Jaaji Technologies

Sophistication with Simplicity

inSis Energy Monitoring System

Solution Overview

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Terminologies:

Jaajitech: Jaaji Software Technologies Private Limited, India (**Jaajitech**)

inSis®: Industrial Smart Information Systems from Jaajitech, India.

Jaaji Technologies®: Jaaji Software Technologies Private Limited, India (www.jaajitech.com)

EMS: Energy Management System

MIS & OI: Manufacturing Information System & Operational Intelligence

MES: Manufacturing Execution System

OIP: Operational Intelligence Platform

Process Historian: A time-series data base where the operations data are stored

Process Data Analytics: Provides actionable insights with the help of views which are a combination of Data, Calculations, Different Time Periods & Visualizations.

OPC: OLE for Process Control, a specification by OPC Foundation.

Modbus: A serial communication protocol for exchange of data between electronic devices

Process Control Systems: An automation system that is used to control process plants

DCS: Distributed Control System

Tag: An ID used to denote a process measurement in the Control System

KPI: Key Performance Indicator

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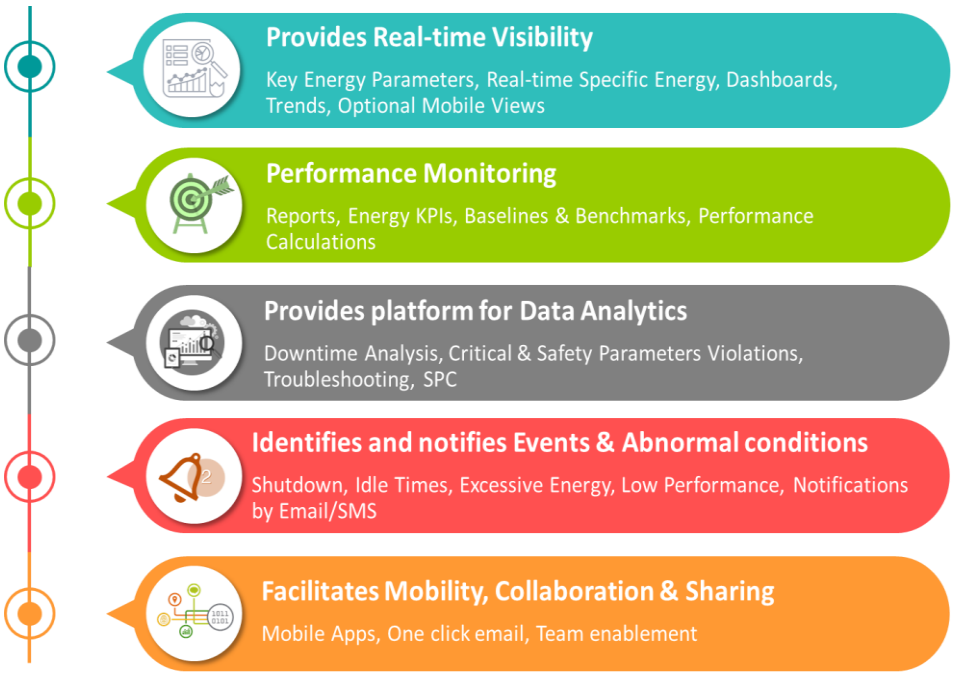
1. Solution Overview - Energy Management System

The Energy Management System is required for all Power Plants & Manufacturing Companies where the real-time energy consumption patterns are to be measured and monitored to minimise the consumption. inSis EMS collects the vital energy consumption information from the energy meters, relays, RTUs etc., on real-time basis. It stores this information and provides to users in the form of Analytics, Trends, Dashboards, Reports, Alerts etc. Further, the Energy KPIs are calculated online and used for monitoring the Energy Efficiency of Manufacturing Facility.

The Energy Management System is based on the sophisticated inSis Suite. Further the proposed EMS will communicate with energy meters to read and histories the real-time parameters and faults. inSis EMS forms as a central monitoring station for all the EMs for quick and easy monitoring and troubleshooting of the EMs.



1.1. Features of inSis EMS

Following are the major features of inSis Energy Management System,

1. **Self-service & Role-based Portal:** Users in the plant can access the role-based and Self-service portal to access information, analytics, trends, dashboards, reports, performance metrics etc.
   1.1. Real-time Monitoring of Energy consumption patterns is done easily using the portal.
   1.2. The portal is Role-based & Secured
2. **Data Analytics & Visualisations:** inSis EMS has built in Analytics platform to help analyse and troubleshoot energy related problems. It provides variety of Calculations, Metrics, Visualisations &

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Analysis Options. inSis EMS provides range of visualisation to best suited to every scenario of data representation.

3. **Real-time Trending:** View real-time & historical trends of Energy Values in browsers.
4. **Reports Scheduler:** Schedule Energy Reports and deliver them to directly to designated users by email
5. **Executive Dashboards:** The Dashboards help summarise the information for centralized view of Energy Patterns. The various levels of management can visualise the Energy Details quickly with help of Executive Dashboards.
6. **Drill down & Detail Views:** Drill down is provided in KPIs, Dashboards, PFDs, Analytics Views etc. Drill down and detail views are extensively supported throughout inSis Reports modules.
   - 6.1. **KPI Drill Down:** Based on the Status, Unit, Quality the KPIs are drilled down from top view to the process parameter that caused the variation in KPI Value. The drill downs are also based on Hourly, Daily, Weekly, Monthly and Yearly.
   - 6.2. **Drill-down of Dashboards**: Multiple drill downs can be configured within a Dashboard to navigate quickly to the point of interest.
   - 6.3. **Detail Views**: From Data Grids, dashboards, Analytics views etc., the variety of details views are available for process parameters like data tables, charts, trends, gauges etc.
7. **Data Collection & Processing:** inSis EMS Collects the Real-time Energy Data from Energy Meters, DCS, PLC/SCADA Systems, Data Acquisition System etc. It has built-in Support for Industry standard protocols like Modbus, OPC DA/UA/HDA, ODBC etc.
8. **Search & Find:** The KPIs, Metrics and Reports are easily searched and fetched.
9. **Unlimited History:** inSis EMS based on inSis Historian which provides unlimited amount of History of the Energy Meters Data. It uses the proprietary database for historization of Energy Data.
10. **Calculation Engine:** inSis EMS has built-in calculation engine which supports Complex Expressions. Variety of online calculations are configured to calculate them on real-time to meet various needs.
11. **MS Excel & Word Add-in:** Info view App for Excel & Word are new generation Add-Ins which will help to fetch and map the data to these applications. And it helps to fetch the latest data directly from the Excel & Work Applications.
12. **Mobile Access:** View real-time plant information, trends, and dashboards on mobiles/tablets
    - 12.1. Native Android App: The native app is free to download from Google Play Store. This App is comprehensive and seamlessly integrates with the Web-version of MIS Reports Automation.
    - 12.2. Hybrid Apps: inSis provides hybrid apps for iOS
    - 12.3. Mobile Views: The mobile enhanced responsive views are provided to support variety of Mobile and Tablet platforms. These views are seamlessly integrated with Web-version. These are accessed from any of the Mobile operating system like Android, iOS, Windows etc.
    - 12.4. Portability: inSis Suite provides device portability. The Views/Dashboards created in web are easily accessed in Mobile. There is NO need to create separate mobile Apps.
13. **Asset Performance Management (APM):** Configure the Assets of the Manufacturing facility, build KPIs, configure notification and monitor the Asset Performance.
    - 13.1. Asset Management: Helps to configure the Assets of Manufacturing Facility, Geo tag Assets and visualise the Assets with different hierarchy.

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13.2. KPI Management: Provides platform to build and manage KPIs for various equipment, sections or units etc. It helps to Measure and Analyse the performance of various Assets.

13.3. Event Notifications: Email/SMS/Web based Alert notifications can be configured for critical energy parameters based on conditions, abnormalities, performance degradations etc.

13.4. Performance & Event Discussions: The operations teams can collaborate online while resolving issues that are detected by APM.

13.5. Map View of Assets, KPIs & Notifications: Visualise the Assets on Map and see the live information of Assets, their KPIs and Notifications related to Assets.

14. **SLD Diagrams:** SLD Diagrams are configured to visualise the Energy Flows within various sections, units etc.
15. **Remote Monitoring**: Access the Energy Information remotely from anywhere from across the devices like Laptops, Mobiles & Tablets.
16. **Scrolling:** inSis Reports is based on web client-server technologies. So, the scrolling in web pages is fully supported. The scrolling is available in Dashboards, Views, Summaries etc. Also, paging in lists, scrolling in charts, zooming etc are supported thoroughly.
17. **Navigation:** inSis Reports features 3D Navigation. It is based on user configurable navigation paths. It provides a Tree View based Solution Browser on the left and Menu on the top of the viewing area. Both these Solution Browser and Menu are simply configured to achieve simple and effective navigation. Further, the navigation is configurable with drilldowns to enter into various information.
18. **Personalisation**: Each of the designated user can create their personalised View, Reports, Trends, Dashboards, Alerts etc.
19. **Sharing & Collaboration**: User can share the Views, Analysis details, Trends, Reports, Dashboards etc. to their colleagues. Also, they can download the information to Excel, PDF or directly send by email.
20. **Integration with Process Units:** inSis EMS can read the Process Data from the Control Systems of Process Units through variety of communication protocols like OPC DA/UA/HDA, Modbus, Relational Database, flat files etc. These data are then used to efficiently monitor the overall plant performance.
21. **Easy Configuration of new Meters**: Clients can configure new meters without any support from Jaajitech. The software offers flexible and intuitive interface to add new Gateways, Energy Meters, Views, Dashboards, KPIs, Notifications, Reports etc.
22. **NO Client Software Required**: The inSis EMS System is based on Web- technologies. The clients access the system using Web browsers. There is no need for installing any software on client computers.
23. **Logs, Events & Messages**: inSis EMS provides various Audit Trail features by means of Logs, Events & Messages. This help Administrators to manage, monitor & troubleshoot the system efficiently.
24. **Third-party OPC Data Connectivity**: inSis OPC UA provides the data to be read from inSis EMS system by the Third-party application.

