FACLON LABS

Solutions and Product Technology

Energy Management

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Meet the Team

Meet the Minds Behind Our Success

FACLON LABS

- **Expertise –**
  1. Sensor Data Integration
  2. Gateways (Wired/Wireless Connectivity)
  3. Automation
  4. Cloud Infrastructure, Software App
  5. Artificial Intelligence and Data Science (ML-Ops)
  6. Domain Expertise
- HO in **Mumbai**, India
- RO in Delhi, Chennai, Bangalore, Pune
- **100+** Employees
- **150+** Direct Customers
- **50+** Channel Partners - India and Globally

Rishi Sharma

Co-Founder, CEO
B.Tech, IIT Bombay

Utkarsh Narain

Co-Founder, CTO
Cloud Platform

Archit Naraniwal

Co-Founder, CSO
B.Tech, IIT Bombay

Parth Chaudhary

CMO & Core Team
B.Tech, IIT Bombay

Parag Patil

Strategic Alliances
Ex- Wipro, Ex- Infosys

Vivek Singh

Chief Data Scientist
B.Tech, IIT Kanpur

Key Customers

FACLON LABS

Trusted and Ideal digital partner for Industrial setups, commercial setups and OEMs

Automobile and ancillary

ESCORTS
EICHER
UNO MINDA
TOYODA GOSEI
Mahindra
PPAP

Consumer Goods

ITC Limited
marico
Dabur
Coca-Cola
BIRA 91
Mondelēz International

Metals

vedanta
JSW Steel
TATA STEEL
ADITYA BIRLA HINDALCO
CENTURY
BMM

Cement

UltraTech CEMENT
JSW Cement
Dalmia Bharat

Pharma

Mankind
RPG LIFE SCIENCES
IOL

Consumer Durables

ADITYA BIRLA GRASIM
KANSAI NEROLAC PAINTS LIMITED
APAR
ashirvad by aliaxis
HAVELLS
Supreme People who know plastics best

Chemicals

SRF
Godrej agrovet
apcotex

Commercial Infra

Kempegowda International Airport Bengaluru
Chhatrapati Shivaji International Airport
adani Ports and Logistics
DLF BUILDING INDIA
IDEMIA
EMBASSY
ICICI Lombard Nibhaye Vaade

Oil and Gas

CAIRN WE FUEL AMAZING
IndianOil

OEM tie-ups

IBEX CORPORATION
KSB

Partnerships

accenture
CII
Infosys

I/O Sense Platform Architecture

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Enabling tailor made and effective implementation of digital strategies

Data Source

- Actuators, Valves, VFDs
- ERP, SCADA, Third Party, Historian
- DCS, OPC and PLCs systems
- Energy, Water, Steam, BTU, Meters
- Pressure, Temperature, Vibration, Camera, Other Sensors

Data Integration

I/O CONNECT

Modbus, HART, OPC, IEC 61850, PROFINET, MQTT, EtherNet/IP, https://, RTSP, BACnet, FTP, PROFIBUS, WiFi, LoRa, 4G LTE

Enabling Insights

I/O SENSE

- Drag and Drop Dashboards
- Alerts and Reports
- Ready to go use case lib
- Workflow Automation
- AI WorkBench for modelling
- Bruce AI
- Admin Panel & Access control
- Strategic Customizations

Business Value

- Increased Manpower productivity
- Reduced utility consumption
- Increased OEE
- Reduced Downtimes
- Reduced Maintenance Cost
- Improved Output Quality
- Improved Safety

Phase I	Phase II	Phase III	Phase IV

I/O Sense Platform Key Features

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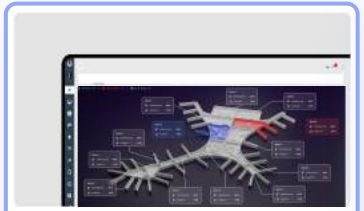
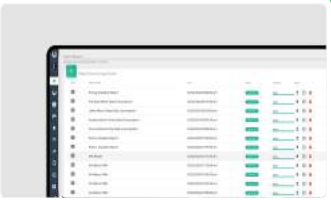
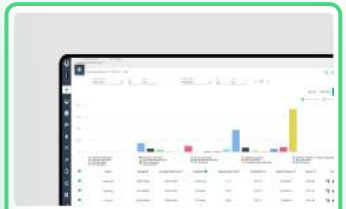


I/O Lens
No-code dashboard creator with drag and drop widgets

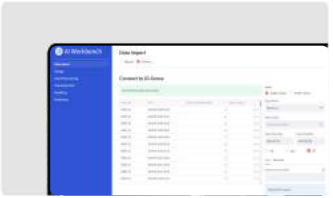
I SCADA
Interactive SCADA creation tool for creating process flows



Reports
Custom reporting and data storage ; 150+ templates

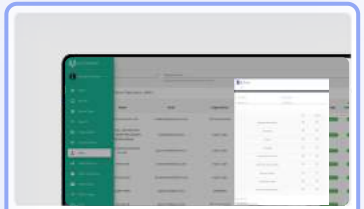


I/O Matrix
Drill down audit tool for power and utility analytics



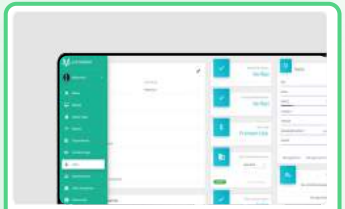
AI Workbench
No-code Machine Learning bundles and libraries for DS

Bruce AI
Generative AI copilot for prescriptions on operations

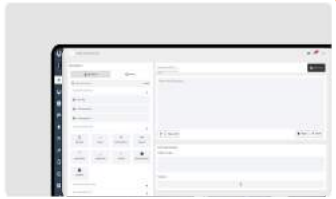


I/O Forms
Form builders for manual data collection from personnel

Triggers
Real time triggers for alerts and automation



I/O Foundry
Platform for managing users, devices and data



Expression Resolver
Real-time equation builder for analytics and computations

No-Coding IoT Stack

Progressive web application

Multi-tenant Architecture

Hostable on AWS, Azure, GCP or on-premise

Military Grade Security

I/O Sense Platform Key Features

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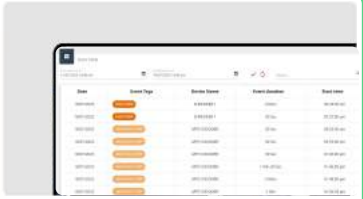
OEE Suite
Prebuilt libraries for availability, performance and quality

