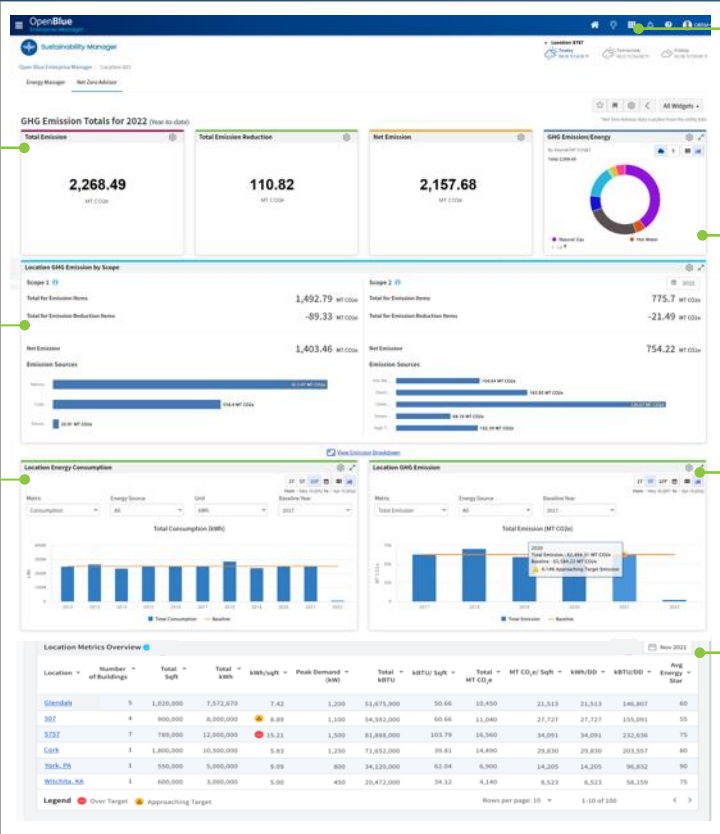


Measure impact of renewable energy certificates and offsets



Understand, compare, and prioritize building performance based on benchmarks

Net Zero Advisor simplifies tracking and reporting



Overall Compliance
At-a-glance view of emissions, emission-reducing items and net emissions

Greenhouse Gas Emissions
Time-based Scope 1 & 2 summaries help identify largest contributors

Energy Monitoring
Detailed consumption readings with easy filtering to quickly compare consumables, emission sources, and timeframes

Unified Experience
Clean transitions across apps from Energy Manager, Utility Manager, and Net Zero Advisor