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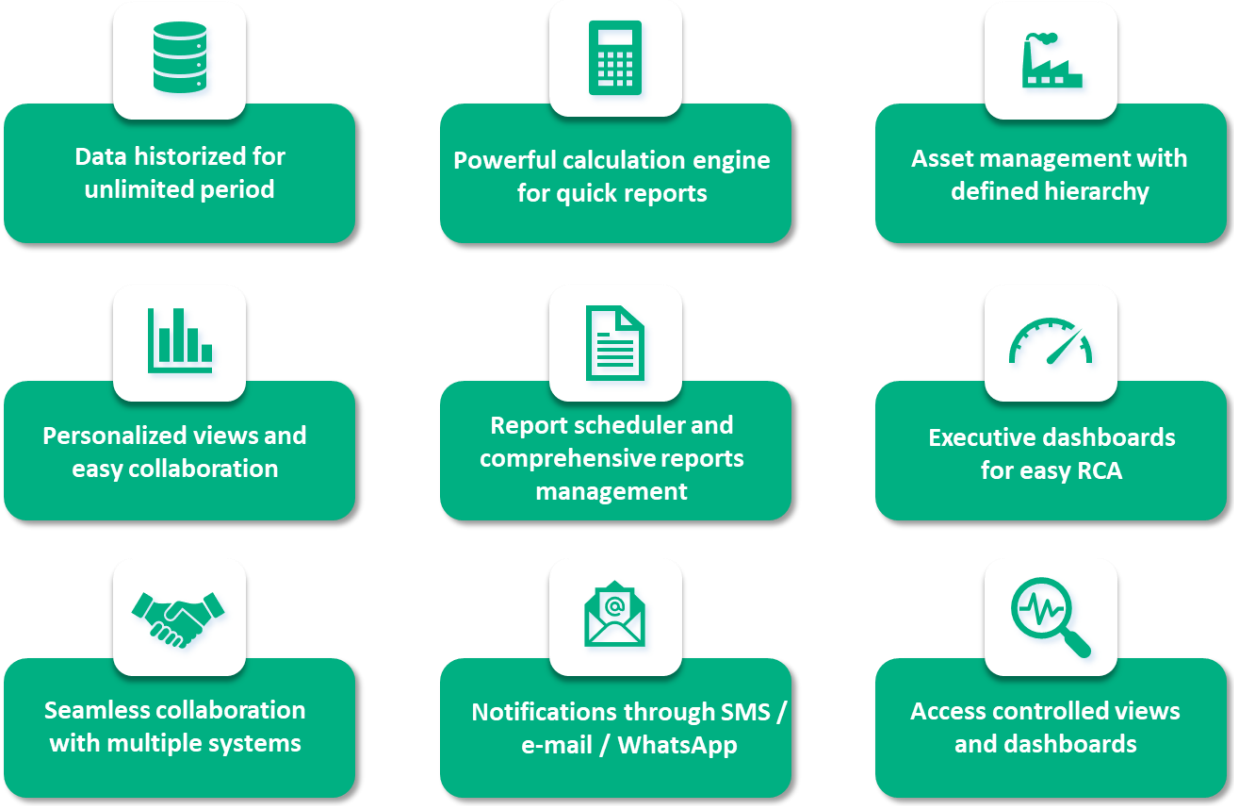

Figure: inSis Suite – Summary of Features

1.2. Benefits of EMS

Following are the major benefits of inSis Industry 4.0 Digital Solutions,

1. Reduces man-hours for data collection, calculations, and presentation by 80%
2. Reduces the time for troubleshoot process issues by 50%
3. Improves Safety by clear visibility of critical operational parameters across organization
4. My making the operations data available on Mobiles, the teams are seamlessly connected to plant which improves their productivity
5. Minimizes the energy consumption by 1 to 3% by providing the baselining and real-time visibility of performance metrics.
6. Provides deep insights to operations problems and constraints with on-the-fly calculations, metrics, and Self-Service Analytic capabilities.
7. Improves the ease & efficiency of Process Monitoring
8. Analytics with Metrics enables better and faster decision-making, increased productivity, and reduced costs.
9. Makes plant operations information easily accessible to all of teams across devices.

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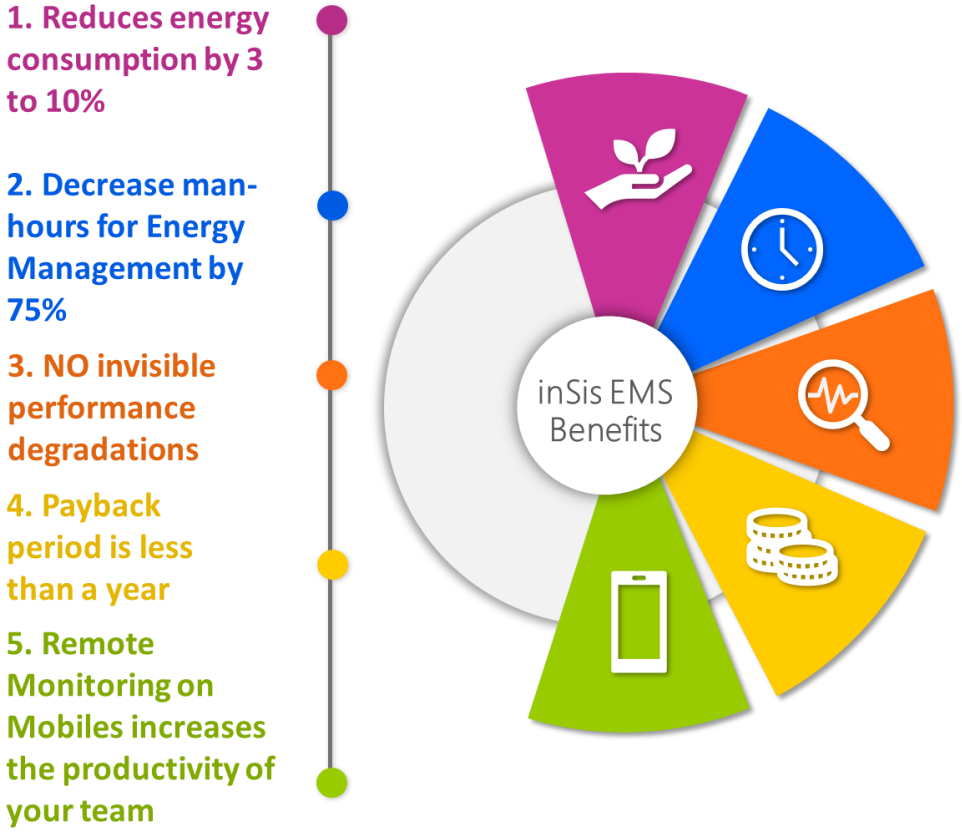

1.3. Typical Parameters read from Energy Meters

All the parameters available in the Energy Meters can be configured to be read by the inSis EMS. Following are the typical Parameters that are read from the Energy Meters:

1. Voltage_Rph, Voltage_Yph, Voltage_Bph
2. Current_Rph, Current_Yph, Current_Bph
3. Current_I0
4. Frequency
5. PowerFactor
6. ActivePower
7. ApparentPower
8. ReactivePower
9. Active Energy
10. Apparent Energy
11. Reactive Energy

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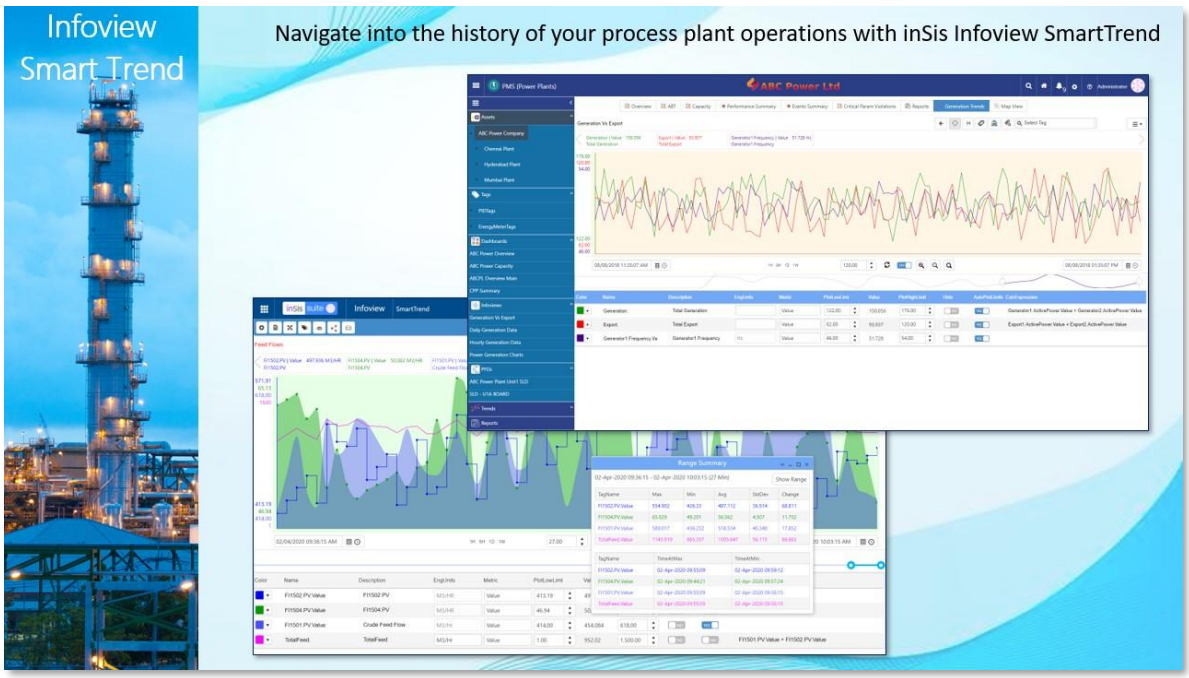
1.3.1. Smart Trend

inSis Infoview SmartTrend provides a rich, fast and intuitive user interface for trending various process parameters. The SmartTrend is based on HTML5 and is light weight. The SmartTrend App helps plant engineers to see the historical trends of operating parameters of all the units of their plant from their computer browsers. Any parameter can be trended with any parameter within the manufacturing facility. The SmartTrend is comprehensive Process Trending tool the helps operations and process teams to explore the historical trends of years of manufacturing operations data.