CBM
Readymade algorithms for predictive maintenance

Device Management

Sub-User Management

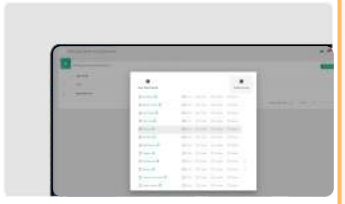


Events, Annotations and Notifications

Steam Trap
Failure detection for header and heat exchanger traps

Busbar Management
Risk assessment of busbar and bus duct based on thermal trends

Configurable Entities



Workflow Automation

Custom Dashboard

Application Specific	Platform Data Management	Alerts & Dashboards

Energy Management - Opportunity Identification

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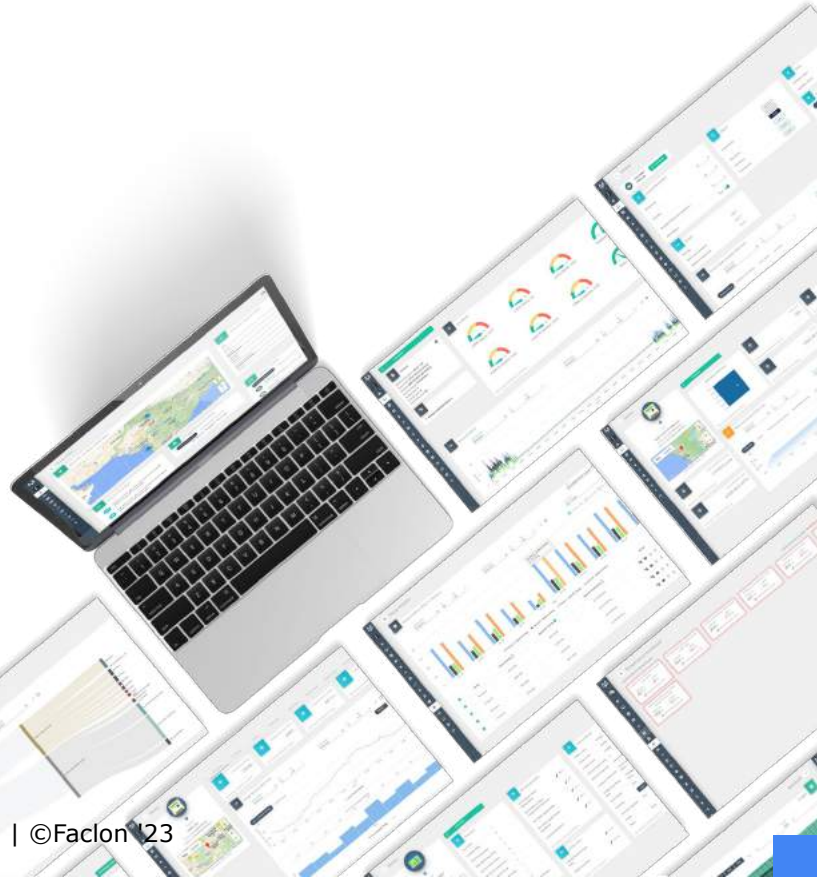
- **Specific Power ->** Benchmarking of electrical/chiller water/steam consumption based on golden batch production at different levels - overall, section, process, and equipment to identify deviation. Further checking the process parameters to identify loss reasons.
- **Idle Time losses ->** Calculating energy consumption with equipment is idle
- **T&D Losses ->** Benchmarking and Calculating energy loss in different distribution network sections
- **Demand and TOD Loss ->** Calculating contract demand and actual to identify required contract demand. Improving utilization based on Time of Day rates
- **Energy Banking Loss ->** Timely utilization of banks and filling of energy banks with low cost energy
- **Power Mix Loss ->** Calculating the cost of energy from different sources like grid, captive solar, WHRS, etc. to understand losses in buying expensive energy
- **Utility Efficiency Losses ->** Calculating utility KPIs - Chiller -COP/IkW by tr, Boiler Efficiency, Solar PR%, DG efficiency, etc
- **Forecasting Losses ->** Identifying energy requirements tomorrow and booking requirements accordingly. To reduce losses in overutilization and underutilization.
- **MIS Automation** -> Manpower savings in automated data collection and reporting
- **Data for Productive Analysis ->** Digital Data warehouse and quick access to data for RCA Analysis
- **Proactive Alerts on Energy Quality ->** Proactive Alerting to reduce any possible issues in Harmonics, Voltage etc.

Power and Utilities Management



Power and Utilities Management

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Multifunction Energy Meters

Modbus RS-485 (10-15 meters)

4G, WiFi, Ethernet

ST Series Gateways

Chillers

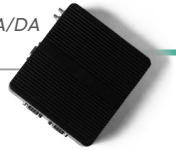
Air Compressors

Boilers

DG Sets

DCS Server

OPC UA/DA



IPC Gateways

Data Sources

- Distribution feeders
- HT/LT Panels
- Incoming/Outgoing Feeders
- MCC, PCC, MLDB rooms
- Utility Equipment Controllers
- OPC UA/DA

I/O Sense Digitization Suite

Analytics | Automation | AI

Modbus RS-485

4G, WiFi, Ethernet

ST Series Gateways

Air-flow Meter

Steam flow Meter

BTU Meter

Deliverables

- Deviation Analysis
- Dynamic SLDs
- Drill Down Audits
- T&D loss analyzers
- Machine COPs
- Real time alerts
- Specific Energies
- Demand Control
- Machine Automation
- Savings Potential
- Energy Prediction
- Golden Batch

Energy Management – Analysis and Benefits

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- **Drill Down Analysis** of energy distribution for electrical, steam, chilled water, compressed air
- **Deviation Analysis** at every level for benchmarked output vs actual output
- **Electrical Analysis** with SLD view
- **Specific Power Analysis** for electrical energy, compressed air, chilled water, steam
- **Efficiency analysis** for Boilers, chillers, steam turbine, DGs, air compressors
- **Alerting** on electrical anomalies like low PF, high demand, full load current, harmonics, voltage etc.
- **RCA** by mapping process parameters of Equipments

Benefits

- ISO 50001 Compliance
- Holistic management system
- No Manual data collection
- No Manual report making
- Single source of truth
- Easy saving opportunity Identification
- Proactive Management instead of reactive
- Reduced CO2 footprints
- Foundation for Sustainability Focus

Plug and Play IoT Device

- Upto 16-20 meters integration on Modbus RS 485
- Multiple connectivity options: variants for 4G , Wi-Fi, Ethernet
- Local backup data storage
- Over the air update
- 1 year warranty
- 12-24 VDC power supply
- Additional Accessories - Panel, MCB, SMPS

I/O Sense Platform Key Features

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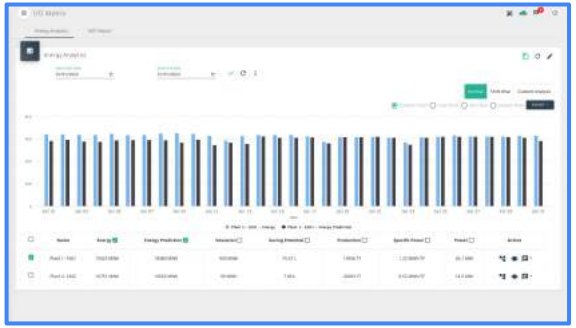
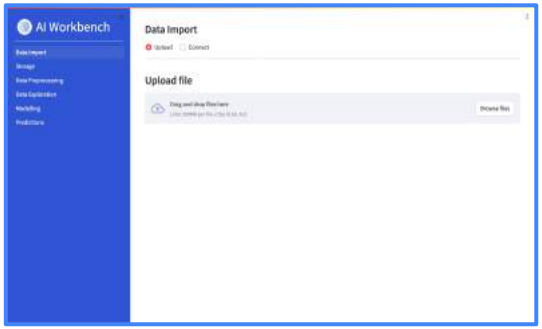
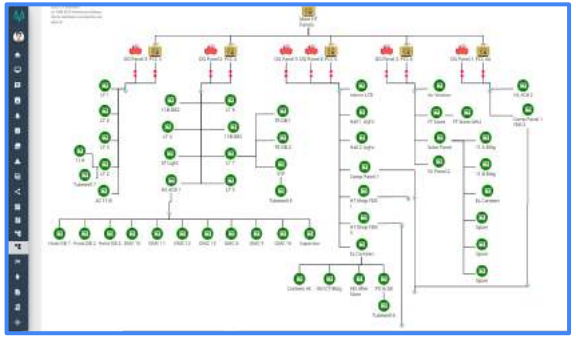