Emissions Summaries
Focused view of Scope 1 & 2, renewables, and RECs

Emissions Trends and Goals
Showcase performance against baseline year and target

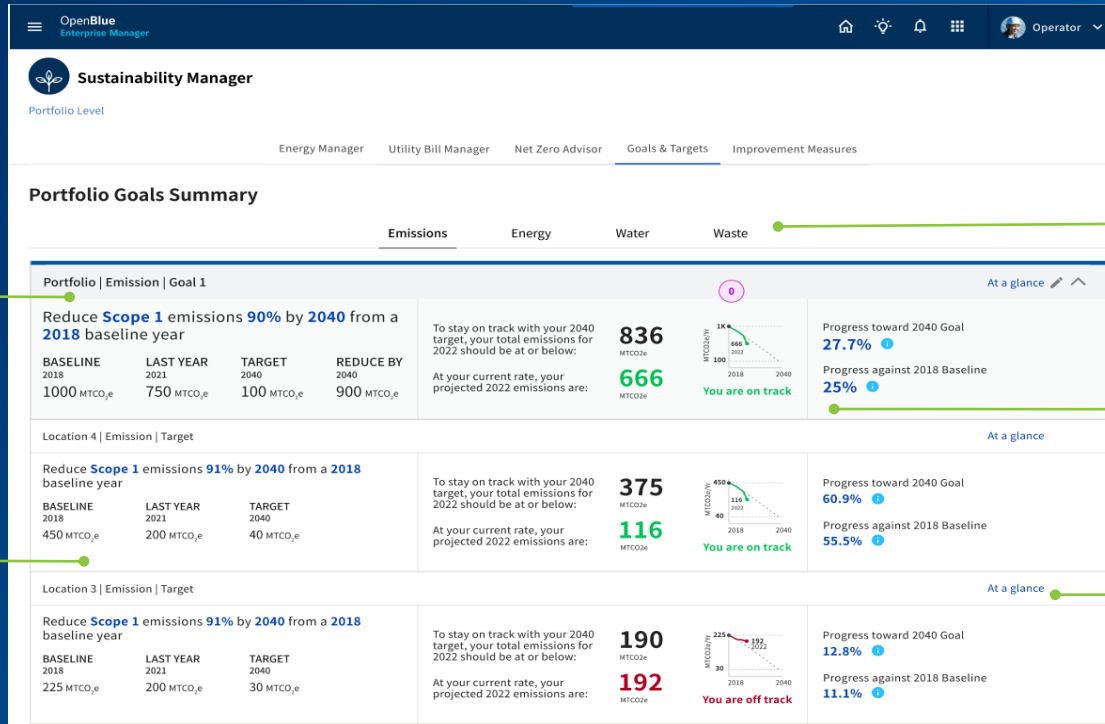
Portfolio Performance
Core Energy and Emissions KPIs provide peer rankings and anomaly indications

| Location | Number of buildings | Total kWh | Total kWh/wh | Peak Demand (kW) | Total kWh/wh | Total kWh/wh | Total kWh/wh | Total kWh/wh | Total kWh/wh | Total kWh/wh | Total kWh/wh | Total kWh/wh |
|------------|---------------------|-----------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Grenoble | 5 | 1,030,000 | 7,572,470 | 7.42 | 1,200 | 51,875,000 | 50.66 | 10,450 | 21,513 | 21,513 | 146,807 | 60 |
| SO2 | 4 | 900,000 | 8,800,000 | 9.89 | 1,100 | 14,392,000 | 60.66 | 11,040 | 27,127 | 27,127 | 155,091 | 55 |
| ST22 | 7 | 780,000 | 12,800,000 | 15.21 | 1,500 | 81,888,000 | 103.79 | 16,360 | 34,091 | 34,091 | 232,836 | 75 |
| Coix | 1 | 1,800,000 | 10,500,000 | 5.83 | 1,200 | 71,852,000 | 39.81 | 14,490 | 29,830 | 29,830 | 203,557 | 80 |
| Trich-ES | 1 | 550,000 | 3,900,000 | 9.09 | 800 | 34,320,000 | 42.04 | 6,300 | 14,205 | 14,205 | 96,832 | 90 |
| Wichita-SA | 1 | 600,000 | 3,000,000 | 5.00 | 400 | 20,472,000 | 34.12 | 4,340 | 8,523 | 8,523 | 58,159 | 75 |

Net Zero Advisor's Goals & Targets streamlines performance tracking

Portfolio Level Goals
Strategic goals break down energy and emission objectives

Multi-Tier Target Assignments
Corporate goals are assigned to campuses and facilities for performance tracking



Categorized Focuses
Dedicated views for Emissions, Energy, Water, and Waste goals

Performance Trends
Vital performance metrics track each location's progress against the corporate goals

Detailed Summaries
Month-over-Month Energy and Emissions trends display projected long-term performance

Goals & Targets — Guided Workflow

Wizard Highlights

- Highly configurable to set up unique goals and targets
- Easy to establish and adjust time-bound objectives
- Responsibility assignments of spaces and commodities
- System-generated recommendation of percentage reductions

Goals and Targets Set up Wizard

Progress: Portfolio Goal (selected), Location Targets, Building Targets

Create a portfolio level goal
Select a goal category to get started.