It has the following features,

- Web-based, Intuitive & User-friendly Process Tending application which has Client Server based architecture.
- Visualize the real-time and historical process trends of multiple tags
- Provides features like Zoom, Crosshairs, Quick Periods, Slider Bar, etc for quick viewing of process trends
- Range Summary Analysis help to quickly identify patterns
- Personalization & Collaboration
  - Create Trends, mark them favorite & share with teams
  - Send by email,
  - Export to PDF/PNG,
  - Export Trend Data to Excel etc.
- Comments and Contextual Visualisation
- Plot Area Customisations, Series Customisations, Axis Customisations etc.

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- Change every aspect of the trend like, series types, colors, lines, ranges etc. and save it to access it elsewhere.
- Trend the normal tags, Calculated tags and Metrics together
- Simply slide to navigate in history, quickly select data periods, change ranges, select series types and visuals, everything reflects real-time.

1.4. Self-Service & Role-based Portal

Users in the Plant and HQ can access self-service portal to access Real-time Operations Information, Analytics, Trends, Dashboards, Reports, KPIs, Events, Performance Metrics etc. The Role-based visualisation helps to provide the right information to the right people at right time. With personalisation & collaboration features, this portal becomes the single window for operational excellence tools. The system provides an environment based on real-time data monitoring, analysis and faster decision making, creating a performance management culture where intervention occurs before incidents, maintaining predictability and transparency in all aspects (proactive approach more than being reactive)

1.5. Data Visualization

Data Visualization functionality is provided by inSis Infoview & Oneview. inSis Infoview is a Self-service Process Data Analytics platform that helps various teams to convert the data into a meaningful information. Infoview collects and historize the process operation data from DCS, SCADA, Third-party Information Systems and other Control Systems. These data are made available to users across the devices like Computer, Mobiles and Tablets. inSis Oneview is a Self-service, Role-based and Interactive Dashboards solutions. Variety of widgets ranging from Analytics Widgets, SQL Widgets, Rich-text Widgets, Process Flow Diagrams Widgets etc. Data Visualisation Layer consists of following aspects,

1. Role based Dashboards
    a. Executive Dashboards
    b. Energy Dashboards
    c. Production Dashboards
    d. Safety Dashboards

2. Realtime & Historical Trends for,
    a. Process Data
    b. Tank Farm Data
    c. Utilities Data
    d. Laboratory Data
    e. Energy Data
    f. Environment Data
3. Summary Charts

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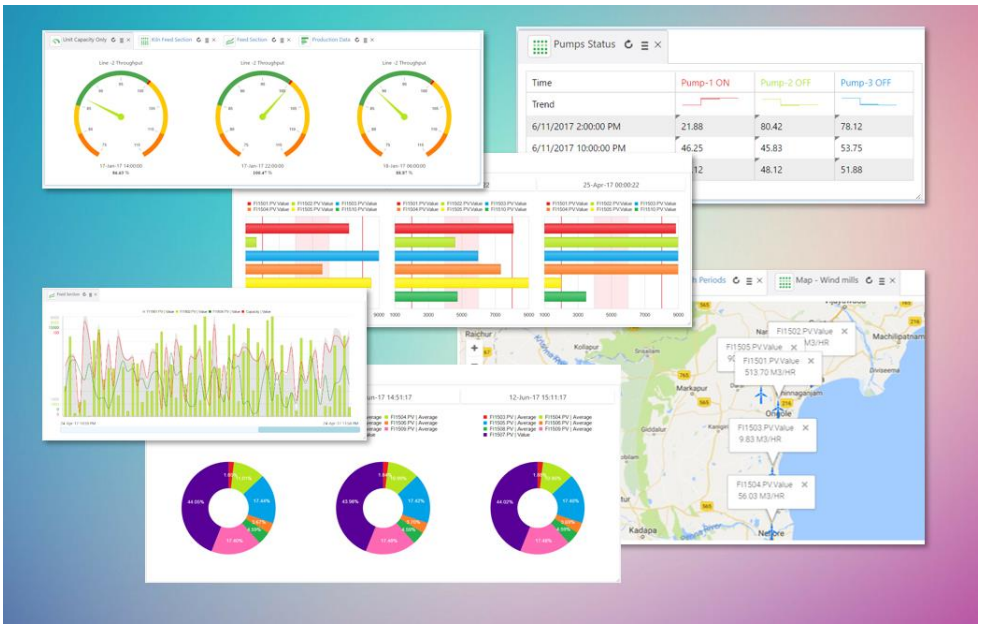

1.5.1. Dashboards

inSis Oneview provides Self-services, Interactive and role-based dashboards. It has two modules, Dashboard builder and Dashboard Viewer.

Self-Service Dashboards: With Self-service Dashboards, Process Engineers and Managers can create their own dashboards without any support from IT departments.

Interactive Dashboards: The Dashboard's widgets support interactivity to dynamically adjust the query settings to get more detailed information of your process.

Real-time Dashboards: The Dashboards provide live data of your process plants. Further, the performance metrics are calculated live and presented in real-time.

Role-based Dashboards: Oneview supports completed control on who can access which information and who can modify which views with comprehensive User and Access Control Management.

Following are the salient features of Dashboards Modules,

- Self-service, Secure, Real-time & Role-based
  - Technical team manages dashboards, i.e., create, modify, share
- Drill-down & details views for interactive analytics
- Four types of Widgets & Wide range of visualizations
  - Analytics Widget, SQL Widget, PFD Widget & RichText Widget
- Dashboard Builder and Viewer
- Special Widgets like, Master-Detail Widgets, Tabbed Widget etc.
- Device portability – Automatically access the dashboards in mobiles

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- View multiple Dashboards in tabs, full-screen view, embed in other Apps etc.
- Distinct, merged and the free layout dashboard items.
- Simple and easy Calculations, aggregations & Metrics
- Personalization, Share & Collaborate
  - Create own dashboards, manage the lists, and share with team to collaborate
  - Send by Email, Download as PDF etc.
- Template Dashboards
- Global Start & End Times

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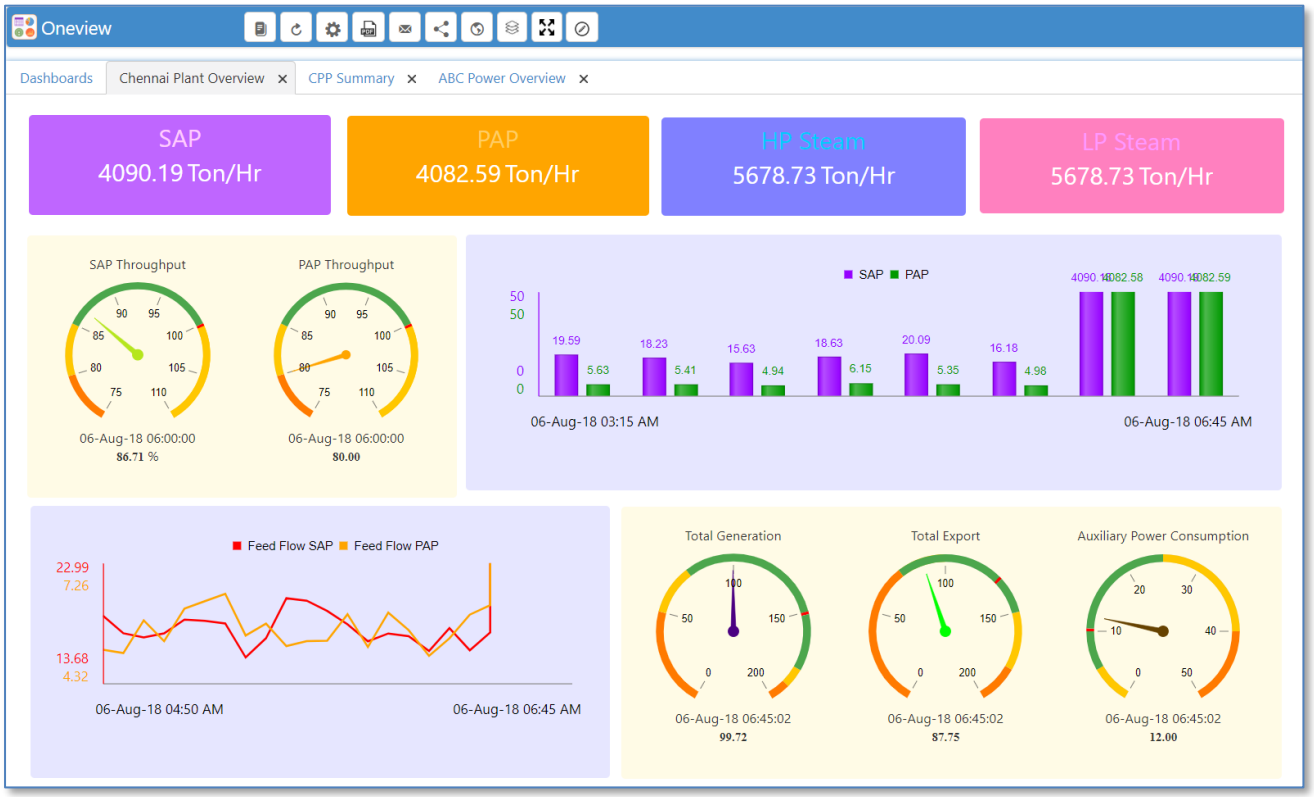
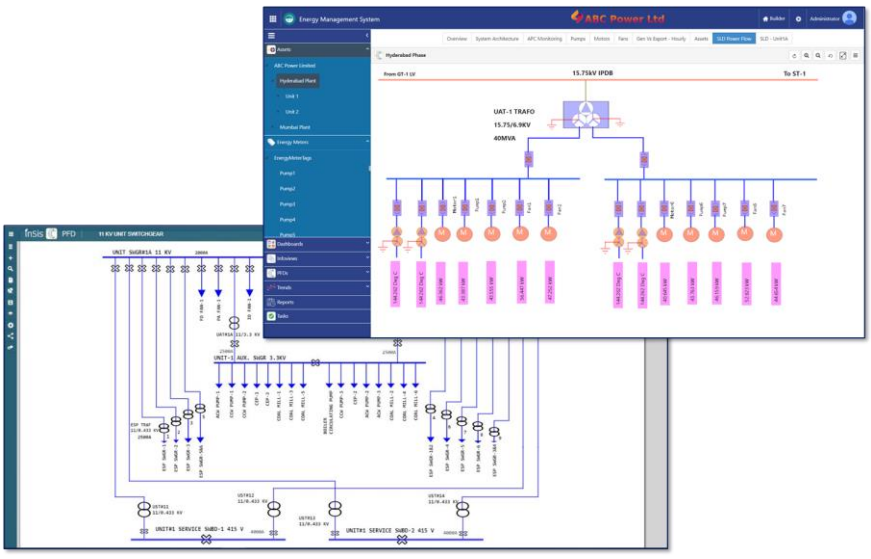


1.5.2. Graphics

inSis PFD provides process graphics to be monitored remotely. It has two modules, PFD Builder and PFD Viewer. PFD Builder is used to configure various process graphics and PFD Viewer is used to monitor these graphics in real-time as well as with Historical Data.