Matrix - Deviation

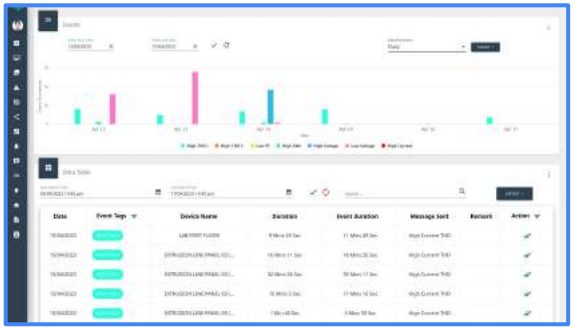
I/O Lens- Custom Dashboard



AI Workbench



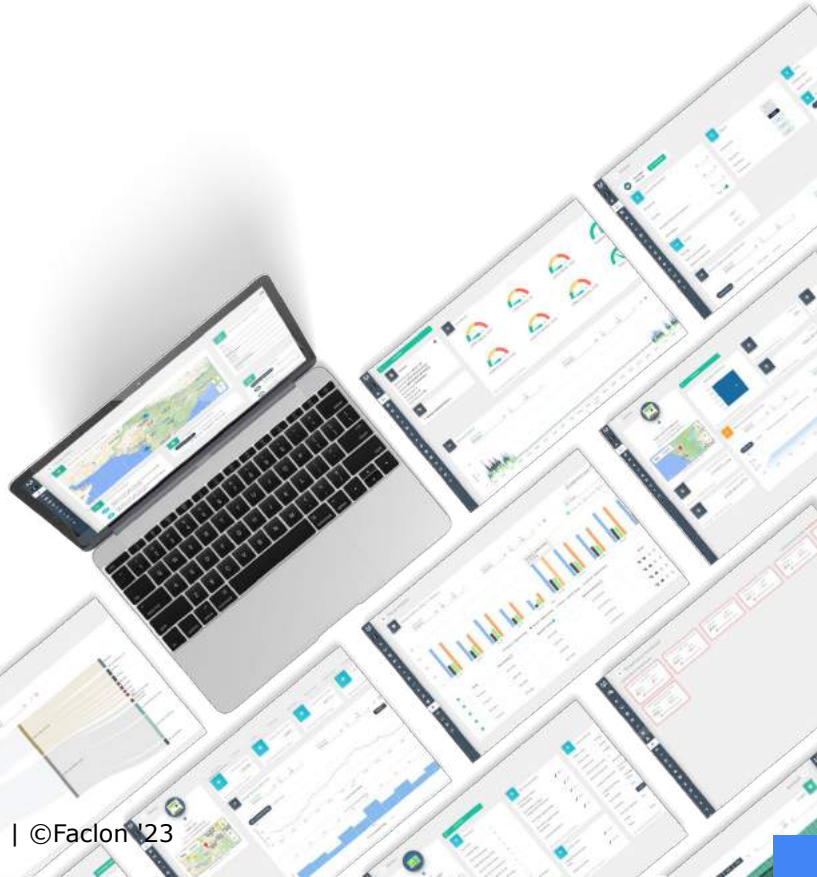
SLD



Alerts and Events

Sankey

Solar Monitoring



Solar Monitoring Architecture

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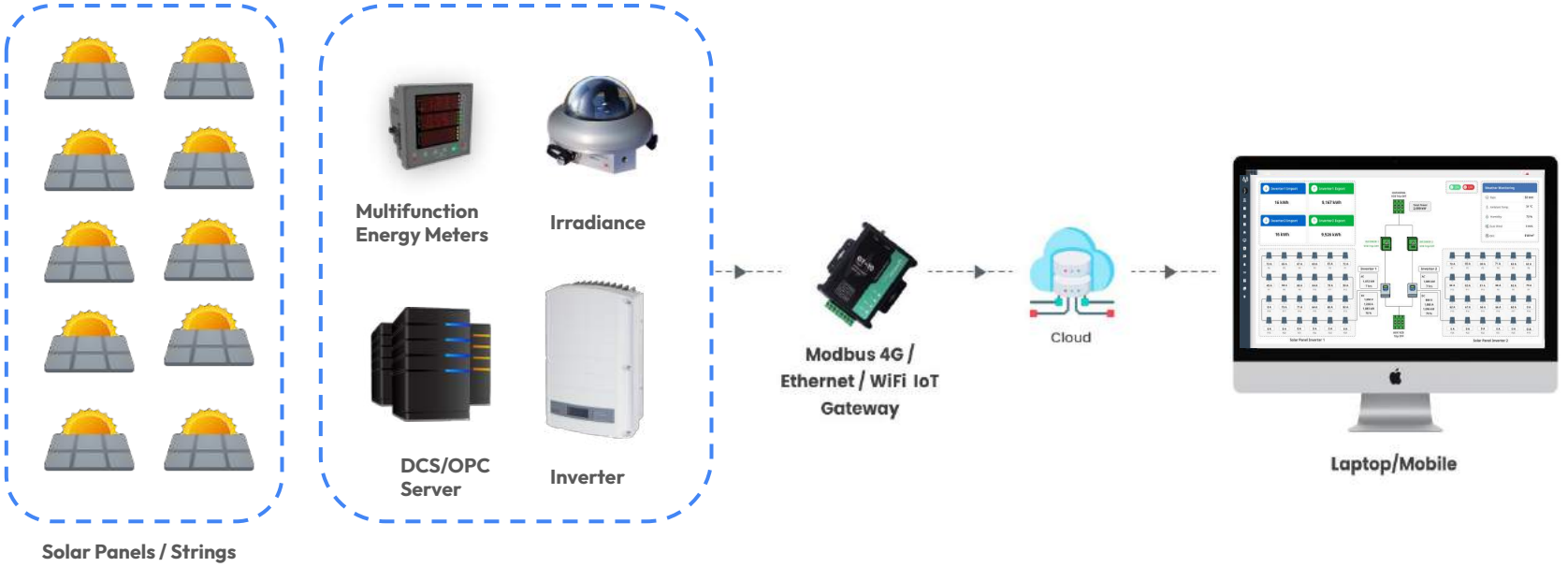

Solar Panels are often large in deployment with multiple discrete locations. Manual inspections for tracking Panel Efficiency, Inverter health, and benchmarking performance become extremely tedious and time consuming

Benefits - To Track and Optimize

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- Capacity Utilization Factor - Actual vs Predicted
- Energy Generation - Actual vs Predicted
- SMS and Email alerts for dirty panels, inefficiencies, Inverter faults
- Overall improved life of solar panels
- Smart efficiency reports
- Monitoring of all locations from a single system

Parameters Monitored

- Power and Energy
- AC Current
- AC Voltage
- DC Current
- DC Voltage
- Irradiance
- String Current
- Inverter Faults
- Rainfall
- GHI
- Ambient Temperature
- Wind Speed
- Performance Ratio
- Yield

I/O Connect | IoT Gateways for Solar monitoring

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GATEWAY	IDEAL FOR CONNECTING	INPUT / PROTOCOL	COMMUNICATION	SALIENT FEATURES
	Energy meters, flow meters,IO Cards, PLCs, VFDs, other sensors etc.	Modbus RS 485, Modbus TCP	Variants in 4G, Wifi or Ethernet. MQTT protocol, Bi Directional	Local backup, FOTA
	OPC server, VFDs, PLCs, DCS, SQL Server etc. .	OPC UA/DA, BACNET, Profinet, Ethernet IP, Modbus TCP, SQL Query, IEC 61850	Ethernet, MQTT protocol, Bi Directional	Local backup, FOTA

