

Smart Pipeline – Standard Specification



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CONNECT AND PROTECT

Functional Specification for Predictive Analytics DTS Software

This functional specification shall describe the requirement for Predictive DTS Analytics Software ("the Software") that shall work seamlessly with distributed fibre optic-based Temperature Monitoring and site Distributed Control System (DCS) data to analyze a heated product transfer pipeline. Distributed Temperature Sensing (DTS) data shall be continuously processed through custom algorithms to provide autonomous monitoring and analytical reports on a real-time basis.

In order to be compatible with the Software, minimum fibre optic DTS architecture and system requirements for a pipeline are shown below:

Sr. No.	DTS System Requirements	Parameter
1.	Fibre Optic Cable Configuration	Double Ended (compound loop)
2.	DTS Unit - Spatial Resolution Setting	0.5 meters to 1 meter
3.	DTS Unit - Temperature Accuracy	+/- 1 degree C.
4.	DTS Polling Time Setting	15 minutes (max.)
5.	Fibre Break Detection	Alarm & Location
6.	Sensing Fibre Loss (as-built attenuation)	Less than 2.5 dB/km

ALGORITHMS AND ANALYTICAL LOGIC SPECIFICATION

Software shall use algorithms to provide the following analytics for the pipeline:

Flow Restriction Characterization	Multiple Pipeline Asset Monitoring
Distributed Pipeline Fill Percentage	Dynamic Time-to-Freeze Calculation
Void Space Location and Tracking	Pipeline Temperature Profile
Pipeline System Monitoring	Shift-Summary Report Access
Access via Mobile Phone, Tablet and Remote PC	Plan / Profile Views with Asset Landmark Mapping
Distributed Temperature Sensing System Health	Heating System Closed-loop Temperature Control
Anchor Heat Loss Characterization	

SOFTWARE CONFIGURATION

Vendor to provide support services for the generation and importation of pipeline-specific reference data.

Algorithm processing Software shall be modular in both design and implementation so as to support the configuration of algorithms, as required.

The Software shall:

1. Incorporate the actual physical geometry (X, Y, Z coordinates) of the pipeline, in order to equate pipeline temperature and other derived analytical results with the physical location at which they occur.
2. Show real-time temperature data schematically (in both plan and profile view) using a color temperature scale on an operator dashboard. Further, it shall be capable of adding physical features and landmarks, (such as pipe anchors, pipe bends, RTDs, road crossings, pipe bridges, unit boundaries, etc.), as symbolic markings along the alignment of the pipeline.
3. Provide for the visualization of both real-time and historical DTS data in the form of temperature profiles (temperature vs. length).
4. Single point data trending over time should also be supported – e.g., temperature (or other parameter) vs time.

5. Clearly display any active alarms and alarm locations on the pipeline.
6. Provide pre-Alarm alerts for conditions that are trending towards alarm thresholds.
7. Provide a fibre optic sensing cable attenuation graph, depicting dB loss of the DTS system along the length of the pipeline.
8. Provide an overall pipeline health status, based on combined (and weighted) health indicators from the DTS system, fibre, insulation, and heating system.
9. Allow operators to view and print shift summary reports that include key heated pipeline operational data.
10. Provide access through mobile phone, tablet or remote PC using an on-premise solution.
11. Allow data trending to be viewable for up to 2 weeks of pipeline operation, and automatically backup all pipeline data onto removable hard drive with sufficient space to last at least twelve (12) months.

CLIENT (FACILITY END USER) IT REQUIREMENTS AND PERMISSIONS FOR ACCESSIBILITY

- Client shall be responsible for supplying "As-built" access to the pipeline routing and isometrics, including XYZ coordinate data for each. Data must be electronic (3D model idf or pcf files, MS Excel or CSV).
 - Mandatory – Location of every pipeline change-in-direction, pipeline anchors, outside of insulation boxes, RTDs.
 - Optional – Location of pressure sensors, flow sensors, heater junction boxes.
- Pipeline Heater design details:
 - Voltage, current, power output at start-up and maintain conditions (inc. ambient conditions for ea.).
 - Circuit lengths and locations.
- Client is responsible for any deviations from client deliverables discovered after delivery and/or during the commissioning of the Software.
- Client shall qualify and select specific individuals that will be given access to the Software for initial identity and access management set-up, training and configuration requirements as necessary.
- On-premise access to the Software local network to deploy appliance server.
 - Network that is uniquely connected (isolated) to the Software stack.
- Client shall provide a dedicated IP or DNS register for the Software appliance.
- Client shall provide a TLS certificate for the Software appliance or be willing to trust a certificate self-assigned by the Software provider.
- Client shall provide an OAuth2 identity provider to allow integration with their identify and access management system.
- Client must allow access to post-installation Software data through the following means:
 - Back-up hard drive
- Software upgrades and updates shall be delivered to client per the delivery options below:
 - Installed on premise as hardware appliance. Upgrades and updates delivered on-site.

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