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1.5.3. Office Apps

INSIS MIS & OI solution provides Add-ins for mapping the various operations data into Excel including the raw as well as processed data like Operations Data, KPIs Data, Reports Data etc. Following are the key aspects of Office Apps,

- The Infoview App for MS Office
  - Excel & Word
- Prepare Excel/Word based reports & schedule for auto-generation & delivery by email.
- Seamless Integration with Web
- Local Mappings
  - Map Infoview to Cells
  - Use data for your calculations
- Auto Update Data
- Embedded Tag Search
- Excel WebApp Visibility

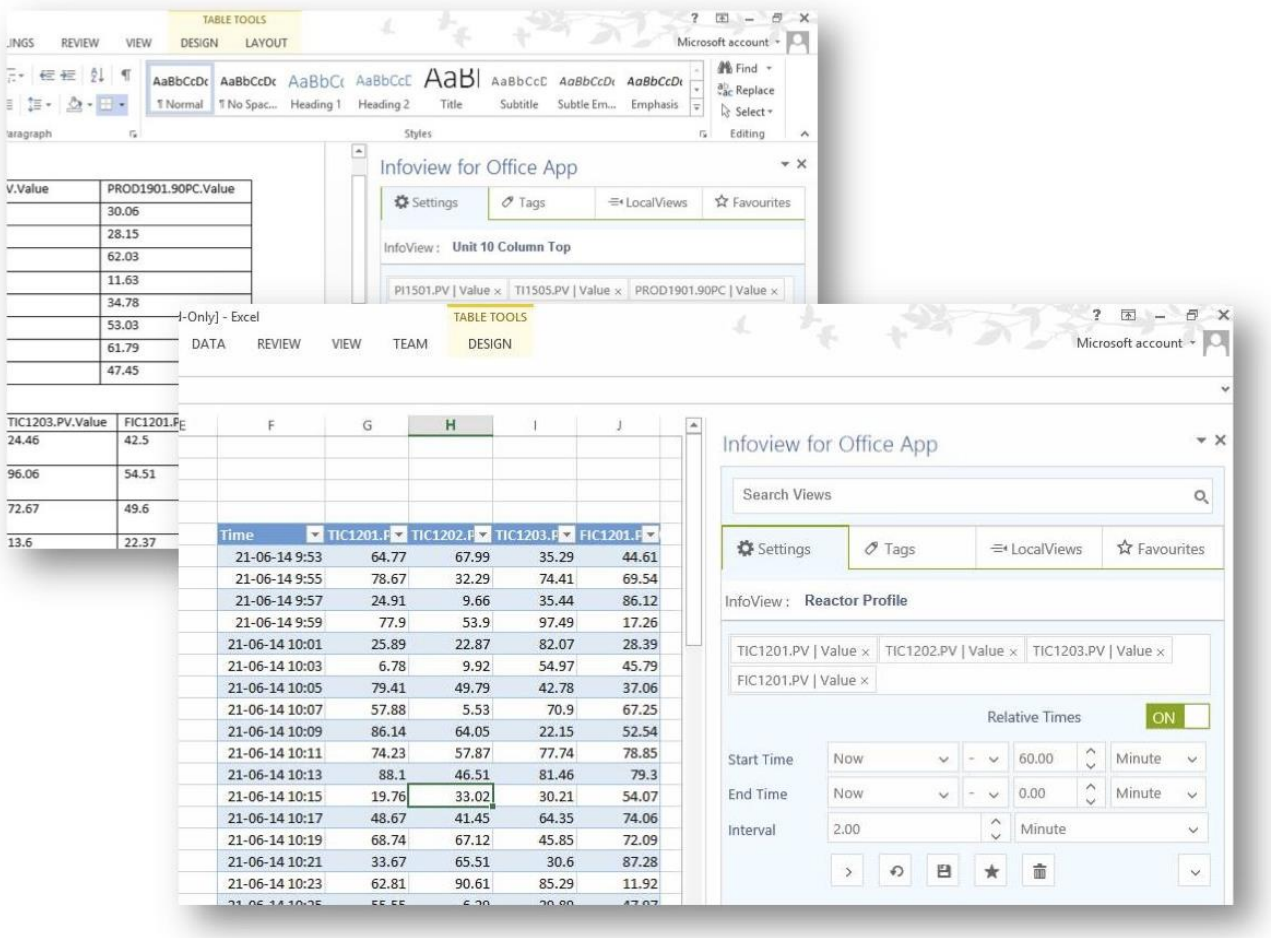

Figure: Office Apps

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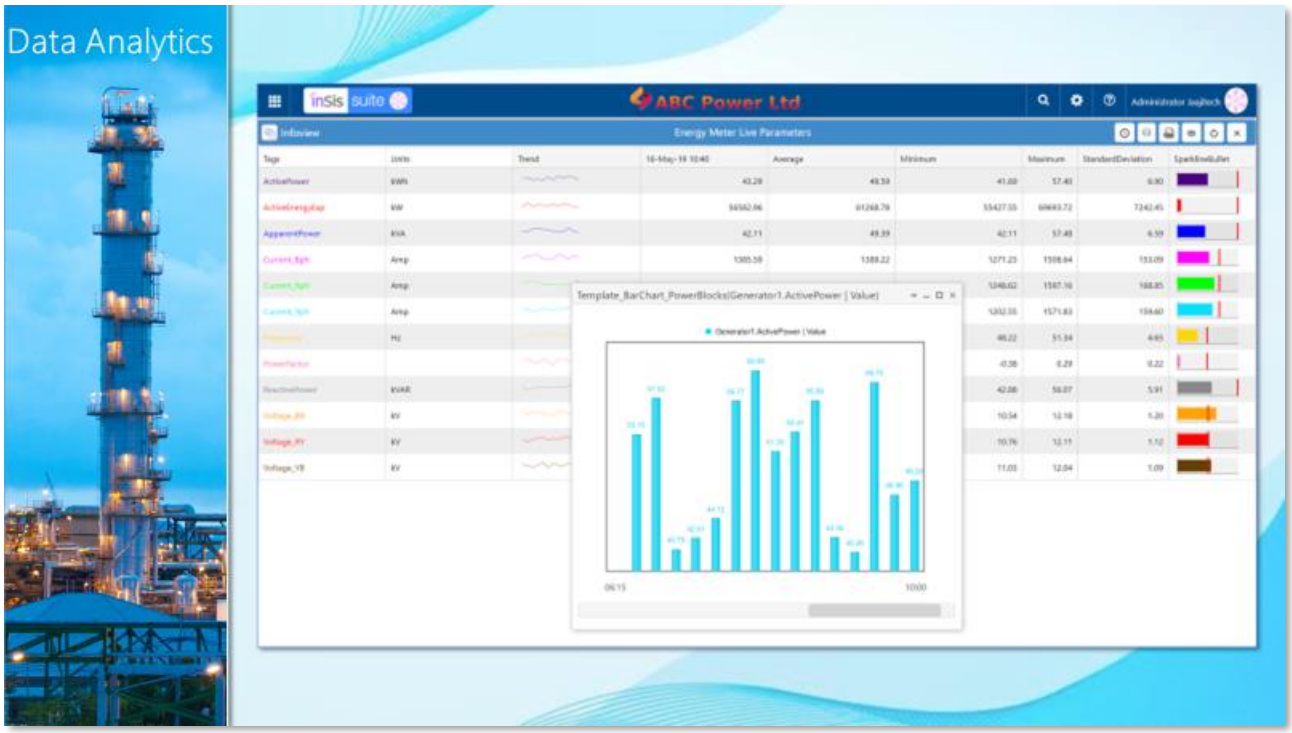

1.6. Data Analytics & Decision Support Tools

Providing the actionable insights is the key aspect of this module. inSis Data Analytics Platform provides wide range of tools to provide the insights in to process operations and enable take quick decisions.

Following are the major aspects of this modules,

1. Process Data Analytics that Provide Actionable Insights
2. Real-time Process Trends
3. Statistical Summaries
4. Built-in Data Analysis Tools

Following are various major Built-in Analytics options,

1. SPC - Histograms
2. SPC - Control Charts
3. Conditional Times Analysis
4. Change Period Analysis
5. Tag group Analysis - by Status and Enumerated
6. Statistical Summaries
7. Conditional Show/Hide
8. Calculation Engine

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9. Critical Param Violations
10. Multiple Period Analysis - Merge Views
11. Smart Trend
12. Various Visualisations
13. Box plots
14. XY Plot
15. Metrics

1.6.1. Calculation Engine

Currently these reports that are part of this project, has numerous calculations configured with-in Excel. While migrating these reports to inSis Reports platform, the calculation engine is used to easily configure these expressions. The Calculation Engine provides easy and flexible platform for configuring expressions in simple form without any software coding. Further, it provides the data mapping and processing of input and output variables. inSis Calculation Engine is used to easily configure complex expressions in a simple way without any coding. Further it provides the data mapping and processing of input and output variables.

