TLS-300C
UST Monitoring and Leak Detection System

Part 1 - General System Requirements

1.1 Description

A. These specifications are intended to provide information by which prospective bidders may understand the requirements relative to furnishing and installing a monitoring system for underground or aboveground liquid storage tanks and associated product piping.

B. These specifications shall describe specifically a continuous underground monitoring and leak detection system that shall perform in accordance with Subpart D of 40 CFR 280 and, as a standard of performance and quality, shall meet the performance specifications and functions of the Veeder-Root Company TLS-300C UST Monitoring system.

C. The underground storage tank monitoring system shall meet all applicable standards and regulatory agency requirements including, but not limited to, the standards and requirements of the following:

1. American National Standards Institute (ANSI)
2. American Petroleum Institute (API)
3. American Society for Testing and Materials (ASTM)
4. Environmental Protection Agency (EPA)
5. National Bureau of Standards (NBS)
6. National Electrical Code (NEC)
7. National Fire Protection Agency (NFPA)
8. Underwriters Laboratories Inc. (UL)
9. Canadian Underwriters Laboratories Inc. (cUL)
10. Underground Storage Tanks: Subpart D, 40 CFR Part 280
11. Federal Communications Commission (FCC)
12. British Approval Service for Electrical Equipment in Flammable Atmospheres (BASEEFA)
13. Factory Mutual (FM)

Part 2 - Operational Specifications

2.1 In-Tank Leak Detection

A. The system shall utilize in-tank probes based on the magnetostrictive principle for liquid level measurement and in-tank leak detection.

B. The tank gauge shall be capable of performing a static tank tightness test to an accuracy of 0.1 GPH with at least a 98% probability of detection [P(D)] and no more than 1% probability of false alarm [P(FA)].

C. The system shall have the ability to be programmed to run a static 0.2 GPH quick leak test. The static leak test will take one hour and commence 30 minutes after the last dispensing cycle, or five hours from the last delivery. whichever is greater.

2.2 Interstitial Leak Detection for Double Wall Tanks

2.2.1 Wet Monitoring

A. The system shall be able to perform automatic, continuous leak sensing by monitoring the liquid level in the reservoir of a brine-filled interstitial space (annulus) of a double wall tank, to detect a breach in the inner or outer shell.

B. The system shall differentiate between a high liquid level and a low liquid level in the brine reservoir of a double-wall tank and provide a high-liquid alarm or a low-liquid alarm.

2.2.2 Dry Monitoring

A. The system shall be able to perform automatic, continuous leak sensing in the dry interstitial space (annulus) of a double wall tank, to detect a breach in the inner or outer shell.

B. The system shall have the ability to sense the presence of hydrocarbons and/or liquid, and provide an alarm for the worst case condition (fuel).

C. The form factor of the sensor must provide for easy field installation and removal.

D. The system shall have the ability to continuously monitor the integrity of the sensor for an open condition, alarm condition, or normal operating condition.

2.3 Containment Sump Monitoring

A. The system shall be able to perform automatic, continuous leak sensing in the piping containment sump.

B. The system shall have the ability to detect the presence of liquid (hydrocarbons and/or water) in the piping containment area and provide an alarm condition.

C. The system shall have the ability to indicate when the sensing device has failed and is no longer providing environmental compliance.

D. The system shall have the ability to continuously monitor the integrity of the sensor for an open condition, alarm condition, or normal operating condition.

2.4 Environmental Compliance Reports

A. The system shall have the ability to provide a record of the last three occurrences of each type of alarm or warning condition detected by the system.

B. The system shall provide the following types of reports related to environmental compliance matters:

1. System status messages
2. Liquid sensor warning and alarm messages
3. Normally-closed sensor warning and alarm conditions
4. Hydrostatic sensor warning and alarm conditions; high or low liquid level conditions
5. In-tank warning and alarm messages (optional)
6. In-tank tightness evaluation (optional)
7. External input messages
8. Software module alarm message

2.5 Product Inventory Control (Tank Gauging)

A. The tank management system shall collect product height and temperature data from up to two magnetostrictive level probes and compute gross and temperature-compensated net gallons. The operator may choose from inventory or delivery information to generate a complete set of printed inventory or delivery reports.

B. The system shall automatically generate an inventory increase report when a delivery of product to a tank has taken place. The report shall include the time and date of the delivery, the starting volume in the tank, the ending volume in the tank, the starting temperature of the fuel, the ending temperature of the fuel, and the inventory increase amount.

C. The system shall have the ability to store up to ten of the most recent inventory increases in memory for business management purposes.

D. The system shall provide the ability to monitor aboveground storage tanks, as well as underground storage tanks, for inventory management.