Goal Category: Emissions
Metric: Total Emissions
Emission Scope: Scope 1, Scope 2
Baseline Year: 2017
Baseline Value: 91,519.07 MT CO2e
Target Year: 2040
Set Target By: % Reduction
Target Reduction: 50 %
Target Value: 45,759.53 MT CO2e

Goal 1
Reduce total emissions of scope 1 and scope 2 by 50% by 2040 from a 2017 baseline year

Save and Finish later

Goals and Targets Set up Wizard

Progress: Portfolio Goal, Location Targets (selected), Building Targets

Recommended location targets
Below are your recommended location targets to help achieve your portfolio goal. Recommendations are based on actual contribution to portfolio goal. Some locations may not be included due to minimal contribution to portfolio goal.

2021 Portfolio Total Emissions by Location
Total 99,184.22 MT CO2e

Portfolio Goal 1
Reduce total emissions of scope 1 and scope 2 by 50% by 2040 from a 2017 baseline year

| BASELINE | LAST YEAR | TARGET | REMAINDER |
|-------------------|-------------------|-------------------|-------------------|
| 2017 | 2021 | 2040 | 2021 |
| 91,519.07 MT CO2e | 99,184.22 MT CO2e | 45,759.53 MT CO2e | 53,424.69 MT CO2e |

Norman, Ok - 03996 | Emission | Target
Reduce total emissions of scope 1 and scope 2 by 31.39% by 2040 from a 2017 baseline year

| BASELINE | LAST YEAR | TARGET | REMAINDER |
|-------------------|-------------------|-------------------|-------------------|
| 2017 | 2021 | 2040 | 2021 |
| 15,414.69 MT CO2e | 23,136.56 MT CO2e | 10,575.77 MT CO2e | 12,560.79 MT CO2e |

Wichita, KS - 03957 | Emission | Target
Reduce total emissions of scope 1 and scope 2 by 37.02% by 2040 from a 2017 baseline year

| BASELINE | LAST YEAR | TARGET | REMAINDER |
|-------------------|------------------|-------------------|-------------------|
| 2017 | 2021 | 2040 | 2021 |
| 22,091.58 MT CO2e | 9,976.76 MT CO2e | 13,914.21 MT CO2e | -3,937.46 MT CO2e |

Grantley Plant, PA - 03826 | Emission | ...
Reduce total emissions of scope 1 and scope 2 by

Marinette Stanton - 14710 | Emission | ...
Reduce total emissions of scope 1 and scope 2 by

Save and Finish later

Customize Accept Recommendation

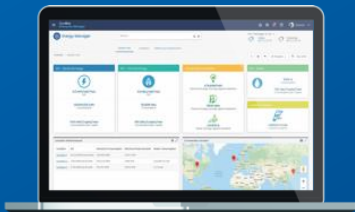
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Single-pane-of-glass experience moves you towards desired outcomes



Gather

data on energy, emissions, and water to set achievable goals and targets



Net Zero Advisor



Energy Manager



Utility Bill Manager



Recommend

new projects to save energy, emissions, water, and more



Energy Manager FDD



Asset Manager FDD



Control

my building in real time to automatically optimize utility costs and/or reduce energy and carbon



Plant Optimizer

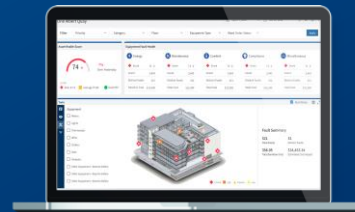


Performance Advisor



Automate

response to electricity grid signals, market pricing, and Demand Response events



Grid Optimizer



Data Auditor



Energy Manager

Need

Organizations need to aggregate and evaluate energy data continuously to highlight areas of inefficiency. They also need to track and communicate progress towards energy and sustainability objectives.

Solution Overview

Energy Analytics that help users analyze and identify excess energy consumption in facilities and forecast the energy consumption for the facilities using so teams understand where to focus continuous improvement efforts and evaluate progress towards goals.

