inSis suite

Industrial Smart Information System

Jaaji Technologies

Sophistication with Simplicity

Analyzer Management Data Acquisition System (AMADAS)

Solution Overview

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Table of Contents

1. Solution Overview – Analyzer Management Data Acquisition System 4
1.1. Self-Service & Role-based Portal 5
1.2. Analyzer Asset Management 5
1.3. Data Visualisation & Mobility 10
1.3.1. SmartTrend 11
1.3.2. Dashboards 12
1.3.3. Graphics 14
1.3.4. Office Apps 14
1.4. Data Analytics & Decision Support Tools 15
1.5. Calculation Engine 16
1.6. Mobility 17
1.7. Analyzer Maintenance 19
1.8. Data Source Integration (DSI) & Data Historian 20
1.9. Reports Automation & Management 22
1.10. Features of inSis AMS 23
1.10.1. Security & Role-Based Visualization 25
1.10.2. Customisations Available in inSis Suite 27
1.10.3. inSis Suite Product Framework 28

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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)

AMADAS: Analyzer Management and Data Acquisition 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

EMS: Energy Management System

ABT: Availability Based Tariff

Operations Logbook: The electronic logbook for Operator Field Logs.

KPI: Key Performance Indicator

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1. Solution Overview – Analyzer Management Data Acquisition System

inSis AMS collects and stores the analyser readings and provides to users in the form of Analytics, Trends, Dashboards, Reports, Alerts etc. The system provides the facility to validate, calibrate & manage the maintenance schedules of analysers in the manufacturing complex. Further, the Performance KPIs are calculated online and used for monitoring the Analyzer performance. The Analyzer Management System is based on the sophisticated inSis Suite. Following are various modules of inSis AMS,

- **Analyzer Asset Management:** Configure, manage assets like Analyzer Houses, Sample handling Systems, Analysers etc. and monitor the real-time conditions of these assets. Receive operations & performance related notifications of the assets.
- **Analyzer Data Visualisation:** Collect, store, visualise the real-time & historical analyser data across devices.
- **Real-time Data Analytics**: Provides actionable insights with interactive and self-service analytics.
- Analyzer Maintenance:
  - **Analyzer Validation**: Validate the analyser readings from time to time to assess the need for calibration
  - **Analyzer Calibration**: Manage the calibration activities, calibration reports and reference bottles.
  - **Analyzer Maintenance Schedules**: Plan the analyser maintenance activities
- **Reporting**: Provide reports for analysers data, performance, maintenance etc.

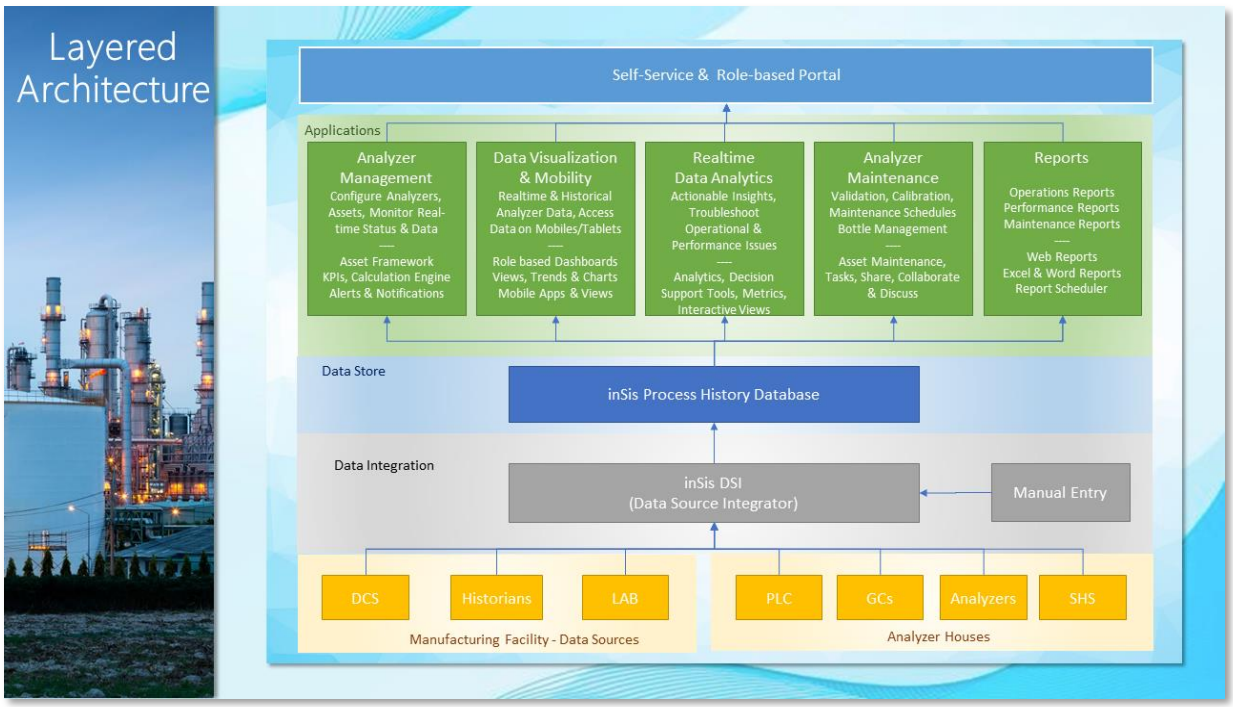

Figure: inSis Analyzer Management System – Solution Architecture

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Following is the Solution Overview of AMADAS,

1.1. Self-Service & Role-based Portal

Users in the plant can access self-service portal to access Real-time Analyser Information, Process Data Analytics, Trends, Dashboards, Reports, KPIs, Events, Performance Metrics, Analyzer Maintenance Details etc. The Role-based visualisation helps to provide the right information to the right people. With personalisation & collaboration features, this portal becomes the single window for Analyser Management. 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).

1.2. Analyzer Asset Management

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

Configure and Manage the Analyzers and other Assets of your Manufacturing Facilities with Asset Framework. For each Asset & Analyzer, the Properties, documents & View Templates are configured. The GeoTagging of Assets feature will help monitoring in Assets in Geographical Map for easy and convenient

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visualization of Assets and their performance. The Asset Browsers for summarizing the Real-time data, KPIs and Notifications are handy to quickly glance the troublesome assets and quickly take corrective actions.

inSis AMS features a new generation Asset Performance Management System. It features Performance Measurement & Monitoring with Key Performance Indicators (KPIs) of the Analyzers & Assets. The KPIs are grouped, categorized and monitored against the Targets and Benchmarks. KPI Panels, Bars and Dashboards help in analysing the Analyzer & Asset performance. Further, the KPI Analytics help in troubleshooting the Performance Issues & help quickly take corrective action. The Key Performance Indicators (KPIs) are configured using complex expressions. It evaluates these KPIs by fetching the real-time data from inSis Core system. The KPIs are grouped, categories and monitored efficiently.

inSis AMS monitors the Analysers continuously for any abnormal conditions, performance degradations and possible issues. Sensing the conditions to detect the Performance and Operational issues is the core functionality of this module. 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 Operations Engineers & Managers in their day-to-day Operations & Process Monitoring activities as this process is largely automated. Further, these notifications are grouped, categorized and personalized for effective addressing of performance issues.