2.6 Inventory Management Reports

A. The system shall monitor inventory in U.S. or Metric units for up to two tanks and produce a combination of automatic and manual reports for each tank, which include the following information:

1. Fuel volume
2. Fuel height
3. Water height
4. Fuel temperature
5. Ullage
6. Temperature-compensated fuel volume
7. Last inventory increase amount
8. Last in-tank leak test result
9. Time and date
10. Tank identification
11. Fuel type identification
12. 90% ullage

B. A printout of the inventory status report shall be generated any time the operator presses the print button while the system is in the normal operating mode, or generated automatically four times a day, with the information stored in memory.

C. The system shall provide an automatic delivery report, programmed to print from 1 to 99 minutes after a bulk delivery to a tank is complete. The information shall include station header, product label, date, starting and ending time, starting and ending volumes, and temperature of the fuel, as well as the net volume increase. The information shall be available in U.S. or Metric units.

D. The system shall be able to generate reports in a display/printer format as well as a computer format upon demand.

2.7 Communications

A. The tank monitoring system shall provide the ability to communicate with locally attached electronic devices through an RS-232 port, or remote locations via an RS-232 port. The system shall provide data in a display or packed computer data format.

B. The communications protocol shall be Veeder-Root standard serial communications protocol or compatible.

C. The tank monitoring system shall provide all reports available on the integral printer through the communications port. These shall include all reports associated with inventory management, environmental compliance, and diagnostics/troubleshooting.

D. The system shall provide for setup and configuration through the communications port using the Veeder-Root standard serial communications protocol or compatible.

2.7.1 Serial Communications

A. The system shall provide an RS-232 communications interface for data transmission to a computer, point of sale terminal, printing device, or modem for remote communications.

B. The system shall provide an auxiliary RS-232 communications interface for connection to a second tank monitoring system.

2.7.2 Wide Area Network Software (Remote Monitoring)

A. The manufacturer shall provide a communications/database software package to poll remote tank monitoring sites from a central location.

B. The communications/database software shall provide the ability to communicate directly with the tank monitoring system, via a 25-pin RS-232 serial interface, or remotely via a dial-up connection over the public telephone network.

C. The software package shall provide the ability to remotely configure a system.

D. The software shall provide a communications mode, in which it can automatically and continuously poll locations that have been designated for data retrieval, and store the data in a standard database format.

E. The stored data shall be easily transferable to other software packages, such as spreadsheets, database packages, etc., for data manipulation.

F. The software shall provide an immediate on-line mode to retrieve specific information from a tank monitoring system and to download setup and configuration information.

G. The software shall be able to generate inventory and environmental compliance management reports on demand, for all of the data stored, or specific ranges of data.

H. The software system shall provide the user the ability to retrieve all diagnostic data from the tank monitoring system. It shall also provide the ability to backup and recover data that has been stored.

I. The software package shall permit the user to connect on-line with a location and enter serial communication protocol commands for information retrieval.

2.7.3 Reports

A. The system shall be able to generate reports in a display/printer format as well as a computer format through the communication interface using the Veeder-Root serial communications protocol. All reports including inventory, delivery, environmental compliance (leak detect), alarm history, and status may be retrieved through remote or local communications.

2.8 Input/Output Capabilities

2.8.1 Output Relay

A. The system shall provide the ability to enable external audible/visual alarms, or control external devices through a relay contact closure.

B. The system shall provide 2 Form C contact relays.

C. The system shall provide the ability to program the relay in either a Normally Open or Normally Closed orientation.

D. The system shall provide the ability to assign sensor or system alarm conditions to a selected relay.

E. The system shall provide the ability to assign a 20 character label to a device connected to the output relay through system programming.

2.8.2 Input Interface

A. The system shall provide the ability to accept an input from an external device and enable a relay to control an external device.

B. The system shall have the ability to define the type of input connected to the system.

C. The system shall have the ability to name, through system programming, each external device connected to an input position.

2.9 Alarms

A. The tank monitoring system shall provide an audible and visual indication of all system in-tank leak, product line leak, and external sensor alarm conditions.

B. The system alarm conditions shall include:

1. Maximum Product level
2. High level limit
3. Overfill alarm
4. High water alarm
5. Second high water alarm
6. Delivery needed alarm
7. Low limit
8. Sudden Loss

C. The tank monitoring system shall provide an audible and visual alarm indication for external sensor leak failures (fuel, water, and sensor out).

D. In conjunction with providing an audible and visual alarm, the system shall have the ability to print out all alarm conditions to the integral thermal printer.

E. The system shall have the ability to send all alarm conditions to the RS-232 serial communications port for data transmission to a central computer. The system shall have the ability to transmit the alarm condition immediately, or program a delay time before sending. The system shall also have the ability to enter a repeat function in the programming to repeat sending the alarm condition.