1. Build in functions
2. Ability to verify the status and value of every tag and expression quickly
3. Auto tag suggestions
4. Ability to configure Ad-hoc calculation Tags

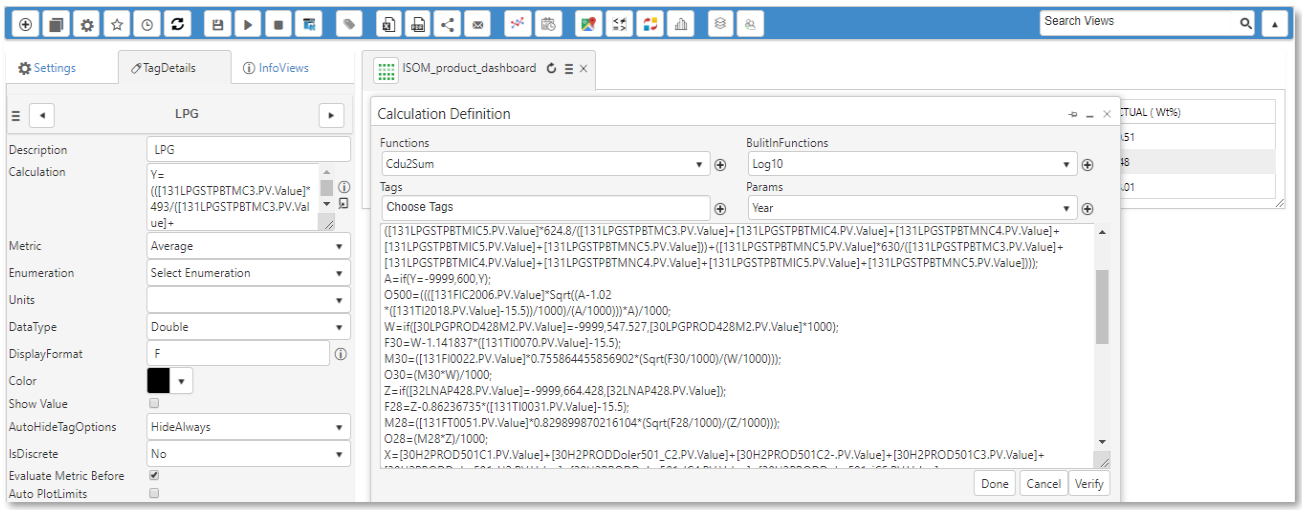

Figure: Calculation Engine

1.7. Asset Performance Management

inSis ProSense provides greater visibility in the Assets and their Performance by connecting the data and business function. It continuously monitors the Asset activities and identifies the abnormalities and provides insights into the Asset reliability, performance & profitability.

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The KPIs are grouped, categorized, and monitored against the Targets and Benchmarks. KPI Panels, Bars and Dashboards help in analysing the Asset performance. Further, the KPI Analytics help in troubleshooting the Performance Issues & help quickly take corrective action. The Key Performance Indicators (KPIs) of the assets are configured using complex expressions. ProSense evaluates these KPIs by fetching the real-time data from inSis Core system. The KPIs are grouped, categories and monitored efficiently.
System monitors the Process continuously for any abnormal conditions, performance degradations and possible issues. Sensing the Process Conditions to detect the Performance and Operational issues is the core functionality of inSis ProSense. The issues/abnormalities are then notified by Web/Email/SMS to the designated personnel for taking corrective actions. Further, these issues/abnormalities are escalated to Middle and Top management when the corrective actions are not taken in timely manner. This reduces the efforts of Process Engineers & Managers in their day-to-day Process Monitoring activities as this process is largely automated. Further, these notifications are grouped, categorized and personalized for effective addressing of performance issues.

Manage the Assets of your Manufacturing Facilities across the globe with Asset Framework Module of inSis ProSense. Asset Structures, Properties & View Templates help in monitoring the Key Operating Parameters and Performance Indicators of your assets quickly. The GeoTagging of Assets feature in ProSense will help monitoring in Assets in Map for easy and convenient visualization of Assets and their performance. The Asset Browsers for summarizing the KPIs and Notifications are handy to quickly glance the troublesome assets and quickly take corrective actions. The Asset Model of your entire corporate can be built into the system.

- KPI Management
  - Create KPIs using complex calculations.
  - Categories, Types, Targets & Bench Marking, Performance Statuses
  - KPI Summaries & KPI Dashboards
- Event Notifications
  - Define Events Detection Method using complex expressions.
  - Notifications by Web, Email & SMS
  - Event Summaries & Event Dashboards
  - Escalations

- Asset Management
  - Asset Framework
  - Geo Tagging
- Collaborative Platform for Asset based discussion and Tasks

“The performance that is measured, will be monitored. The performance that is monitored, will be controlled. Unless the performance metrics are measured, it is impossible to control and improve”

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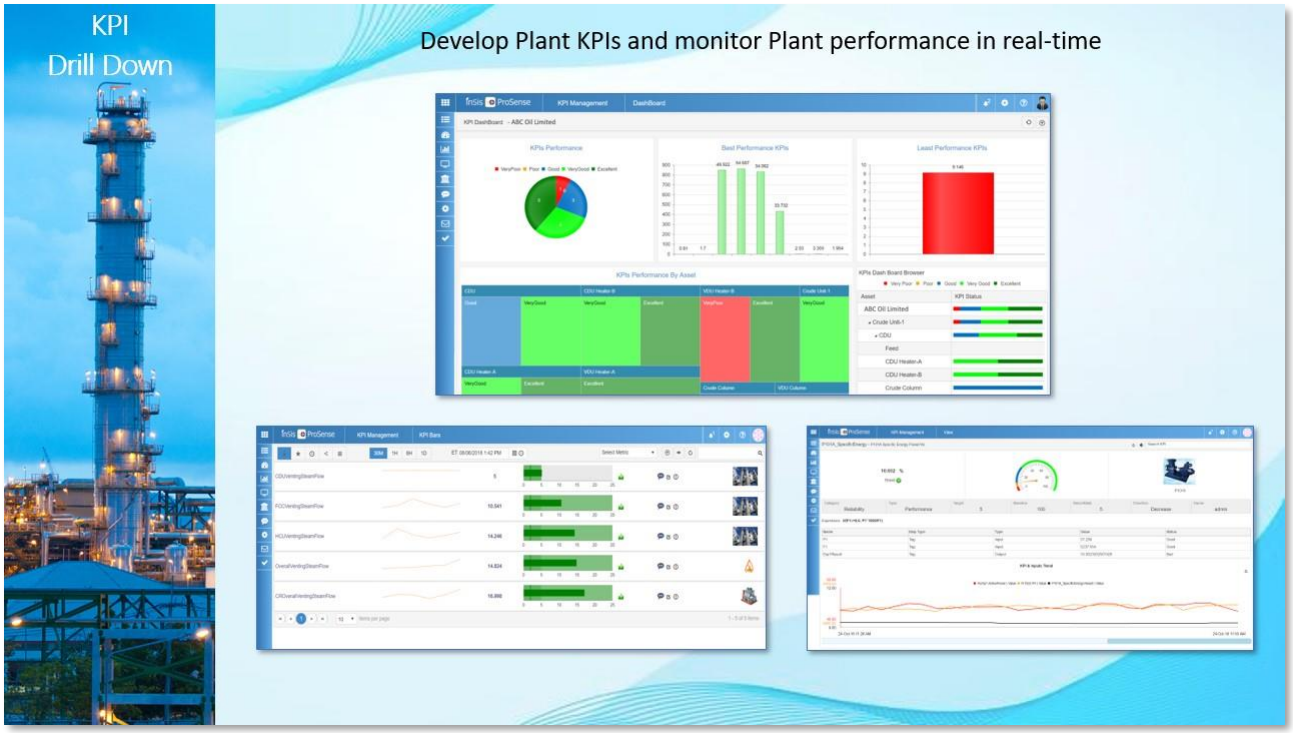

Figure: KPI Summary Dashboard & Drill-down to find root-cause of performance issues

1.8. Mobility

The mobility module provides the access to Data Analytics & Reports over the mobiles & tablets. This will enhance the interaction of various teams and increase the overall efficiency of operations by reducing the time to access the right data at right time. Following are provides as part of this module,

1. Real-time Analytics on Mobile
2. Operational Trends on Mobile
3. Executive Dashboards on Mobile
4. Reports on Mobile

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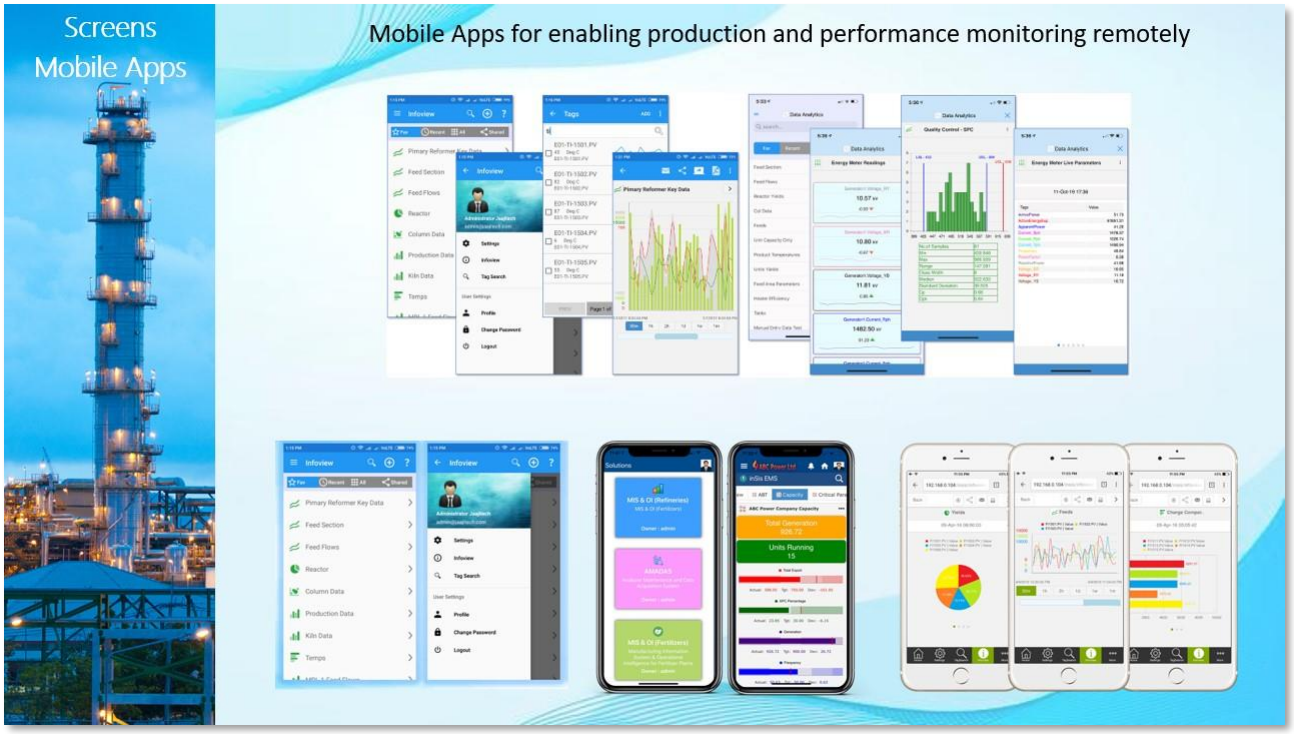