Solution Outputs

- Track energy usage and identify areas of savings opportunities
- Report out energy usage to stakeholders
- Identify alternate cost-effective sources of energy
- Predict the spend and provide options to optimize
- Measurement and verification

Outcomes

Reduced energy consumption

Achieve sustainability goals

Comparative analysis of energy optimization measures

Asset benchmarking and optimization

Supporting Infrastructure



Building Systems

- BMS/BAS
- Energy meters / Sub-meters
- Utility provider pulse meter

OpenBlue Platform

- OpenBlue Bridge for metering



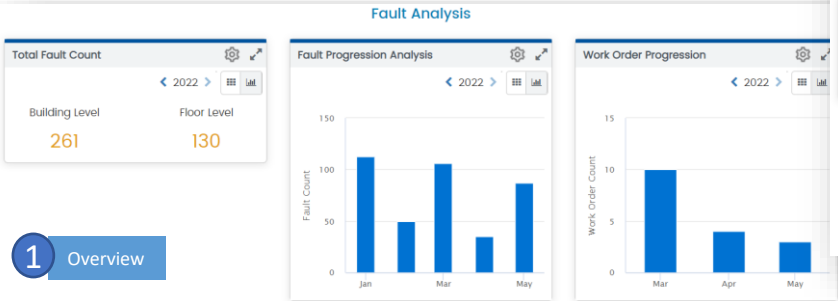
Energy FDD

- Enterprise Manager automatically collects, analyses, and displays information for all configured physical meters (Online/Offline meters).
- Supports creation of virtual meters to substitute sub-metering or create calculated values online.
- Consumption and Demand Comparisons, Energy Profiling, Consumption Profiling, Demand Profiling. Data anomaly detection and auto-correction using AI.

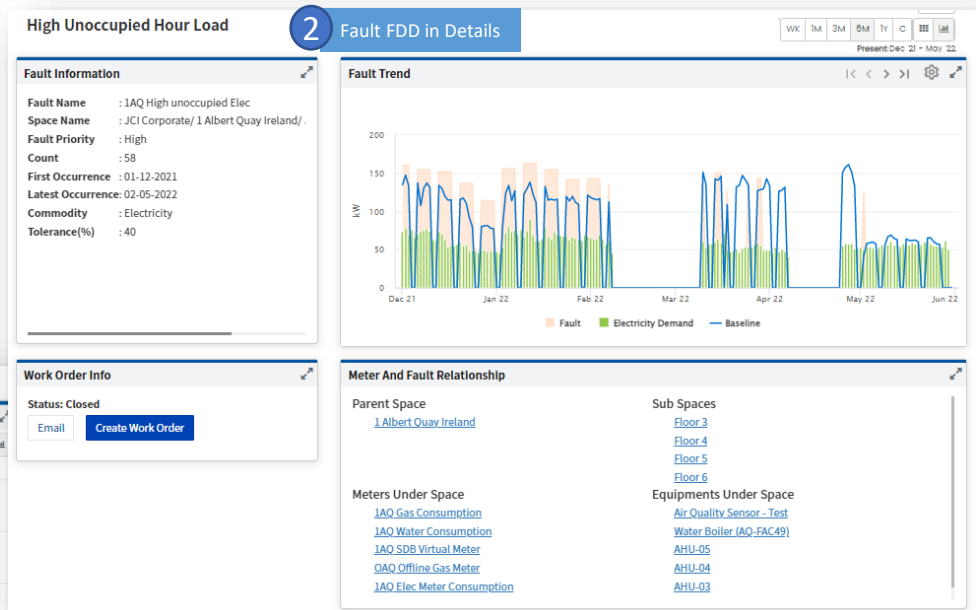
Energy manager currently have fault detection and diagnostics (FDD) rules, that could be deployed based on customer requests.

New fault will have comparison matrix like Baseline, Fixed value, Previous period and Last year.