- Analyzers & Assets Management
  - Add/Modify/Delete Analysers & Plant Assets
  - Add/update Images and various details of Analyzers & other Plant Assets
  - Upload documents of Analysers & Plant Assets like User Manuals, Installation Procedures, Operating Procedures etc.
  - Set Category, Type, Parent, Tagging etc to each Asset for browsing and searching easily.
  - GeoTagging for visualizing the Assets on Maps.
- KPI Management
  - Create KPIs using complex expressions
    - Data mappings,
    - Input/Output Values validations
    - Slice input data before using in calculations
  - Set Categories, Types, Targets & Bench Marking, Performance Statuses for each KPIs
  - KPI Summaries & KPI Dashboards
  - Set KPI ownership and collaborate with team to improve the overall asset performance.
- Event Notifications
  - Define Events Detection algorithms using complex expressions.
    - Data mappings,
    - Input/Output Values validations
    - Slice input data before using in calculations
  - Provides the Notifications by Web, Email & SMS
  - Event Summaries & Event Dashboards

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- Escalations: System will escalate the issues by notifying the appropriate levels when the issue persists for defined time periods.

Following minimum number of KPIs are configured for each analyser,

1. Availability
2. Repeatability
3. BreakdownTime
4. MaintenanceTime

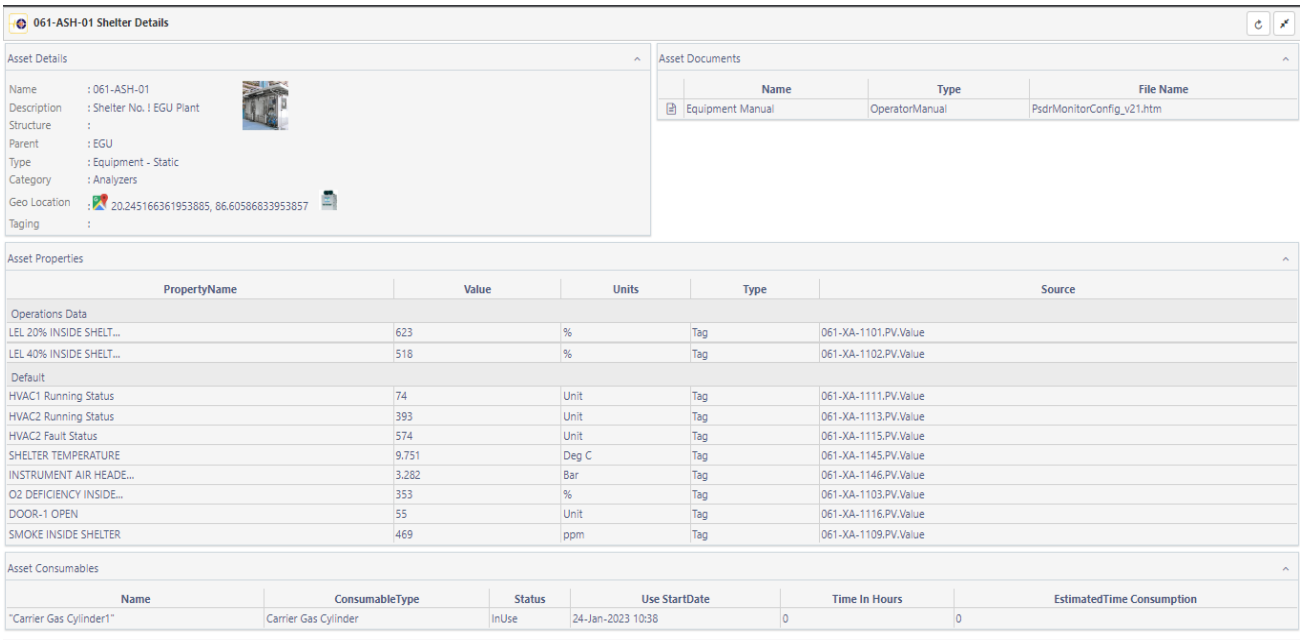

Figure: inSis AMS – Asset Management – Asset Summary

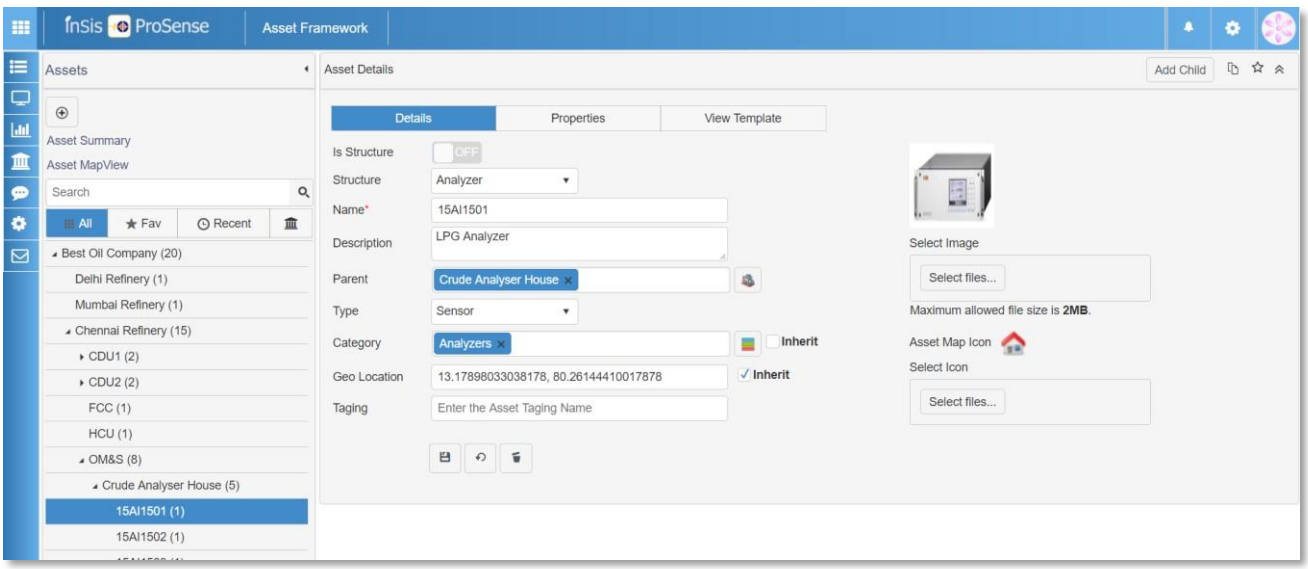

Figure: inSis AMS – Asset Management – Asset Details

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Figure: inSis AMS – Asset Management – Asset Monitoring – Operation Data