Figure: Mobile Apps

There are two types of Mobile Applications,

1. Native Apps - Android & iOS Apps
2. Mobile Views based on Browsers (Works for all mobiles)

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Figure: Mobile Apps – Summary

1.9. Data Source Integration (DSI) & Data Historian

The Data Integration Layer is base for the proposed Solution. It has variety of built-in Data Adapters to fetch the Real-time data from various PLC/SCADA/DCS/ Historians/MES & MOM Databases/Data Files/Web-API and any other Control Systems. The system will collect the Operations data from the existing IP21 Historian and DCS Systems through appropriate interfaces. inSis DSI supports both read and write to the control systems/Data Sources. Following are the built-in Interfaces available in inSis DSI,

1. OPC DA/UA/HDA
2. Modbus RTU/Modbus TCP
3. Relational Databases connectivity like MS SQL/Oracle/ODBC/OLEDB etc.
4. File Interfaces for CSV/TXT/Excel etc.
5. Custom IP21 Connectivity

Data Validation & Data Processing:

As the data are fetched, various options are provided to validate and process the raw data before it is being used elsewhere. Following are few built-in Validation and Data Processing Options,

1. Bad Data Check
2. Outlier Check
3. Exponential Filters
4. Scaling Factors
5. Data Mapping
6. Data Calculations (See Calculation Engine)

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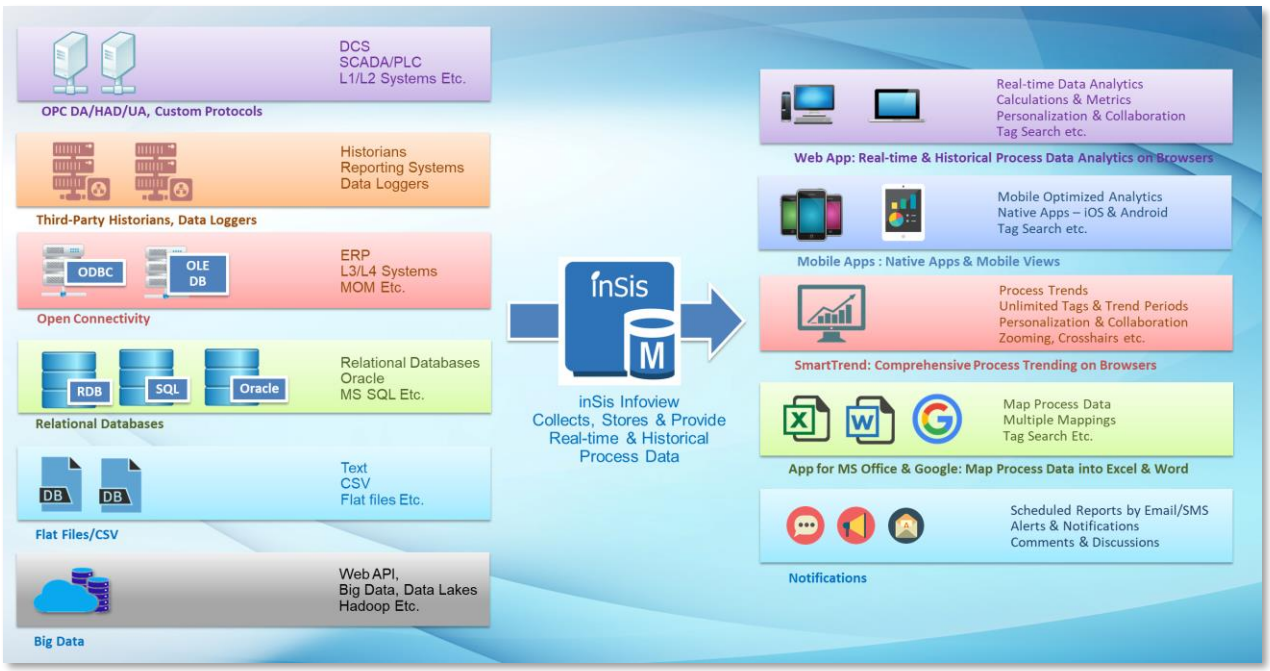
Process Data Historian:

Process Data Historian Software collects the Real-time Plant Data from various Systems and stores these data for unlimited period of time. These data are then provided to clients from across devices and across platforms.



Following are few features of inSis Infoview Historian,

- Collects Real-time Process Data from
  - Control Systems like DCS, SCADA, PLC, ECS, etc.
  - L3 & L4 Layer Solutions like LIMS, ERP/SAP, MOM, etc.
  - IOT Devices, M2M Technologies etc.
  - Existing Historians like PI, IP21 etc.
  - Relations Databases like Oracle, MS SQL, MySQL etc.
  - Flat Files like .txt, .csv etc.
- Stores these Process Data in inSis Server for unlimited period
- Provides Tools/Apps to retrieve these Historical Data
  - Across the Devices like Desktops/Laptops/Mobiles/Tablets
  - Across Platforms like Browsers, MS Office, Mobile Native Apps, Cloud Apps etc.
- Also, provides data to various applications of,
  - Manufacturing Execution Systems (MES)
  - Manufacturing Information Technologies (MIT)

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Big Data Connect:

inSis provides a Quick connect to Big Data platforms like Hadoop. It also provides the Data Analytics for Big Data.

1.10. Reports Automation & Management

inSis Reports Platform provides comprehensive platform for managing reports in various modes and processes as per the following,

1. **On Demand Reports:** The reports are viewed on-demand as per the requirements of user. The user selects required Reporting periods to view, share and download the required Report. The reports are generated on when the first-time users run the report. From next time onwards, the previously run report will be displayed.
2. **Scheduled Reports:** The reports are scheduled to be run at desired time and at desired frequency. At the scheduled time, the reports are generated and saved in XML/PDF formats. Optionally, the reports are configured to be delivered by email.
3. **Workflow based Reports:** In this process reports are generated and approved using workflow.

In all cases, the historical reports are easily navigated, viewed, interacted, shared and downloaded using web based inSis Report Viewer.

Reports Management Process in inSis Reports:

1. Process Engineer or production personnel cconfigures the Report using Report Builder and is approved by respective managers. These reports are then shared with respective end-users.
2. As per the schedule, Process Engineer will open the report in Report Viewer. Selects the appropriate Dates and Times for the reporting period. Then, runs the report. The report is then populated with Data and Calculated results.
3. Process Engineer checks the Raw Data & Calculation Results Validity. inSis Reports provides Visual indications for the bad/outlier data. Process engineer modifies the data as required. Further, he enters the comments appropriately and submits for Review by appropriate line managers.
4. Line Mangers will approve the reports. He/She will also correct report as required. Once approved, the report can be published by Process Engineer.
5. The published Reports are then viewed by end-users which are shared the respective report.
6. The report is ether PDF or online interactive report with drilldowns and details views.

Reports module provides the comprehensive platform for building, generating, and publishing the reports. Following are the key features of Reports Module,

- Web-based reports Building & Viewing software
- Self-service, flexible, and user-friendly reports building & generation
- Intuitive UI & configurable Reports Layout

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- Data Integration & Processing
- Rich Visualizations
- Drilldowns
- Reports scheduling, Email delivery
- Reports viewing integration & Download

Figure 1: inSis Reports Automation Platform

1.11. Personalisation & Collaboration of Teams

The personal home page helps users to configure the information that is relevant to them so that the same is quickly accessed. It also provides one space for managing all the personal content. As the actionable items are identified, this module provides the necessary tools to collaborate with teams to share the information. Following are key aspects of this module,

1. Personalisation
2. Online Share of Views
    a. With/Without Edit Option
3. Comments
4. Quick share by email
5. Export to Excel, Export to PDF

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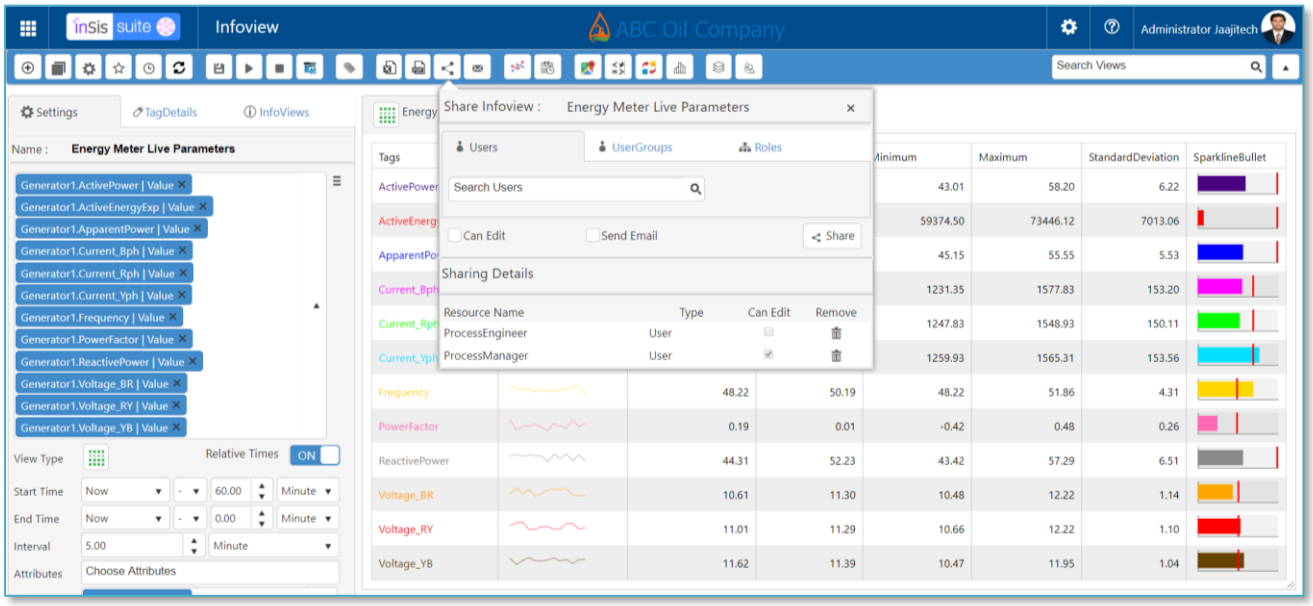