- High energy consumption
- High Occupied Energy consumption
- High Unoccupied Energy consumption
- High Weekend Energy consumption
- Electrical Peak demand above threshold
- Unoccupied peak demand above threshold
- Weekend electrical peak demand above threshold



1 Overview



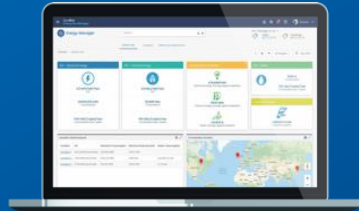
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Utility Bill Manager



Recommend

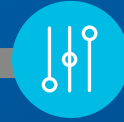
new projects to save energy, emissions, water, and more



Energy Manager FDD



Asset Manager FDD



Control

my building in real time to automatically optimize utility costs and/or reduce energy and carbon



Plant Optimizer

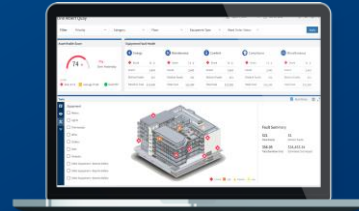


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Data Auditor



Asset Manager

Need

Facility managers are busy running day-to-day building operations and are challenged with quickly detecting and diagnosing alarm, which can number in the thousands creating fatigue.

Solution Overview

Asset Manager proactively identifies equipment and system anomalies, prioritizing faults based on sustainability and business impact. Diagnostic recommendations enable your team to understand a potential resolution reducing the time to action

Solution Outputs:

- Asset fault detection with diagnostic feedback
- Monetization and summary of faults detected
- Overview of asset KPIs
- Anomaly notifications with integrated work orders

Outcomes

Reduce total cost of operations

Reduce unplanned downtime

Improve tenant satisfaction

Reduce alarm fatigue

Supporting Infrastructure



Building Systems

- BMS
- HVAC

OpenBlue Platform

- OpenBlue Bridge

Fault Detection and Diagnostics- Global & Custom rules

Fault detection and Diagnostics help technicians quickly zone in on a preventative solution, dramatically reducing baseline energy consumption, capital costs and equipment wear

800
Global Rules

997
Diagnostics Rules

66
System Rules

87
Cost Expressions

Categorical distinguishing of faults

- ✓ Fault By Space - gives Fault Count/Duration at the selected Space Level
- ✓ Fault By Equipment Category - Gives Fault Count/Duration at the selected Equipment Category Level
- ✓ Fault by Type - Gives Fault Count/Duration by Fault Types (Fault Names)
- ✓ Easy navigation to get to the Fault root-cause with the Space to Equipment link
- ✓ From equipment to the points causing Fault View (Fault Trend View)
- ✓ Details of Faults at varying levels: by floor, wing, room, or meter.
- ✓ Top Five Faults
- ✓ Faults Trend

| Equipment Category | Equipment Type | Equipment Fault Name | Hot Link | Release Date | Library Version |
|----------------------|-----------------------------------|--|------------|------------------|------------------|
| Active Chilled Beams | Active Chilled Beams | ACB-FD-004 High Zone Temperature | Click here | 2018 | V 1.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-005 Zone 1 High Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-006 Zone 2 High Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-007 Zone 3 High Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-008 Zone 4 High Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-009 Zone 5 High Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-010 Low Zone Temperature | Click here | 2018 | V 1.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-011 Zone 1 Low Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-012 Zone 2 Low Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-013 Zone 3 Low Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-014 Zone 4 Low Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-015 Zone 5 Low Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-016 Zone -1 High Deep point Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-017 Zone -2 High Deep point Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-018 Zone -3 High Deep point Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-019 Zone -4 High Deep point Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-020 Zone -5 High Deep point Temperature | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-021 Room Relative Humidity | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-022 Low Zone Relative Humidity | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Active Chilled Beams | Active Chilled Beams | ACB-FD-023 Zone temperature sensor Fault | Click here | Jan to July 2019 | V 1.0.0 to 2.0.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-001 High Return Air Pressure | Click here | 2018 | V 1.0.0 to 1.6.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-002 High Static Pressure | Click here | 2018 | V 1.0.0 to 1.6.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-003 High Supply Air Temperature in Cooling Mode | Click here | 2018 | V 1.0.0 to 1.6.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-004 Low Static Pressure | Click here | 2018 | V 1.0.0 to 1.6.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-005 Low Supply Air Temperature in Heating Mode | Click here | 2018 | V 1.0.0 to 1.6.0 |
| Air Handling Unit | Mixed Air Single Duct AHU (MASSD) | AHU-FD-006 Poor Indoor Air Quality | Click here | 2018 | V 1.0.0 to 1.6.0 |

Global Fault Release List

Fault Configuration Screen



Asset FDD

- Advanced FDD rule engine drives proactive and predictive fault identification, spaces impacted, diagnostics and related analytics using statistical algorithms applied to high volume long time span data sets.
- Cost expressions for calculating monetary impact of faults remaining open, especially on energy cost.