F. The system shall provide the operator with the ability to disable the audible portion of an alarm, but the visual alarm shall not be disabled until the alarm condition has been corrected.

G. The system shall be equipped with an external audible and visual alarm with acknowledgement switch. The external alarm box and acknowledgement switch shall be contained in a watertight gasketed enclosure for installation in an outdoor environment. The external alarm box and acknowledgement switch shall interface to the tank monitoring system via an internal relay.

H. The system shall have the ability to store up to three alarm occurrences in memory. The operator shall have the ability to print the alarm history and alarm status on the integral printer, as well as retrieve alarm history and alarm status through the communications interface (RS-232).

2.10 Setup (Startup/Installation)

A. The system shall contain parameter-driven software to adapt the tank monitor to site specifications. The parameters must be enterable in assigned fields at the time of system startup. In addition, the parameters must be field updatable so that changes in tank dimensions and site specifications can be made.

B. The system shall provide the use of a security code to prohibit unauthorized entry to the system's set-up parameters. The system security code shall be a six-digit number entered through the front-panel keyboard or through the external communications interface. The security code shall have the capability of containing alpha or numeric characters.

C. A four-line, 24-character custom location header to identify the site must be user-programmable. The header must appear automatically on inventory status reports, leak detection reports, and automatic delivery reports each time they are printed.

D. Set-up parameters shall include the following:

1. System setup data
2. Communications setup data
3. In-tank setup data
4. Liquid sensor setup data
5. External sensor setup data
6. Output relay setup data

2.11 Diagnostics/Troubleshooting

A. All diagnostic information shall be generated by the system itself. The system shall not allow the user to change or enter diagnostic information in any way. The following diagnostic information shall be included in the system:

1. Probe diagnostics
   a. Probe type
   b. Serial number
   c. Probe length
   d. Calibration values
2. System diagnostics
   a. Software revision level
   b. Software part number
   c. Software creation date
3. In-tank diagnostics
4. In-tank leak results (optional)
5. Liquid sensor diagnostics
6. Alarm history report

2.12 Reports

A. All diagnostic information, listed in Part 2, section 2.11, paragraph A, subsections 1 through 6, shall be capable of being printed by the system's integral printer for hard-copy documentation and historical record keeping.

Part 3 - Product Specifications/Capacities

3.1 Console

A. The console shall be wall mounted using external mounting tabs.

B. The console shall be equipped with a 2-line, 24-character liquid crystal display for on-site viewing of all inventory, leak detection, and alarm information.

C. The console shall be equipped with a 24-key front-panel keypad with control and alphanumeric capability for programming, operating, and reporting functions.

D. The console shall be equipped with three front-panel indicators to provide a visual indication of power on, warning, and alarm conditions.

E. The console shall be equipped with an integral, 24-character, thermal report printer with built-in take-up spool for hard-copy documentation of inventory, leak detect, and alarm information.

F. The console shall be equipped with a back-up battery to maintain all programming information, as well as inventory, leak detect, and alarm information in the event of a power outage.

G. The console shall provide 2 form C contact relays to provide the ability to enable an external audible/visual alarm or control external devices.

H. The console shall have a fixed feature set design to address business management, leak detection, and communications requirements.

I. The console shall be equipped with three 1-3/4" conduit knockouts on the top and the bottom of the monitor for rigid conduit entry into the monitor. One conduit entry shall be designated for the intrinsically safe compartment, and two conduit entries (top and bottom) shall be designated for the high-power compartment.

J. The console shall be separated into two compartments for: 1) intrinsically safe wiring and devices; 2) high-power wiring and devices.

K. The console shall have an internal quick-disconnect connector for 120 VAC wiring to the console for ease of installation,

service, and troubleshooting.

L. The console shall be equipped with the ability to communicate directly with an external POS terminal, printing device, or PC. The system shall also have the ability to communicate with a remote device via the telephone lines.

M. The console shall be capable of selectively communicating in English, French, German, Polish, Portuguese, Spanish, and Swedish.

N. The console shall he equipped with internal audible and visual warning and alarm indicators.

O. The console shall provide an intrinsically safe electrical barrier, for connection to devices mounted in hazardous areas, with Underwriters Laboratories (UL) and Canadian Underwriters Laboratories (cUL) approval.

P. The console shall comply with the FCC's RF emissions and susceptibility restrictions and be tested to be in compliance with FCC Part 68, Subpart 15.

Q. The console shall be mounted and wired according to the manufacturer supplied installation manuals, with all underground intrinsically safe field wiring enclosed in dedicated conduit and separate from all other wiring. The system's high-voltage wiring may share existing conduit with other high-voltage devices in accordance with the applicable guidelines published in the National Electrical Code (NEC).