Figure: Collaboration & Share

1.12. Personal Home for Every User

All users of the system will have a personalised home page wherein the end users can manage their essential operations data for quick access. Following are few features of Personal Home,

- Personalized Home Layout
- Personal Shortcuts
- Profile Management
- Personal On-load content, Quick Search
- Personal Theme, App Links

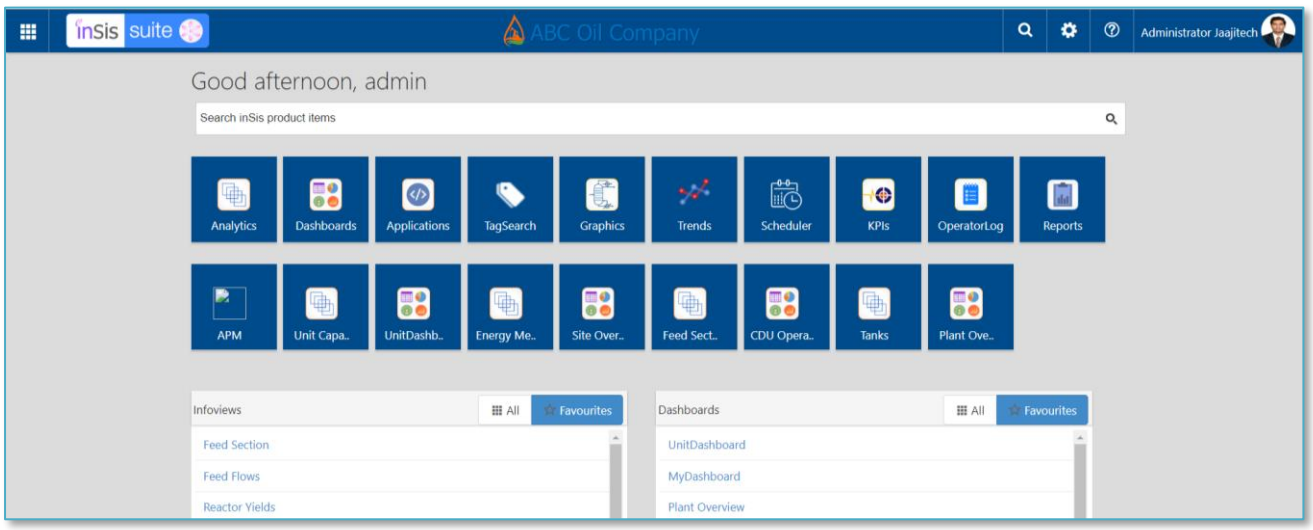

Figure: Personal Home

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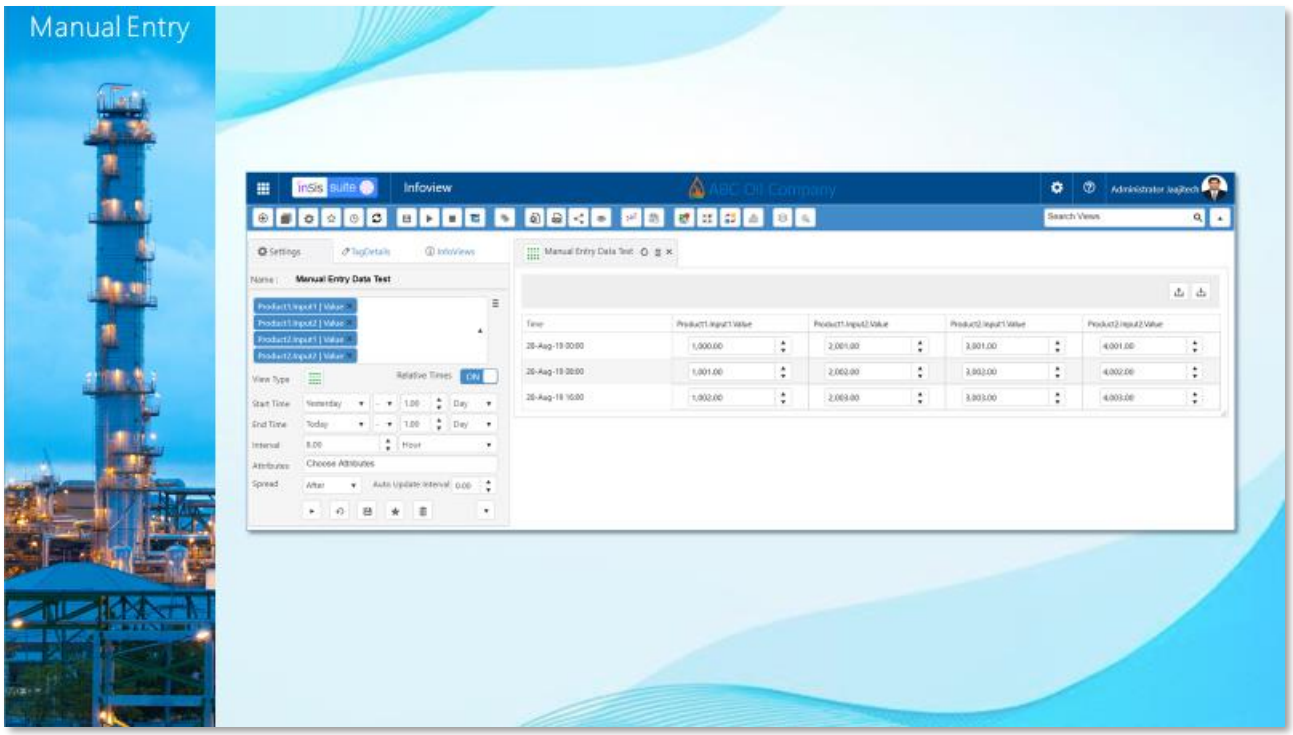
1.13. Manual Data Entry Module

There are several Manual Data that are to be entered manually in order to complete these reports. inSis Reports provides a flexible and user configurable Manual Entry Forms. These forms are used to enter the respective manual data. Further these forms are shared with other teams so that these manual data are collected from across the teams using the online manual entry forms. Following are key aspects of Manual Entry module,

1. User Defined Manual Forms
2. Multiple Data Entry
3. Upload using Excel
4. Group Edit



1.14. Notifications Scheduler

MIS & OU Features a Scheduler module wherein user can create self-service notifications for critical parameters by Email and SMS. Following are the few aspects of Scheduler Module,

- Send Daily/Shift Production & Key process parameters by Email/SMS
- Self-Service: No support required from IT
- Scheduled SMS
    - Free formatting

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- Scheduled Email
  - HTML Reports & Embedded Infoview
- Scheduled Excel Report
  - Report by Email Delivery
  - Infoview Data Mapping to Excel