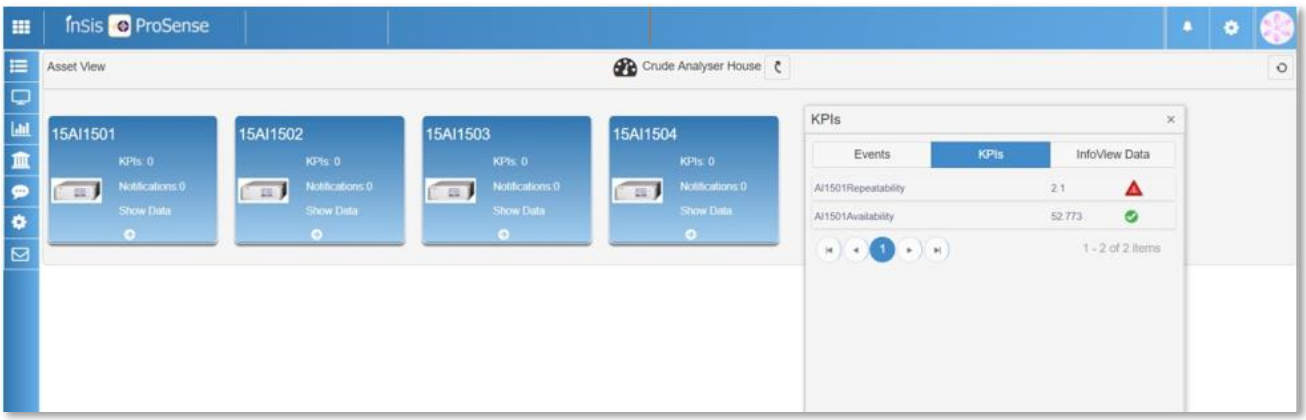

Figure: inSis AMS – Asset Management – Asset Monitoring – Performance Data

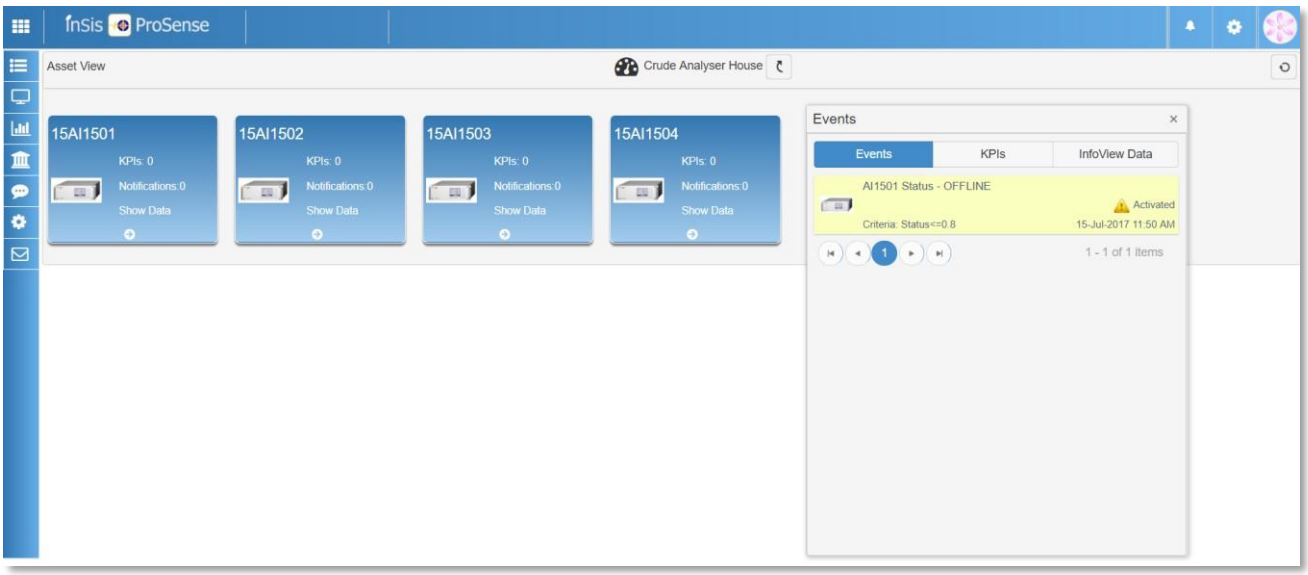

Figure: inSis AMS – Asset Management – Asset Monitoring – Events & Notifications

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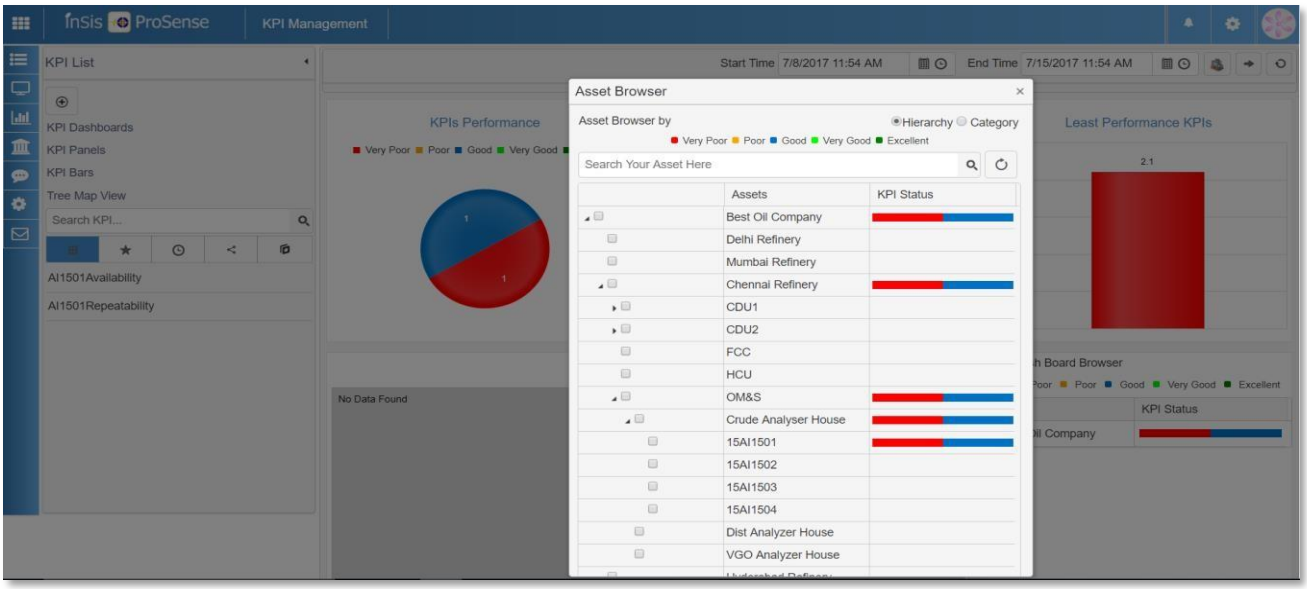