I/O Sense Platform Key Features

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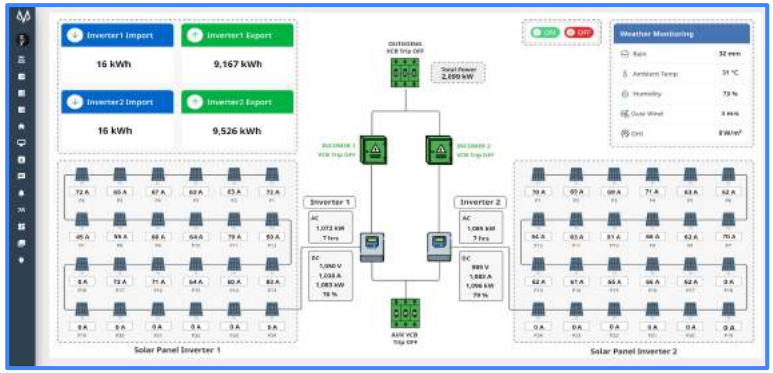


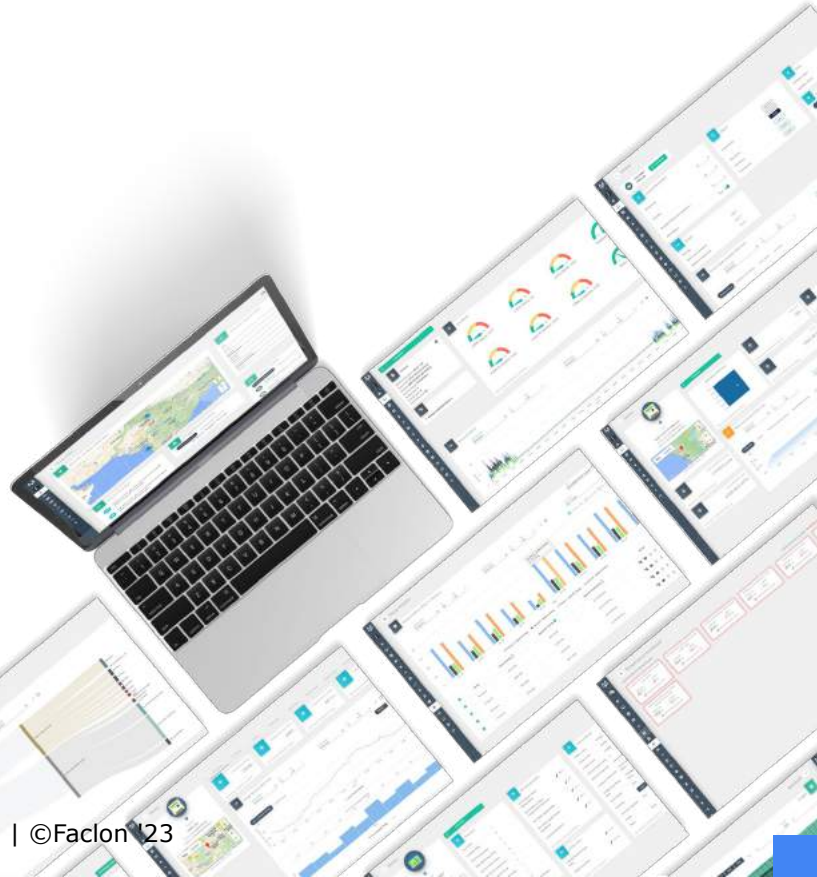
Real time SLD

Trends

Overview

Tabular view

Energy Demand Forecasting

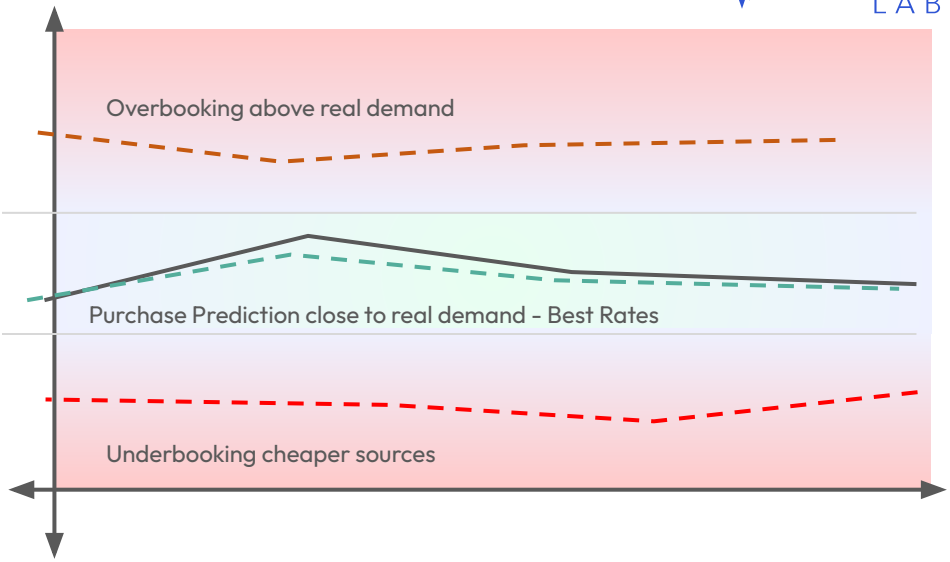


Current Challenges

- **Manual Booking Process:**
  Scheduling energy every 15 or 30 minutes from the Captive Energy Plant/Alternative Cheaper Energy Sources requires complex coordination with internal and across department teams.

- **Financial Impact - Underbooking:**
  Due to underbooking, we lose out on purchasing maximum energy from cheaper sources, instead of more expensive sources.

- **Financial Impact - Overbooking:**
  By predicting demand above plant's current needs, excess energy is not utilized exhaustively and wasted, leading to billed unit losses.



Faclon's **I/O Deep Sense** AI Models continuously analyze vast amounts of data points on real time equipment consumption, maintenance schedules, target production and various process parameters to **improve purchase accuracy to secure best rates of Energy**