Individual Asset FDD Details
500+ Rules

Dedicated fault summaries

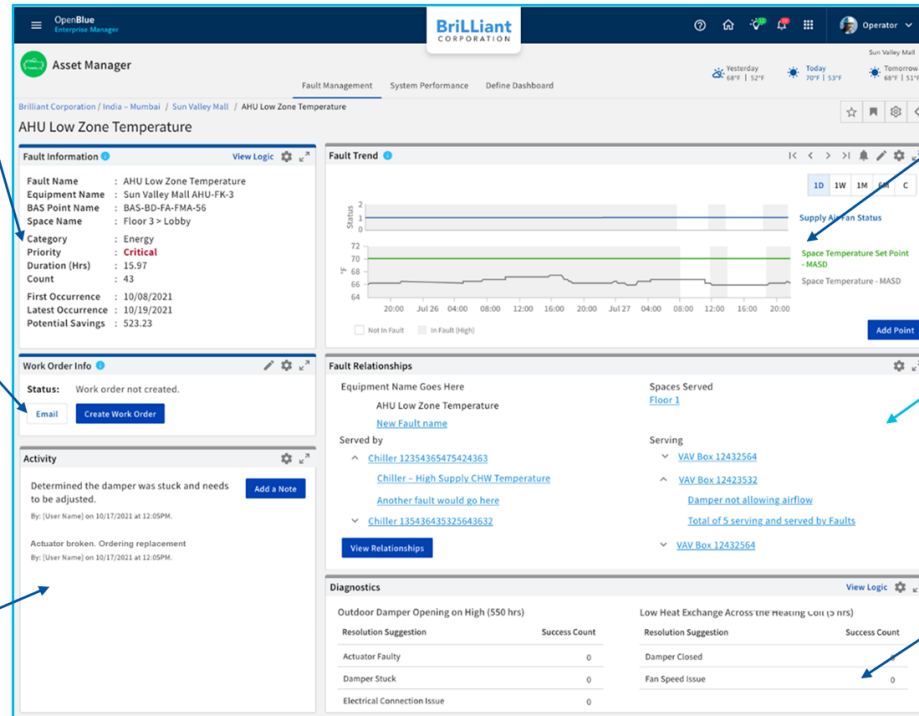
Detailed page outlining all critical information to analyze and diagnosis an occurring fault

Fault to email option

Immediate action through email option allows users to send emails from dashboard instead of creating a workorder

Equipment relationships

Build up service history through annotations during fault and maintenance responses



Cohesive fault summaries

All relevant data trends available in a single pane for fault analysis

Equipment & fault relationships

Industry-first fault tree to quickly identify root cause and separate out symptom faults

Simplified diagnostics

Prescriptive actions broken down for faults with feedback loops to track success counts

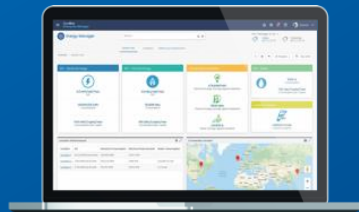
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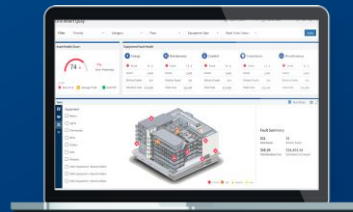


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An aerial view of a city skyline, likely New York City, seen through a window with a prominent grid pattern of dark metal bars. The city is densely packed with buildings, and a large body of water is visible in the distance. The sky is overcast and hazy.

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