Figure: inSis AMS – Asset Management – KPI Management – KPI Dashboard

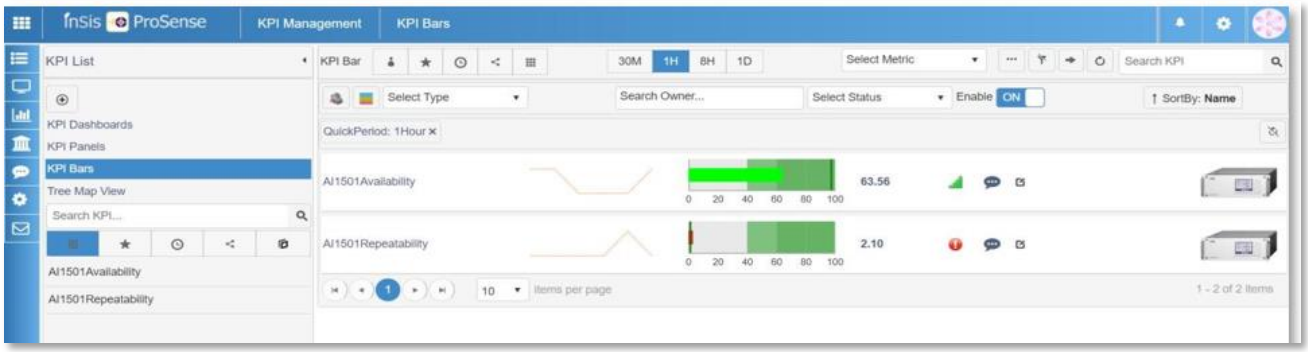

Figure: inSis AMS – KPI Management – KPI Summary

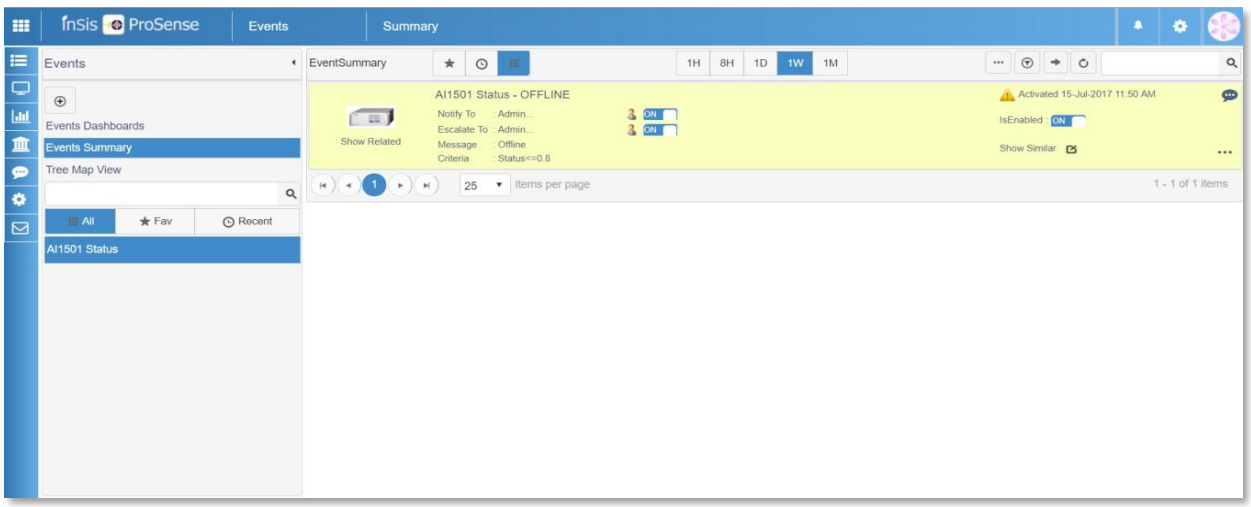

Figure: inSis AMS – Events & Notifications – Event Summary

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1.3. Data Visualisation & Mobility

inSis AMS Collect, store, visualise the real-time & historical analyser data. This module helps in visualising the Analyser readings & performance metrics with the help of Rich Visualisations. Data Visualisation Layer consists of following aspects,

1. Executive Dashboards - for Analyzer Performance Summary
2. Operations Dashboards - for Analyzer Operations Summary
3. Maintenance Dashboards - for Analyzer Maintenance activities
4. Real-time & Historical Trends of Analyser data
5. Charts & Visual Reports

The mobility feature provides the access to inSis AMS over the mobiles & tablets. This will enhance the interaction of various teams with inSis AMS 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 Mobiles
2. Operational Trends on Mobiles
3. Executive Dashboards on Mobiles

Figure: Real-time Data Visualisation

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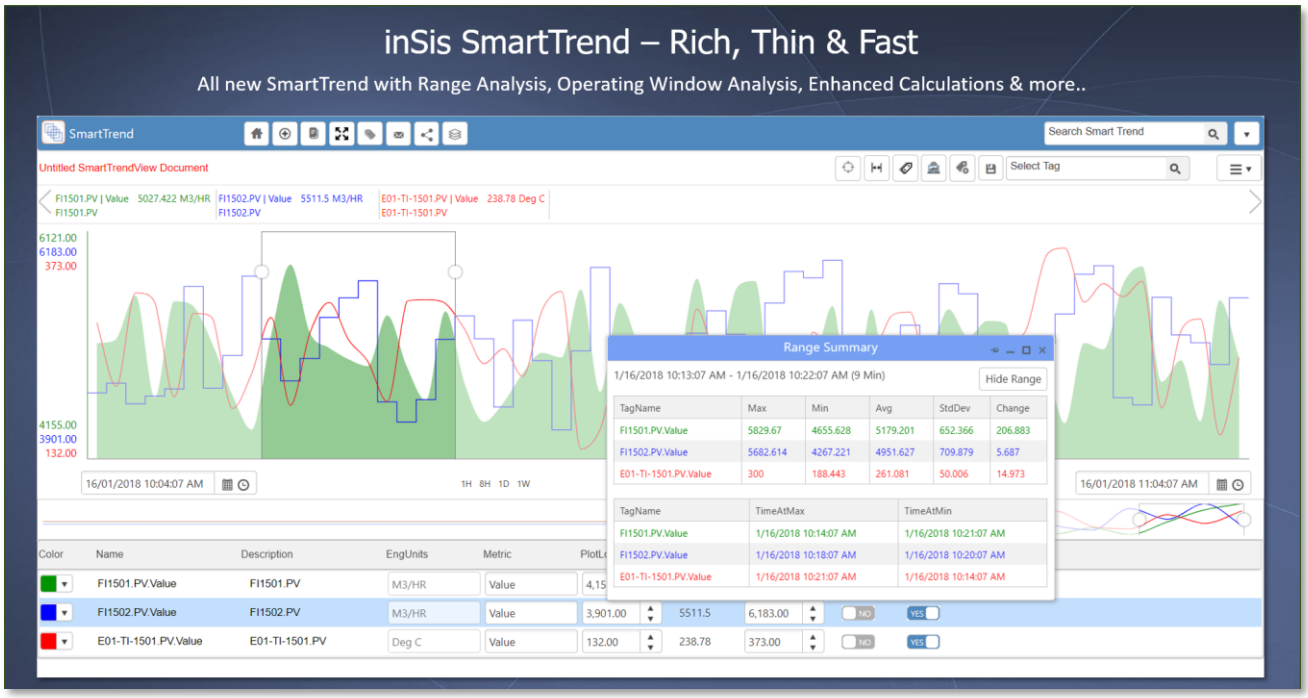
1.3.1. SmartTrend

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.