Solution Benefits

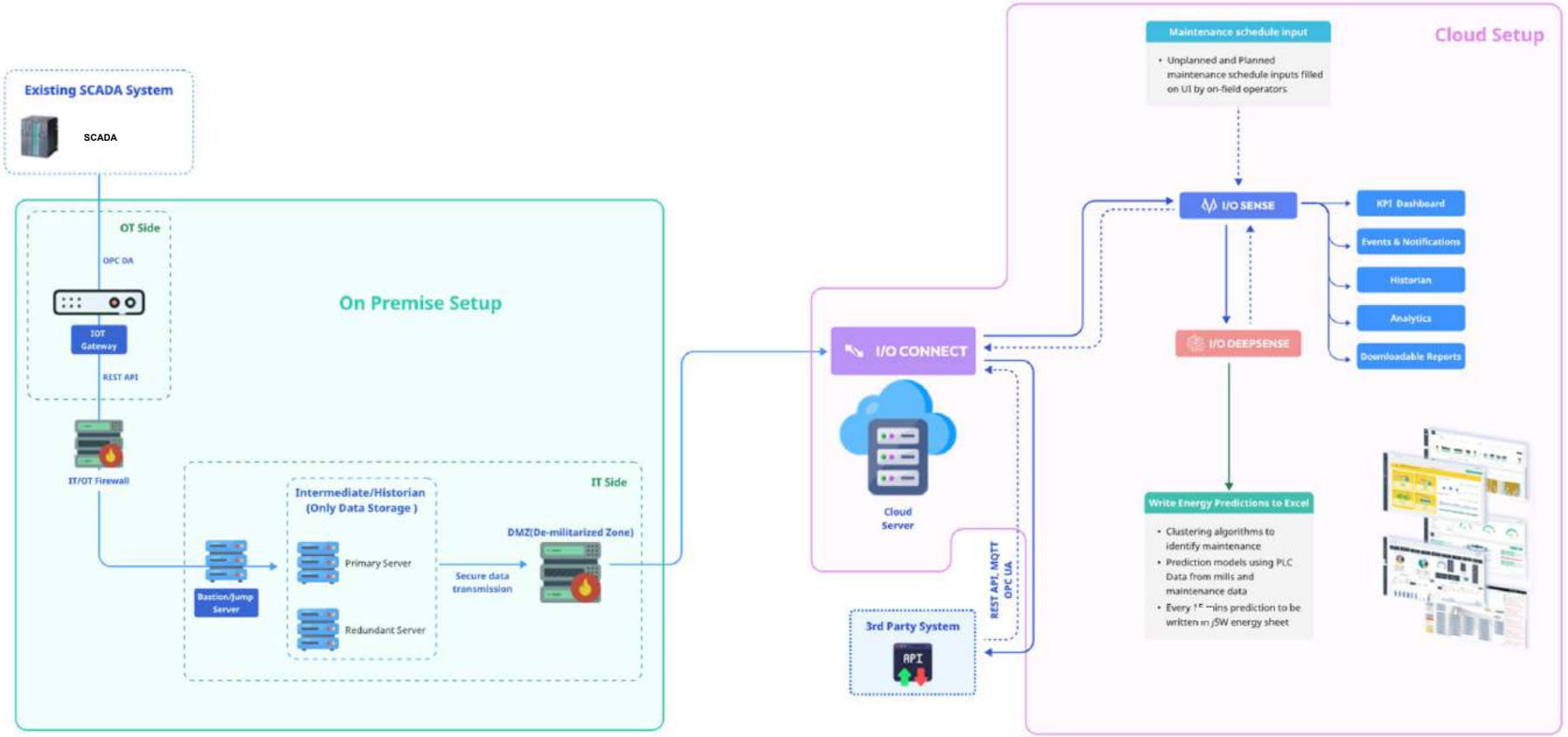
Economic Savings

- **Efficient Energy Procurement:** By predicting more accurately, energy can be procured/generated at optimized rates, leading to considerable cost savings on total energy spend
- Our forecasting AI model is minimizing the monetary loss due to under injection and over injection combinedly
- **Reduced Grid Cost:** Appropriate injection of energy helps in reducing the wastages of power purchased from grid leading to lesser fixed demand charges and also procure energy at cheaper cost from captive power plant.

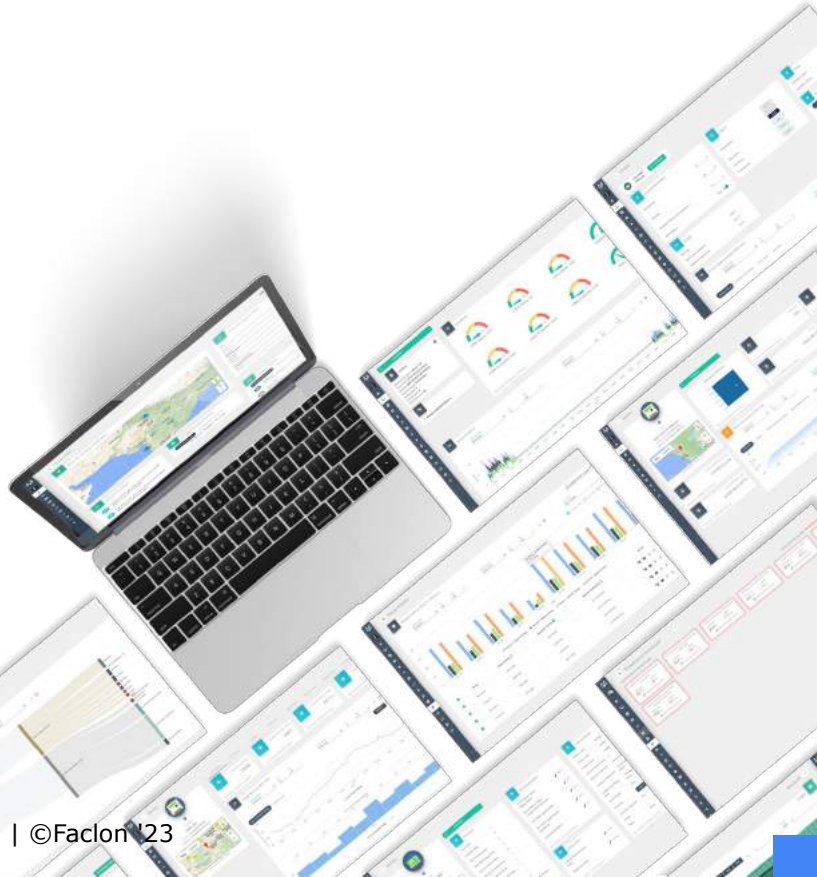
Operational Efficiency

- **Proactive Management:** Enhanced forecasting allows for better planning, leading to smoother operations and less reactionary measures reducing all manual coordination between teams

Architecture for Demand Forecast



Power Mix Financials



Current Challenges

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How to reduce cost/kwh?

How to reduce cost/production

How to ensure higher renewable share

Without accurate, real time and AI based recommendation analysis, one has to constantly manually address below questions for coming up with ideal power mix:

- What is my demand for next day?
- Am I purchasing energy from grid at the best rate?
- Am I booking right amount of energy requirements from all energy sources?
- Is my solar plant efficient ?
- Is my specific energy consumption optimal?
- Are my DGs efficient?
- What should be my strategy if there is any breakdowns in power sources?
- Is my CPP and WHRS efficiently operating and providing maximum output?..... And so on

Objective With Power Mix

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With Faclon's enablement, you will get recommendations and analytics required to come up with ideal power mix

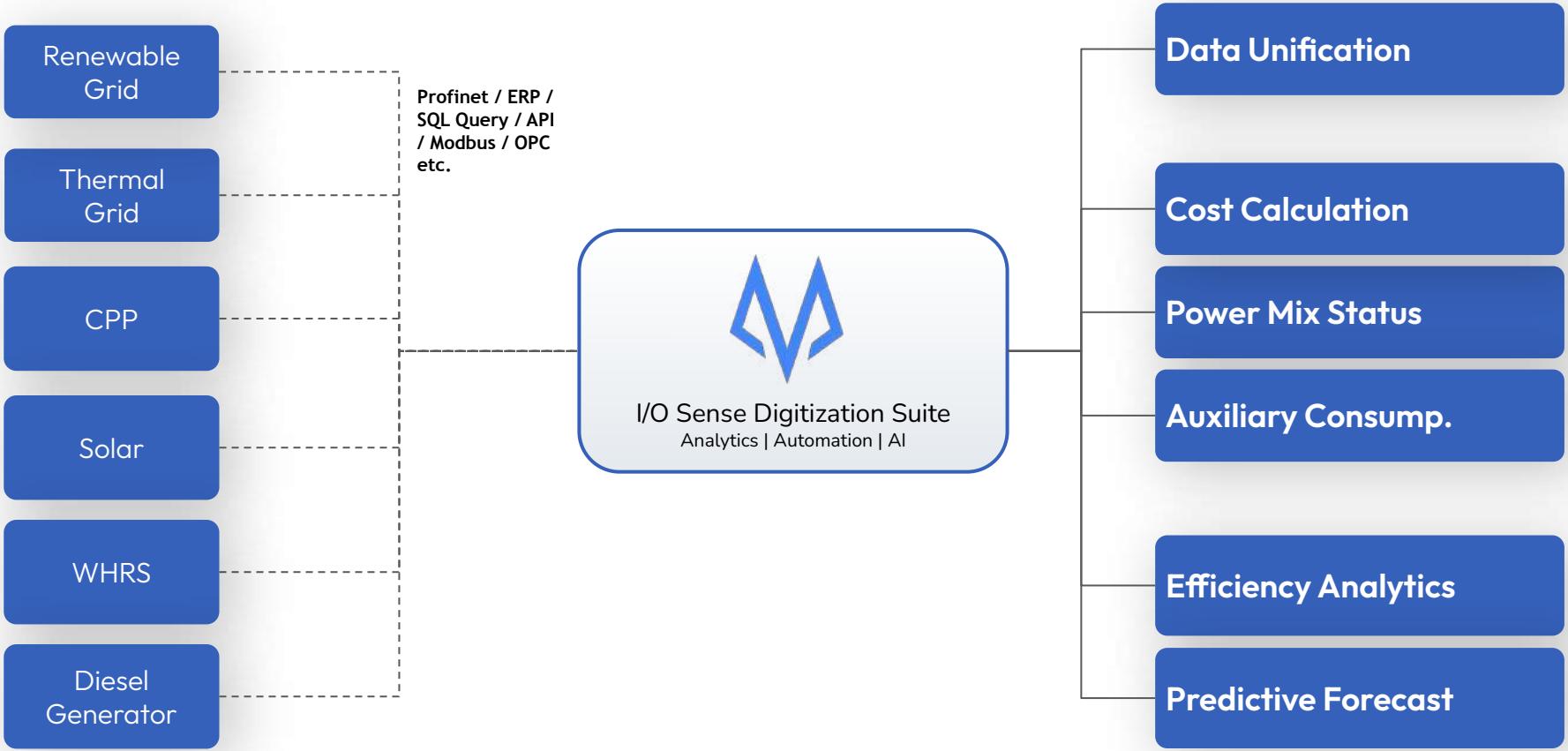
Forecasting Energy Demand : Forecasting the demand of energy consumption based on AI based models or manual inputs.