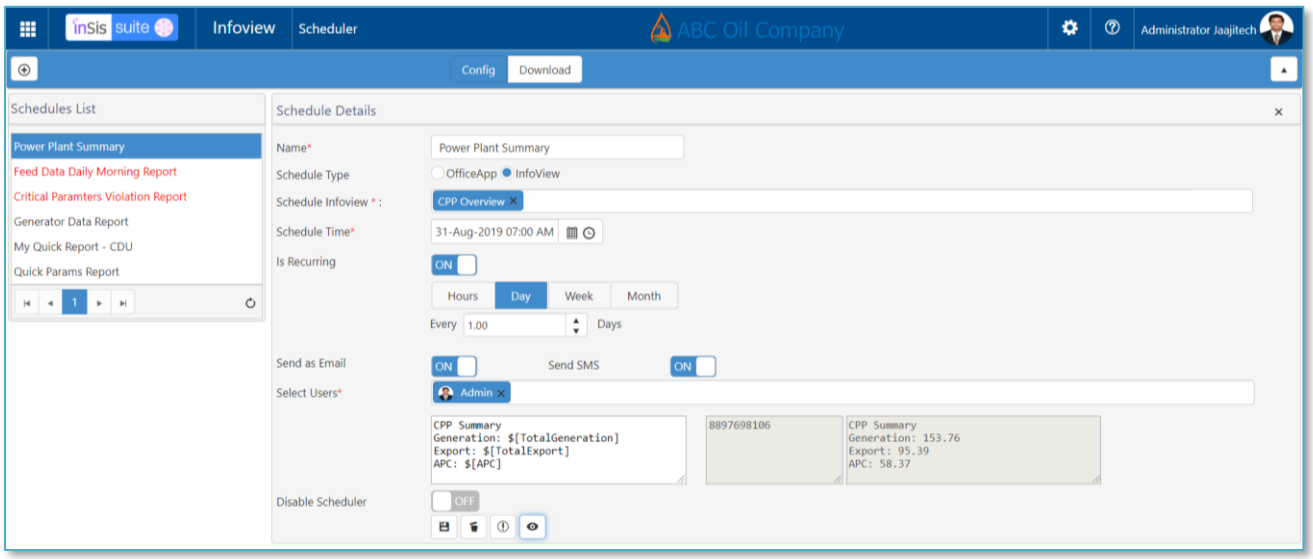

Figure: Self-service Scheduler for Notifications

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ABC COMPANY LIMITED PHASE-1 SUMMARY SHEET FOR APC CALCULATION											
		Value		Unit	Total Auxiliary Power Consumption= Total Generation-Net Export				0.27	MU	
Total Generation		2.22		MU							
Net Export		1.95		MU	Total Auxiliary Power Consumption in %				12.18%		
Net Import		0.00		MU							
Date_Time	Block No	GEN-1	GEN-2	GT-1	GT-2	UAT-1	UAT-2	ST-1	ST-2	LINE-1	LINE-2
		Values in MW									
6/9/2017 0:15	1	0	141.46	29.91	-865.43	-0.19	-9.88	-2.86	-2.28	62.04	64.33
6/9/2017 2:45	11	0	143.3	29.24	-878.77	-0.19	-9.36	-2.57	-2.3	63.32	65.68
6/9/2017 3:00	12	0	143.87	28.45	-868.5	-0.19	-9.32	-2.65	-2.28	63.55	65.9
6/9/2017 8:30	34	0	74.09	27.96	-447.36	-0.18	-5.83	-2.5	-1.29	31.91	32.47
6/9/2017 8:45	35	0	74.29	25.59	-446.63	-0.18	-5.92	-2.36	-1.19	32.03	32.57
6/9/2017 9:00	36	0	74.12	28.36	-444.9	-0.18	-5.93	-2.43	-1.24	32	32.44
6/9/2017 9:15	37	0	74.25	26.63	-446.15	-0.17	-5.93	-2.38	-1.53	31.84	32.35
6/9/2017 9:30	38	0	74.19	28.52	-446.69	-0.2	-5.91	-2.5	-1.46	31.76	32.31
6/9/2017 9:45	39	0	74.29	29.2	-445.03	-0.21	-5.92	-2.46	-1.38	31.94	32.44
6/9/2017 10:00	40	0	74.34	27.68	-444.03	-0.2	-5.99	-2.5	-1.43	31.87	32.28
6/9/2017 10:15	41	0	74.25	27.65	-442.86	-0.2	-5.99	-2.45	-1.5	31.9	32.23
6/9/2017 10:30	42	0	74.28	26.49	-438.54	-0.2	-6.01	-2.42	-1.54	31.89	32.23
6/9/2017 10:45	43	0	74.18	27.61	-439.49	-0.21	-6.04	-2.41	-1.55	31.8	32.16
6/9/2017 11:00	44	0	74.08	27.68	-445.33	-0.2	-6.06	-2.43	-1.58	31.76	32.31
6/9/2017 11:15	45	0	74.01	24.68	-442.12	-0.21	-6.04	-2.42	-1.57	31.58	32.18
6/9/2017 11:30	46	0	74.1	26.26	-446.23	-0.21	-6.02	-2.41	-1.5	31.72	32.27
6/9/2017 11:45	47	0	74.13	30.07	-443.31	-0.2	-6.01	-2.62	-1.44	31.68	32.3
6/9/2017 12:00	48	0	74.2	28.69	-444.02	-0.2	-6.07	-2.65	-1.53	31.73	32.18
6/9/2017 12:15	49	0	74.23	27.64	-440.97	-0.21	-6.09	-2.62	-1.42	31.74	32.17
6/9/2017 12:30	50	0	74.16	29.88	-444.92	-0.2	-6.08	-2.64	-1.48	31.74	32.19
6/9/2017 12:45	51	0	74.03	29.24	-439.16	-0.21	-6.1	-2.6	-1.37	31.7	32.13
6/9/2017 13:00	52	0	74.08	27.22	-444.72	-0.21	-6.11	-2.53	-1.34	31.82	32.15
6/9/2017 19:15	77	0	143.46	26.07	-872.15	-0.18	-9.44	-2.49	-2.98	63.03	65.28
6/9/2017 19:30	78	0	143.68	27.98	-866.32	-0.17	-9.34	-2.55	-2.94	63.89	66.26
6/9/2017 23:45	95	0	140.93	26.43	-862.13	-0.18	-9.29	-2.58	-2.53	62.11	64.29
6/10/2017 0:00	96	0	139.54	26.71	-862.79	-0.18	-9.34	-2.56	-2.48	61.44	63.66
Average		0	92.52077	27.76308	-558.021	-0.19462	-6.92385	-2.52269	-1.73577	40.14577	41.10615
Minimum		0	74.01	24.68	-878.77	-0.21	-9.44	-2.65	-2.98	31.58	32.13
Maximum		0	143.87	30.07	-438.54	-0.17	-5.83	-2.36	-1.19	63.89	66.26

Figure: Excel Report using Infoview App for Excel

1.15. Security & Role-based Visualization

All the products of inSis Suite are fully secured and based on configurable access permissions. The various Apps of inSis Suite implement thorough security for accessing the content and various features. inSis Suite supports Role-based Visualization.

Active Directory Integration:

inSis Suite has built-in connectivity with Active Directory so that the Users can be easily added in to inSis System directly from AD. Also, the authentication is done using the Active Directory.

System supports parallel authentication using Active Directory and Form authentication for supporting the Mobile Apps and accessing the inSis System from outside the corporate networks.

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Cybersecurity:

By using the Microsoft Azure Cloud, we provide the reliable, secure and robust cloud solution. Further the securing provided by Application software as per the following,

The application security is Forms based security of Windows Active Directory based security. In both cases, the security model implements the following,

1. Users
2. User Groups
3. Roles
4. And Privileges

Users: User are created by Administrator for each of the person who is intended to access inSis Suite. Each User has various details like Password, email, phone etc. User can change their password and manage their profiles after login. When a new user is created, by simply assigning to appropriate User Group, his access is controlled.

User Groups: A User Group is configured for similar type of users i.e., Process Engineers, Production Engineers, Process Managers etc. The Roles are assigned to the User Groups.

Roles: By default, there are Administrators, Engineers, Operators & View Only roles. The privileges for each of these roles are pre-configured. However, these privileges can be modified by the Administrator.

Privileges: The privileges are fixed which define the accessibility and specific activity in the application, i.e., accessing an overview, or creating a dashboard etc.

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Login Process:

inSis Suite is accessed through Web-browsers, Office Apps and Android Apps wherever applicable. In all scenarios, the user shall authenticate before proceeding further.

- **Credentials:** The login process required providing a valid credentials.
- **Encryption:** The passwords are encrypted while passing over to Server for validation.
- **Captcha:** The logins are done with Captcha.
- **Blocking of Username:** The usernames are blocked on fixed number of invalid credential entries.

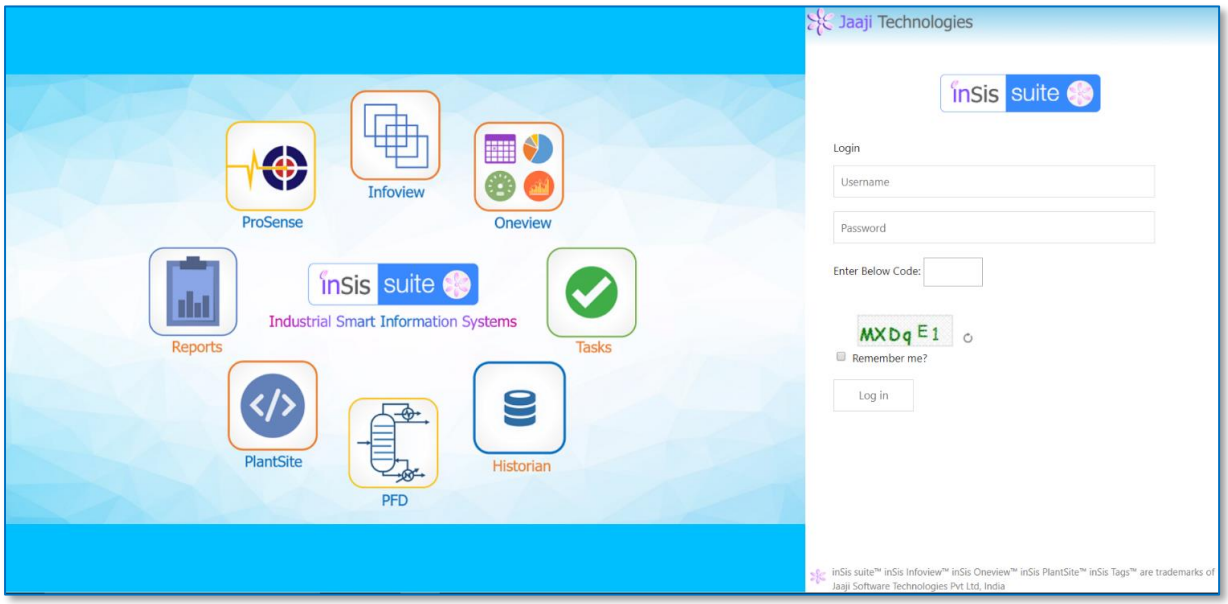

Figure: Login Page

Content Visibility & Access within the Organization:

The various Analytical views, Trends, Dashboards, Graphics, Reports which are created by specific user will be accessible to only the user who configures them. However, user can share this information to specific Users, User Groups & Roles for them to access with or without the privilege to modify. This enables to full control of the data visibility and access within the entire organization.

1.16. Customisations Available in inSis Suite

inSis Suite is a comprehensive plat form for customising and building variety of solutions in the MES domain. inSis Suite is built based on Self-Service approach. End users and System Integrators can customise range of solutions and use cases. Following are major areas where the customisations are offered in inSis Suite,

1. **System Administration:** inSis Suite offers entire range of features available for end users to configure as per the following**,**
    a. Add/Modify/Delete New Tag Templates
    b. Add/Modify/Delete new Tags
    c. Modify Tag Properties like Limits, Units, Filters, Data Processing options, Historization options, Scan frequency etc.

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d. Add/Modify/Delete new Calculation Tags with user defined calculations
e. Add/Modify/Delete new Data Source Connections to OPC Servers, Modbus Gateways etc.
f. Add/Modify/Delete User Enumerations
g. Add/Modify/Delete Engineering Units
h. Modify System Settings
i. Add/Modify/Delete Users, User Groups & Roles

2. **Dashboards:** Users can configure their own dashboards depending on their requirements. They can modify the Tags, Visualisation, Calculations, etc. at any point of time. inSis Suite offers drag & drop, click & select, search & add approach while creating the dashboards. The IT teams support is NOT required to configure Dashboards.
3. **Analytical Views:** Like the Dashboards, Users can configure their own Analytics Views depending on their requirements. They can modify the Tags, Analytics, Calculations, etc. at any point of time. inSis Suite offers drag & drop, click & select, search & add approach while creating these Views. The IT teams support is NOT required to configure Analytics Views.
4. **Calculations:** End users can configure Ad-hoc calculations in Analytical Views, Dashboards, Trends, Reports etc. Further a Server-based calculation Tags can be configured by End users with user defined calculation expressions.
5. **Trends:** Like the Analytics Views, the Process Trends are configured easily by end users based on their day-to-day monitoring & troubleshooting requirements
6. **Process Flow Diagrams:** The PFDs are configured using the graphics studio which is provided along with MES system. End Users can configure & update the PFDs as and when required.
7. **Reports:** Free format reporting platform is provided to create the reports as per the required format by end users.
8. **Email & SMS Notifications & Reports:** Users can freely create email and SMS notifications to deliver the Manufacturing data on their mailboxes and phones.
9. **inSis Solution Space:** This product which is exclusively designed to build customised UI for the end users for a specific use case. For example, Energy Management System, Performance Management System etc. It offers customisable UI with user defined navigations, drilldowns, content etc.

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10.

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