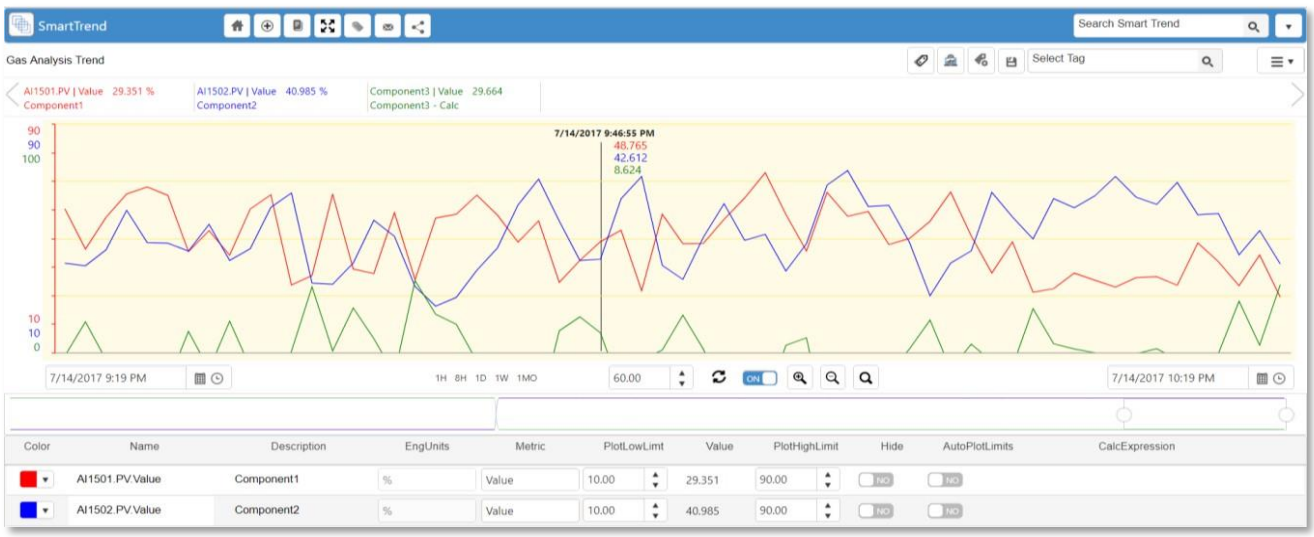


Figure: inSis AMS - SmartTrend for Visualizing Analyzer Data

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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.
- 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.

1.3.2. 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

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- 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
- 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

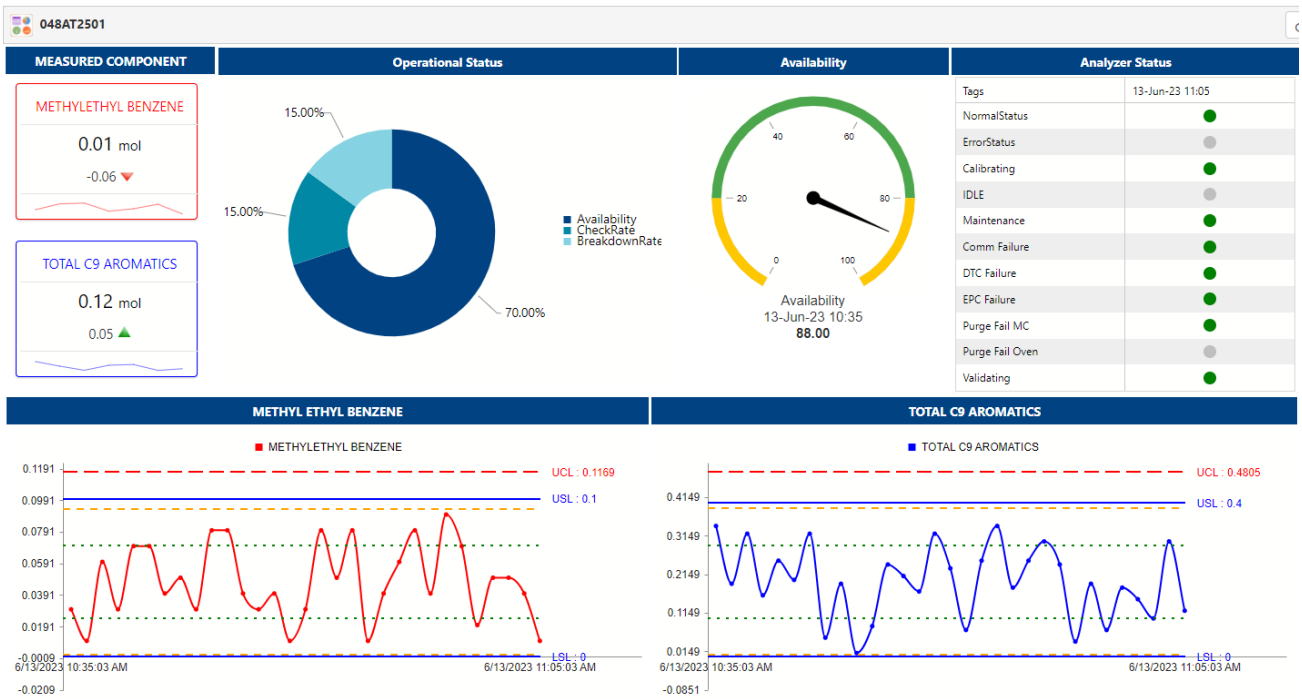

Figure: inSis AMS: Process Dashboards for Manufacturing Plants

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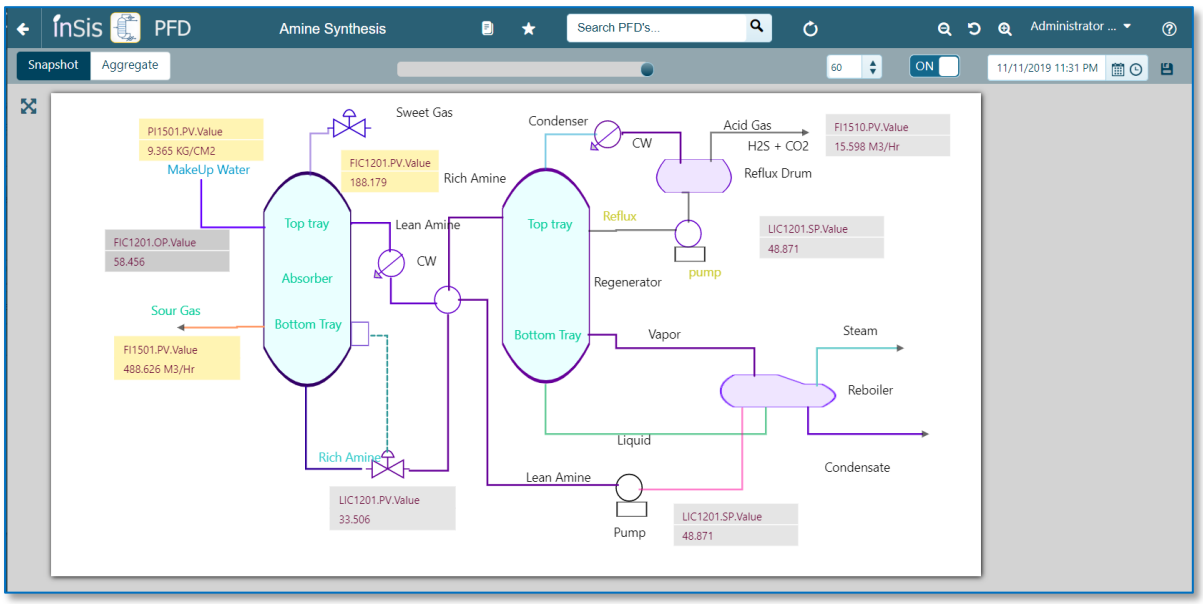
1.3.3. Graphics

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.