Power Source Analytics: Identifying and analysing the rates, efficiency, breakdowns, generation and capacity of different power sources in real time.

Ideal Proportion Recommendation : Recommendation of ideal utilization units for all the sources available.

Architecture

To ensure seamless data integration from multiple pipelines



I/O Connect | IoT Gateways

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GATEWAY	IDEAL FOR CONNECTING	INPUT / PROTOCOL	COMMUNICATION	SALIENT FEATURES
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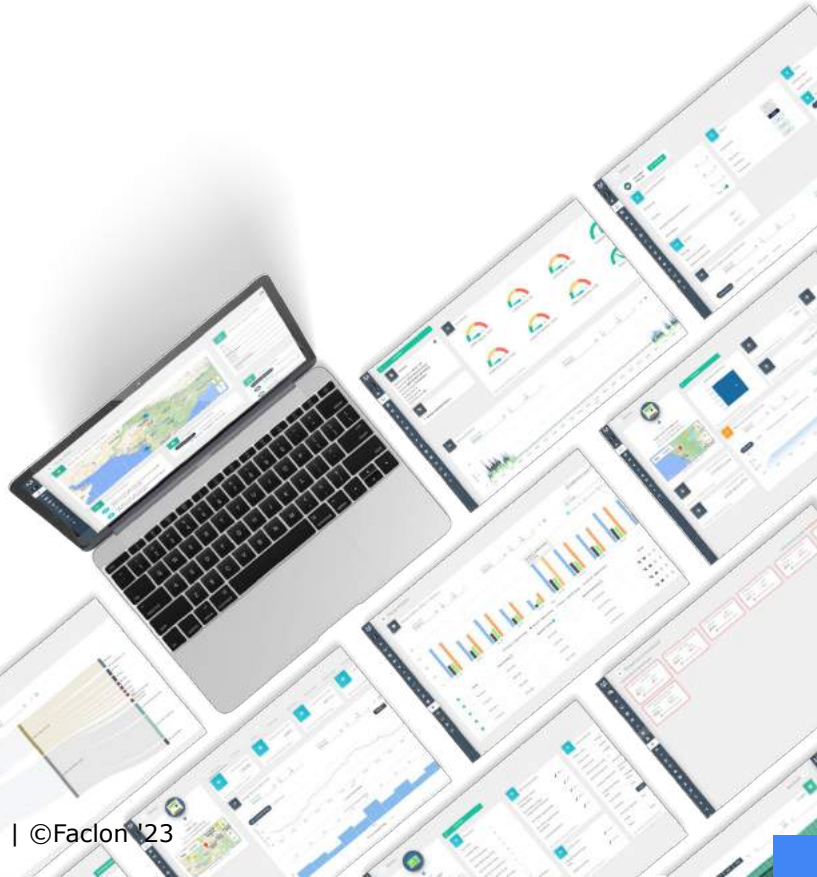
Intelligent HVAC Automation



Need for Intelligent Building Management & HVAC Automation

HVAC is crucial to maintain comfortable conditions within an infrastructure. However, **HVAC accounts for 40-60% Electrical consumption**. However, most of the HVACs are not automated and hence not optimally running. Because of:

1) High costs of automation
2) Complexity created by existing automation setup
3) Issues with backward compatibility
4) Instrumentation connectivity issues
5) Lack of competent retrofit providers
6) Lack of efficiency analysis provided in BMS to prompt maintenance insights on AHUs and Chillers

Chiller Plant Management - Architecture

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Automation:

CPMS (Chiller Plant Management System) enables intelligent and sequential automation of all equipment in Chiller Plant (Chiller Bank, Pumps, Cooling Towers, VFDs, Valves, etc)

Water cooled Chillers

Cooling Towers

Smart control and automation of all equipment - your Digital BMS Operator

Synchronized Control of Entire Chiller Plant to meet Set-point Temperature requirements

Weather based Intelligence - Optimize Chiller Plant use by leveraging external weather conditions

I/O Sense Digitization Suite
Analytics | Automation | AI

Primary/Secondary/Condenser Pumps

Air cooled Chillers

Analytics:

- Energy and Power Tracking
- COP of equipment (BTU/kWh)
- Operating Mode
- Inlet and Outlet Temp