1.3.4. Office Apps

INSIS AMADASsolution provides Add-ins for mapping the various operations data in to 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

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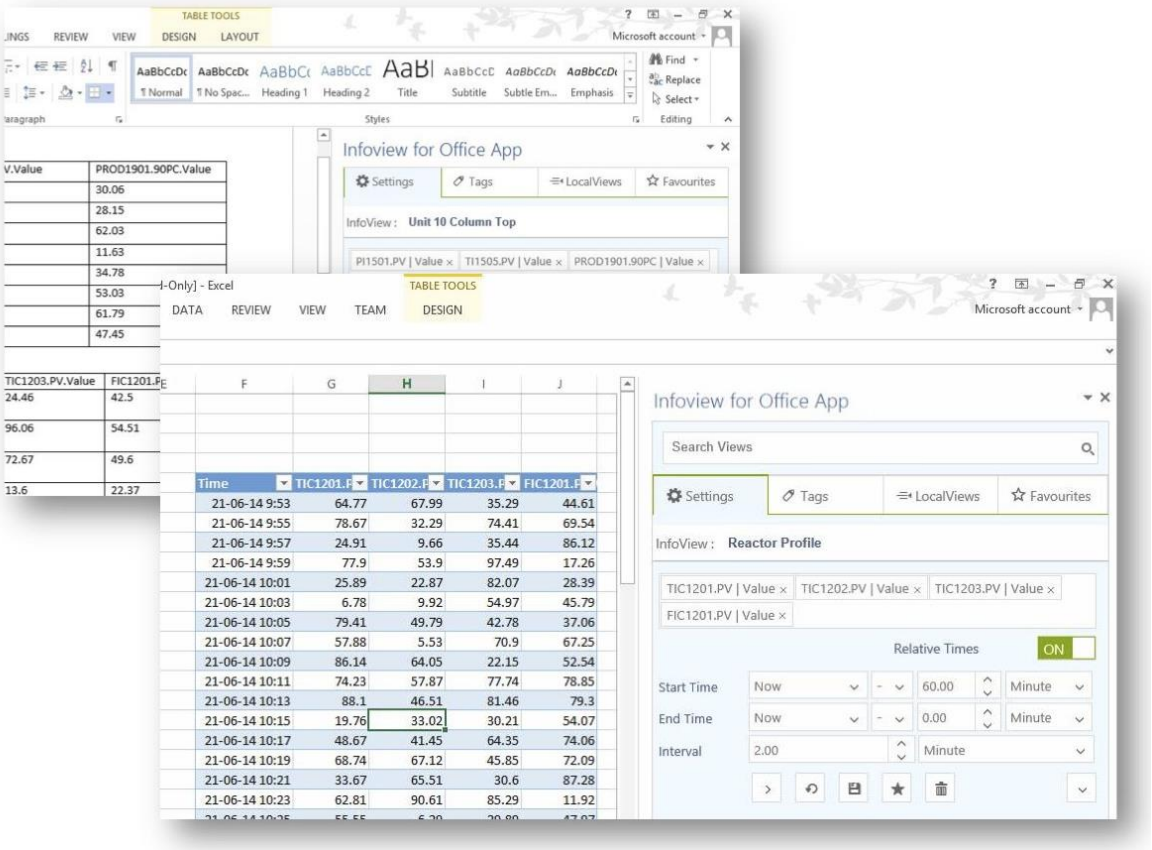

Figure: Office Apps

1.4. 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

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

1.5. 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. Built-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

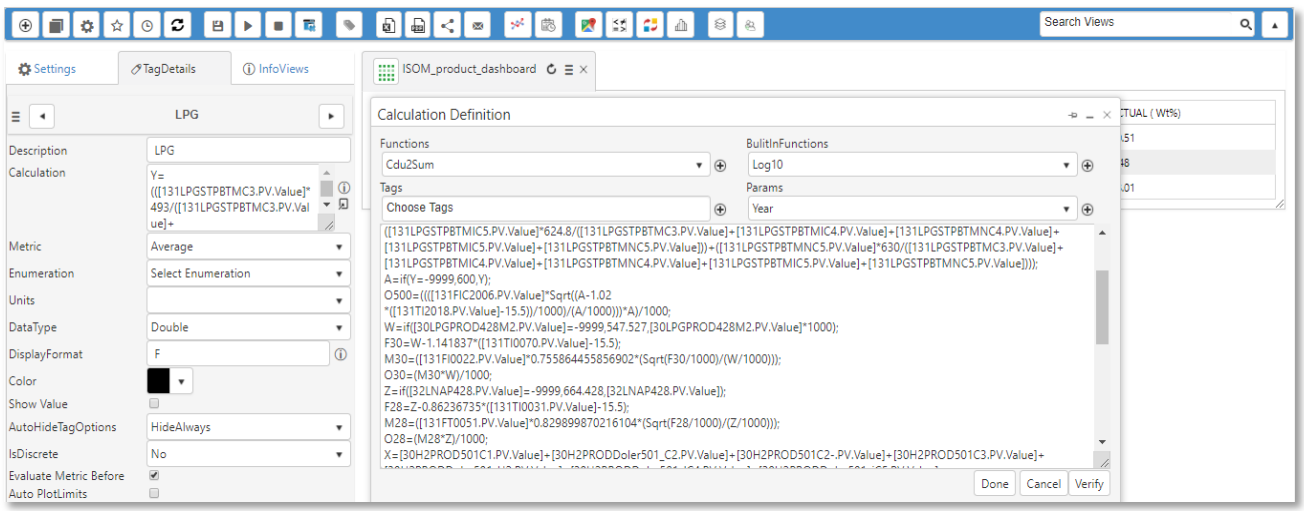

Figure: Calculation Engine

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1.6. 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
5.

There are two types of Mobile Applications,

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

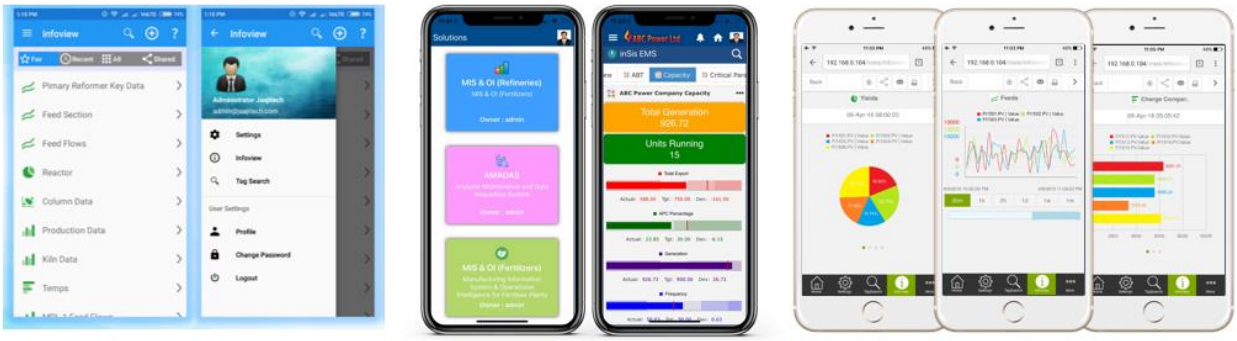

Figure: Mobile Apps

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Figure: Mobile Apps – Summary

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1.7. Analyzer Maintenance

Analyzer systems need to be frequently validated and maintained to sustain the performance at best levels. This module helps in managing the maintenance related activities of the Analysers & Assets. Following key maintenance activities are supported,

1. Maintenance Tasks Management: Creating, tracking & remind the Maintenance Tasks for various maintenance teams.
2. Analyzer Validation: Validate the analysers readings to monitor the performance of Analyzer and requirement of calibration.
3. Analyzer Calibration: Allows to auto-calibrate the Analysers remotely, maintain the calibration reports and logs.

Maintenance Tasks Management: Following are key functionalities of Maintenance Tasks Management,

1. Assign Task to a team member also assign another team member as follow-up user.
2. Create Task Groups to segregate the tasks.
3. Track the Task Completion Status and discuss with team online with Pillow Chat.
4. Add custom reminders to get the task assignee reminded automatically in case of the task is not being completed.
5. Add Due dates, documents, task guidelines, Priorities, reminders etc to each task.
6. Create recurring tasks so that System will automatically create Maintenance Task as per the scheduled periods.
7. Create Analyser Maintenance Task by Sending email to Task System.
8. The Maintenance Tasks can also be accessed and managed from a native Android App
9. Maintenance Procedures can be defined and updated in the system to easy access by the assignee.

Analyzer Validation:

The analyser validation at frequent intervals is essential to maintain the performance. This module helps in validating the Analyzers. After validation, the result will be SUCCESS or FAIL. If the validation is failed, the analyser needs to be calibrated.
Validation is normally done with two types,

- Line sample method: Using LAB Results
- Reference sample method: Using known sample

For certain analyzers, the validation is done automatically. When the automatic validation is not available, manual validation details will be entered in the system.

The validation tests are performed as per the ASTM D3764 standard. The deviation calculation is also performance to check the Drift of the analyser.

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System provides the Control Charts which can be used by the engineers to troubleshoot the analyser performance issues.

Analyzer Calibration:
This module helps in managing the calibration activities of the Analyzer System. Analyzer Calibration is carried out either manually or automatically based on the features of Analyzer. For Manual Calibration of Analyzer, the calibration details shall be entered manually in to the system. However, for the auto-calibration method, system will send Calibration signal to Analyzer and collects the calibration results.

Reference Bottle Management:
This module helps in managing the reference bottles for each of the Analyser.

1.8. 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)

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.

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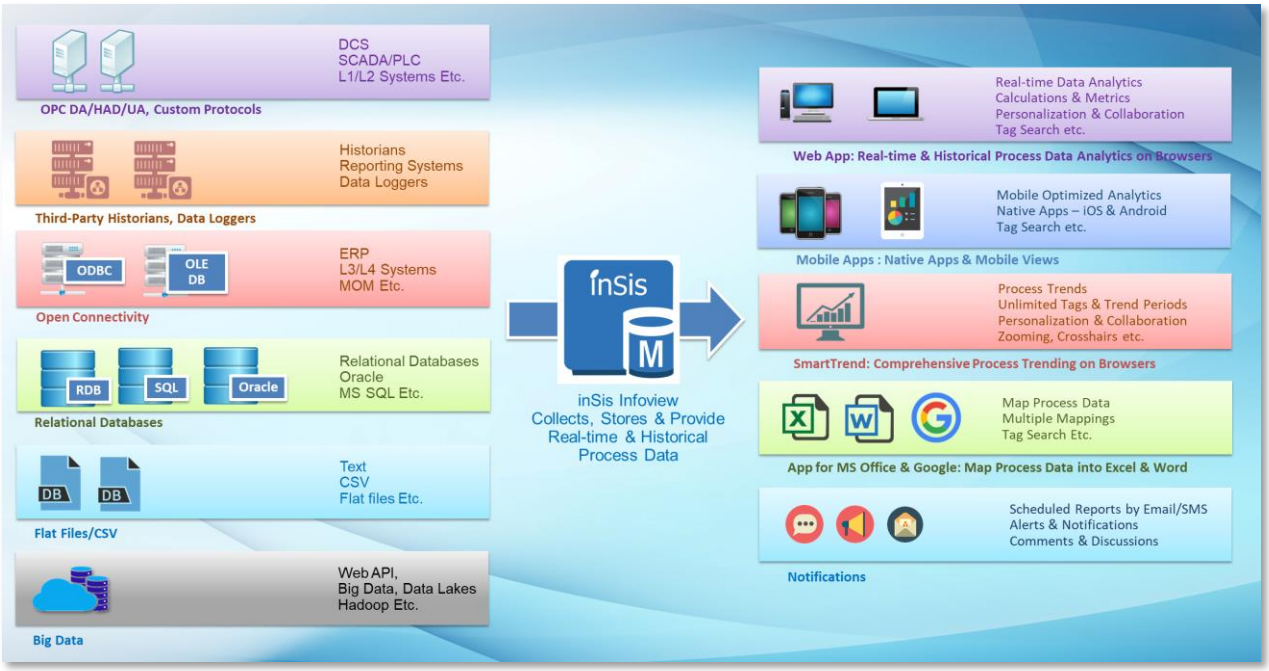

Following are few features of inSis Infoview Historian,

- 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 of time
- 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)

Big Data Connect:

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

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

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Figure: inSis Reports Automation Platform

1.10. Features of inSis AMS

Following are the major features of inSis Analyzer Management System,

1. **Self-service & Role-based Portal:** Users in the plant can access the role-based and self-service portal to access the Analyzer information, analytics, trends, dashboards, reports, performance metrics etc.
   1.1. Real-time Monitoring of Analyser data is done easily using the portal.
   1.2. The portal is Role-based & Secured
2. **Data Analytics & Visualisations:** inSis AMS has built in Analytics platform to help analyse and troubleshoot analyzer related problems. It provides variety of Calculations, Metrics, Visualisations & Analysis Options. inSis AMS provides range of visualisation to best suited to every scenario of data representation.
3. **Analyzer Maintenance Tasks Management:** Efficiently manage the Maintenance task of Analysers using
4. **Analyzer Validation:** Validate the Analysers performance to carry out appropriate maintenance activity.
5. **Analyzer Calibration:** The calibration related details are maintained. Further, the analysers auto-calibration is done remotely using inSis AMS.
6. **Real-time Trending:** View real-time & historical trends of Analyser readings in browsers.
7. **Reports Scheduler:** Schedule Reports and deliver them to directly to designated users by email
8. **Executive Dashboards:** The Dashboards help summarise the information for centralized view of Analysers & Assets. The various levels of management can visualise the information quickly with help of Executive Dashboards.
9. **Data Collection & Processing:** inSis AMS Collects the Real-time Data from Analysers, 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.