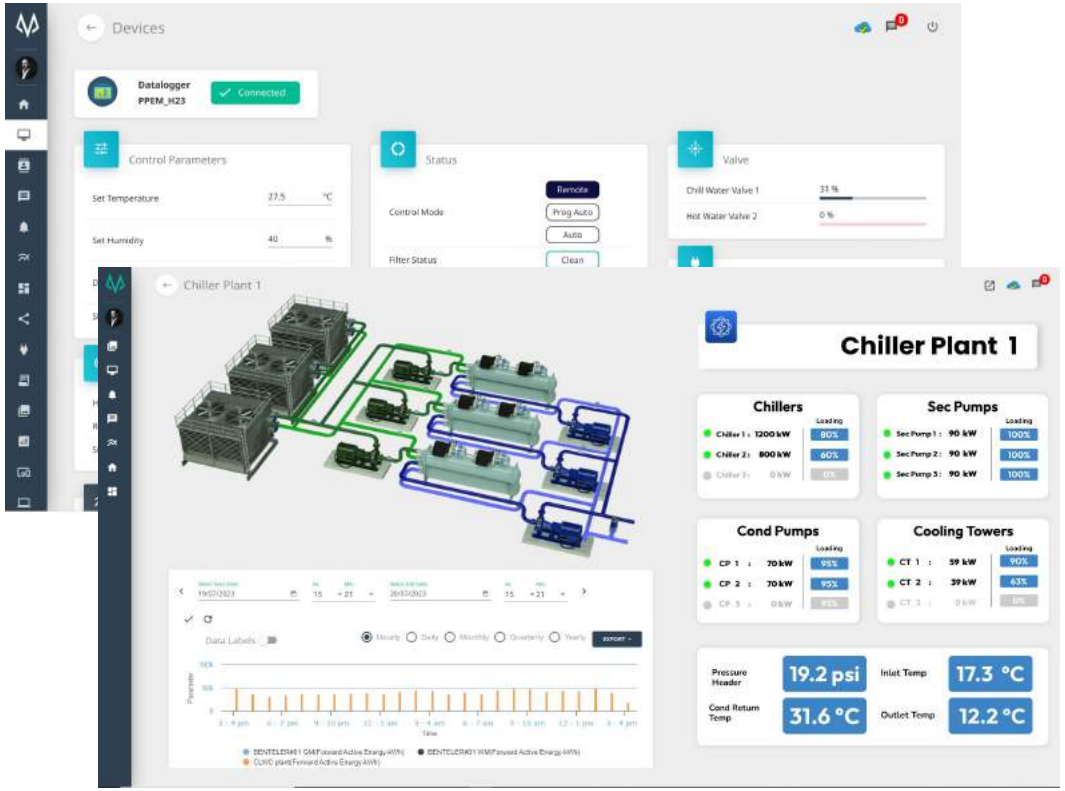
Chiller Plant Management - Benefits

Benefits:

- Upto 5-7% Energy Efficiency of Chiller Plant
- Improved Life of Equipment
- Remote control operations
- 360 degree visibility on Chiller Plant performance

Faclon Advantage:

- Integrate different OEM make of Chiller
- Ease of deploying additional bespoke use-cases
- Enhanced troubleshooting and fault analysis



AHU Management System - Architecture

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Automation:

AHU Management System is a unique solution to manage multiple Air-handling units across a facility with ease.

Intelligent Modulation of blower fan using VFD

Modulation of chilled/hot water usage via 2-Way/3-Way valve

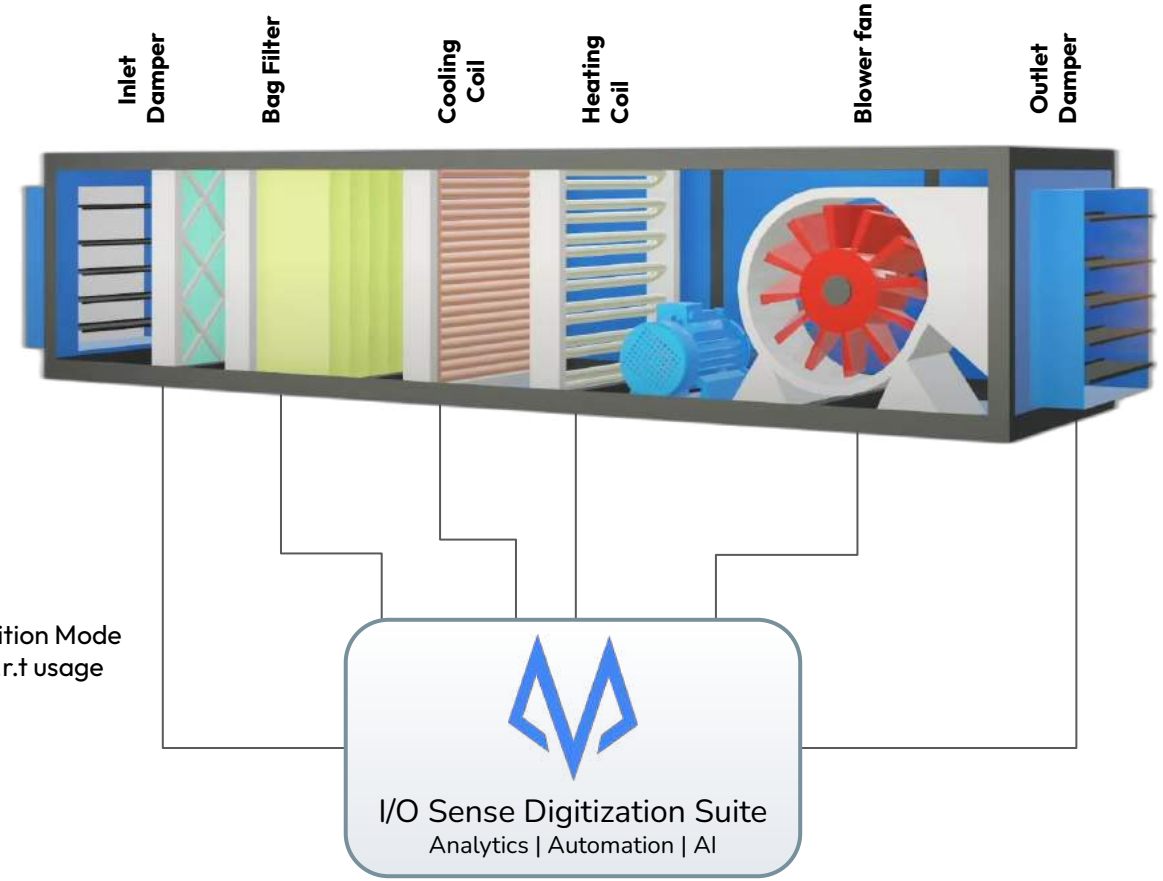
Schedule on/off based on peak hours, off hours, lunch-breaks, etc

Analytics:

- Energy and BTU Monitoring
- Supply/Return Temperature
- Indoor AQI, CO2 Monitoring
- Operating Condition Mode
- Valve position w.r.t usage

Asset Health:

- Vibration based Predictive Maintenance of Blower
- Bag Filter Health and integrity
- VFD Monitoring



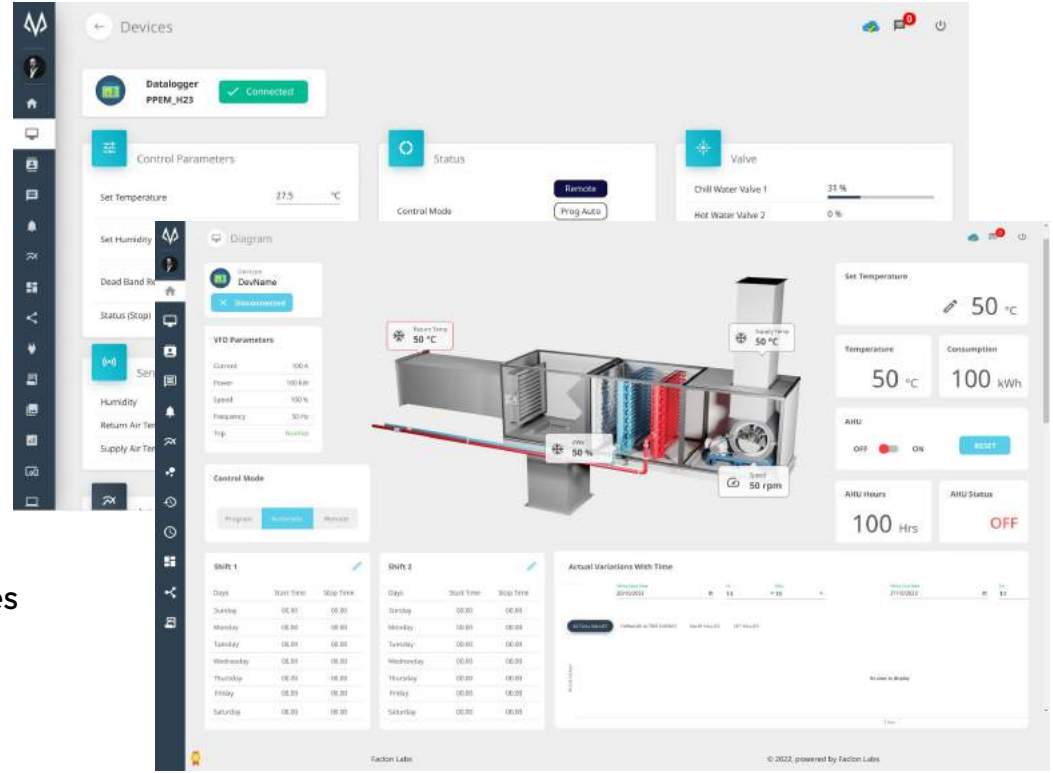
AHU Management System - Benefits

Benefits:

- Reduced Load on Chiller
- Upto 12% Energy Efficiency
- Remote control operations
- 360 degree visibility on AHU health
- Enhanced Comfort of occupants

Faclon Advantage:

- Integrate existing Motorized Valves and Drives
- Ease of deploying additional bespoke use-cases
- Enhanced troubleshooting and fault analysis



Installation images for AHU controllers, dashboarding and Gateways

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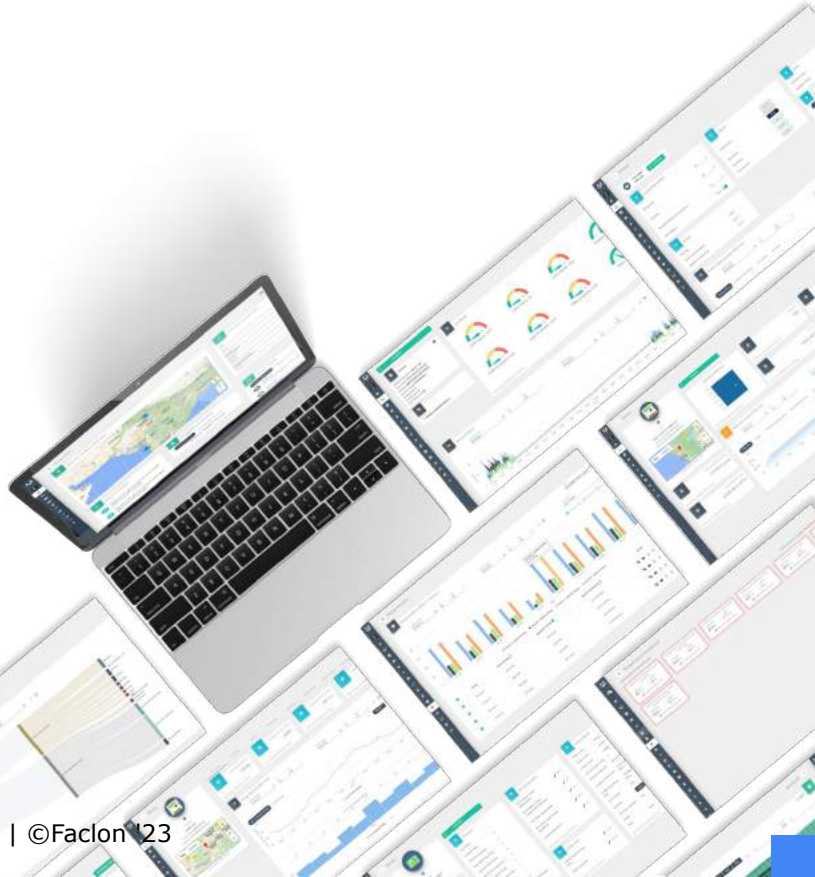
Compressor Digitization



Air Compressor Maintenance and Automation

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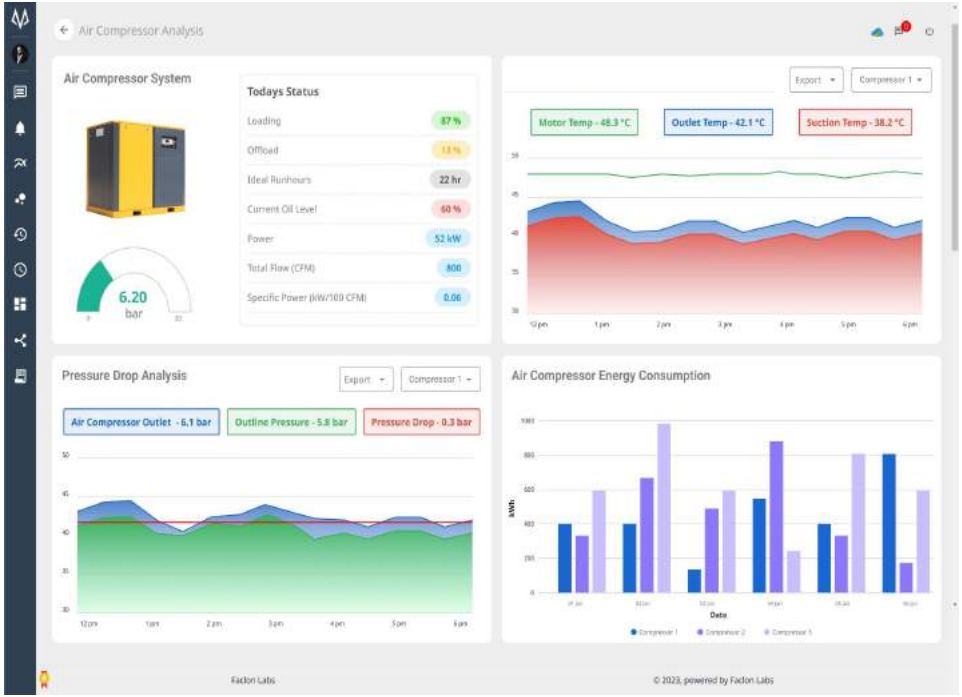
Maintenance insights on Compressor :-

Digitization and Data Logging in IO sense Platform

- Air Compressor efficiency with Air delivery ratio
- Compressor Loading and Unloading
- Specific Power Consumption Kw/CFM
- Run Time and Cycle Count
- Pressure – Individual Air Compressor, Receiver Tank, Dryer Input and Output and Pipe Lines.
- Pressure drop variation in dryer filters
- Lubrication System – Oil Level, Pressure and Flow with OEM Support
- Temperature – Suction Temperature, Motor, discharge Air
- Suction pressure and discharge pressure ratio
- Air leakage analysis
- Dew Point Analysis
- Overall Pressure Drop analysis with cost
- Oil Analysis - Condition of the compressor's lubrication systems with OEM Support
- Filtration Monitoring with OEM Support



Air Compressor Maintenance and Automation

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Automation and Controlling

- **Centralized Control:** The ACM acts as a central control unit for the entire compressor system. It connects to each compressor unit, typically through communication protocols such as Modbus or Ethernet, allowing for data exchange and control commands.
- **Load Management:** The ACM optimizes the compressor operation based on demand requirements. It analyzes the compressed air demand and dynamically controls the number of compressors running, their capacity, or motor speed to match the required output, helps prevent energy wastage and maintain stable system pressure.
- **Sequencing and Scheduling:** In systems with multiple compressors, the ACM implements sequencing and scheduling algorithms. These algorithms determine the optimal sequence of compressors to start, stop, or load/unload based on factors like compressor efficiency, maintenance needs, and overall system demand. The ACM ensures that compressors are operated efficiently while maintaining reliable air supply.
- **Energy Efficiency Optimization:** The ACM focuses on energy optimization by utilizing advanced control strategies. It adjusts the operating parameters, such as compressor speed or pressure setpoints, to minimize energy consumption while meeting the required air demand. The ACM may also integrate with energy management systems or utility tariffs to take advantage of off-peak hours or preferential energy rates.

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