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10. **Unlimited History:** inSis AMS based on inSis Historian which provides unlimited amount of History of the Analysers Data. It uses the proprietary database for historisation of Process Data.
11. **Calculation Engine:** inSis AMS 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.
12. **MS Excel & Word Add-in:** Infoview 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.
13. **Mobile Access:** View real-time plant information, trends and dashboards on mobiles/tablets
    13.1. 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 inSis AMS system.
    13.2. 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.
14. **Asset Performance Management (APM):** Configure the Assets of the Manufacturing facility, build KPIs, configure notification and monitor the Asset Performance.
    14.1. Asset Management: Helps to configure the Analysers and Assets of Manufacturing Facility, Geo tag Assets and visualise the Assets with different hierarchy.
    14.2. KPI Management: Provides platform to build and manage KPIs for various Analysers, equipment, sections or units etc. It helps to Measure and Analyse the performance of various Assets.
    14.3. Event Notifications: Email/SMS/Web based Alert notifications can be configured for critical parameters based on conditions, abnormalities, performance degradations etc.
    14.4. Performance & Event Discussions: The operations teams can collaborate online while resolving issues that are detected by APM.
    14.5. Map View of Assets, KPIs & Notifications: Visualise the Analysers and Assets on Map and see the live information of Assets, their KPIs and Notifications related to Assets.
15. **PFD Diagrams:** Process Flow Diagrams are configured to visualise the Analyzer Networks with in various sections, units etc.
16. **Remote Monitoring**: Access the Analysers and process Information remotely from anywhere from across the devices like Laptops, Mobiles & Tablets.
17. **Personalisation**: Each of the designated user can create their personalised View, Reports, Trends, Dashboards, Alerts etc.
18. **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.
19. **Integration with Process Units:** inSis AMS 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.
20. **Easy Configuration of new Analysers**: Clients can configure new analysers without any support from Jaajitech. The software offers flexible and intuitive interface to add new Gateways, Analysers, Assets, Views, Dashboards, KPIs, Notifications, Reports etc.
21. **NO Client Software Required**: The inSis AMS 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.

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22. **Logs, Events & Messages**: inSis AMS provides various Audit Trail features by means of Logs, Events & Messages. This help Administrators to manage, monitor & troubleshoot the system efficiently.

1.10.1. 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.

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 either 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

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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 & ViewOnly 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.

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.

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.

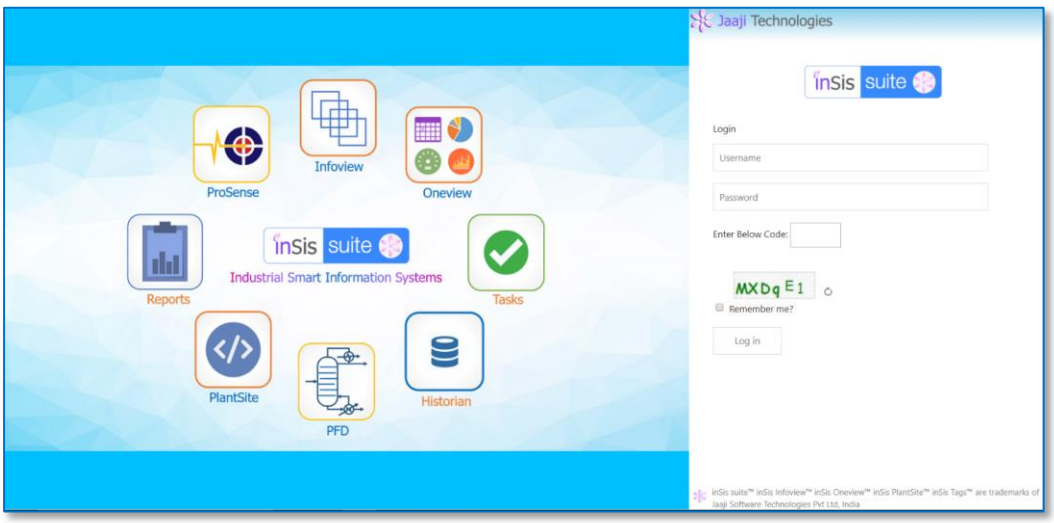

Figure: Login Page

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1.10.2. 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. **Analyzer Asset Management:** Configure, manage assets like Analyzer Houses, Sample handling Systems, Analysers etc. and monitor the real-time conditions of these assets. Receive operations & performance related notifications of the assets.
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. **System Administration:** inSis Suite offers entire range of features available for end users to configure as per the following**,**
    a. Add/Modify/Delete Users, User Groups & Roles
    b. Add/Modify/Delete New Tag Templates
    c. Add/Modify/Delete new Tags
    d. Modify Tag Properties like Limits, Units, Filters, Data Processing options, Historisation options, Scan frequency etc.
    e. Add/Modify/Delete new Calculation Tags with user defined calculations
    f. Add/Modify/Delete new Data Source Connections to OPC Servers, Modbus Gateways etc.
    g. Add/Modify/Delete User Enumerations
    h. Add/Modify/Delete Engineering Units
    i. Modify System Settings
10. **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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1.10.3. inSis Suite Product Framework

inSis Suite of Products is based on inSis Platform which is built on most powerful technologies like Windows Communication Foundation, ASP.NET MVC, HTML5/JavaScript/jQuery etc.

Following are salient features of the inSis Suite application framework,

1. **Parallel Systems & Layers:** The products are based on parallel systems approach where most of the Systems function independently while some layers are dependent on other layers and systems. Following are the details,
   1.1. DSI System: Data Source Integration System
   1.2. Core System: Core System is heart of the Real-time Data Collection and Processing
   1.3. Information System: This provides the Real-time and Historical Data for the front-end applications Dashboards, Analytical Views, Trends, Reports etc.
   1.4. History System: This is to histories the massive Realtime data.
   1.5. Analytics Engine: The Analytics engine is base for all the Analytical Views, Dashboards etc whenever the Analytics are to be visualised or reported.
   1.6. Calculation Engine: This engine is integrated across the Systems and Applications of inSis Suite.
2. **Distributed Architecture:** inSis Suite is based on distributed architecture, which is designed for,
   2.1. High Performance
   2.2. Security
   2.3. Robustness
3. **Extensible** Software Architecture
4. **Based on powerful and flexible frameworks**
   4.1. WCF: Windows Communication Foundation
   4.2. ASP.NET MVC
   4.3. HTML5/jQuery
   4.4. Communication protocols like OPC, Modbus, ODBC etc.

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