R. The console shall continuously monitor all probes and sensors, reporting not only normal operating conditions, but also system malfunctions or failures.

3.2 Probes

A. The probe shall be capable of utilizing standard non-shielded gas- and oil-resistant wire between 14 AWG and 18 AWG for field connections.

B. There shall be no more than two conductors between each probe and the control console.

C. The probe shall be capable of performing a leak detect test to 0.1 GPM or higher.

D. Third-Party Certification is required in accordance with the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems" (0.2 GPH monthly monitoring).

E. Third-Party Certification is required in accordance with the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Volumetric Tank Tightness Testing Method" (0.1 GPH annual tank tightness test).

F. The probe shall be compatible for aboveground tank installations as well as underground tank installations.

G. A cap and ring kit, available from the manufacturer, shall be supplied with each probe for easy installation and removal.

H. The probe shall use a digital communications protocol format for maximum RF/EMF immunity.

3.3 Sensors

A. The system shall provide the ability to monitor up to 8 interstitial areas and/or containment areas, utilizing a standard float style sensor.

3.3.1 Piping Sump Sensor

A. The piping sump sensor shall be of PVC construction, utilizing a float and reed switch technology to sense the presence of liquid. The sensor shall also be supplied with a mounting bracket for installation of the sensor in a containment area.

B. The piping sump sensor shall be 12" long to address monitoring in piping containment sumps, as well as dispenser pan/sump areas.

C. The sump sensor shall be designed with a five-foot leader cable to connect the sensor to field wiring in the sensor junction box. The sensor shall be supplied with watertight cord grip assemblies to install in the sensor junction box.

1.	Power Requirements:	Intrinsically safe power supplied by tank monitor.
2.	Sensor Type:	Hermetically sealed magnetic reed switch.
3.	Contact Rating:	15 watts.
4.	Switch Travel:	7/8 inch to contact.
5.	Operating temperature:	Hydrocarbons: -25 C to +60 C. Freezing Liquids: 0 C to +60 C.

3.3.2 Hydrostatic Sensor

A. The hydrostatic sensor shall be supplied by the manufacturer in a single-float or a dual-float configuration.

B. The dual-float hydrostatic sensor shall be 19" long with a clear Lexan tubular housing for visible confirmation of sensor operation. The sensor shall be 2.5" in diameter to install in the riser pipe assembly of a double-wall tank brine reservoir.

C. The single-float hydrostatic sensor shall be 6.0" long with a clear Lexan tubular housing for visible confirmation of sensor operation. The sensor shall be 2.5" in diameter to install in the riser pipe assembly of a double-wall tank brine reservoir.

D. The single- and dual-float hydrostatic sensor shall be supplied with a 12-foot leader cable to connect the sensor to field wiring in the sensor junction box.

E. The single- and dual-float hydrostatic sensor shall be supplied with a lockable, watertight riser cap to prevent accidental spills into the tank reservoir. The cap shall be equipped with a vent tube to vent air out of the reservoir area and prevent liquids from entering into the reservoir.

F. The single-float hydrostatic sensor shall indicate only a low-liquid level in the tank reservoir.

G. The single-float hydrostatic sensor shall utilize a float and reed switch assembly for sensing the presence and change in liquid level. The contact shall be a Normally Closed dry contact.

H. The dual-float hydrostatic sensor shall indicate a high liquid level and a low liquid level in the tank reservoir.

I. The dual-float hydrostatic sensor shall utilize a dual float and reed switch assembly for sensing the presence and change in liquid level. The contact shall be a Normally Closed dry contact.

1. Operating temperature: -25 C to +70 C.
2. Installed in a brine solution of up to 30% calcium chloride.
3. Clear plastic housing for visual inspection.
4. Cable length: 12 Feet.
5. Available in both a single-float and a dual-float configuration.

3.3.3 Interstitial Sensor for Double-Wall Steel tank

A. The interstitial sensor for a double-wall steel tank shall be 2.5" high and 1.5" in diameter to fit into a riser pipe for a double-wall steel tank of 1.5" I.D. or greater.

B. The steel tank interstitial sensor shall be equipped with a 25-foot leader cable to connect the sensor to field wiring in the sensor junction box.

C. The sensor shall utilize a float and reed switch technology to sense and alarm for the presence of liquid.

1.	Operating temperature:	Hydrocarbons: -25 C to +70 C. Freezing Liquids: 0 C to +70 C.
2.	Cable length:	25 Feet.
3.	Dimensions:	2.5" high, 1.50" dia.
4.	Can be used in the annulus of steel tanks with a sensor riser pipe of 1.5" I.D. or greater.	

5. Two-wire connection to the monitor.

3.3.4 Interstitial Sensor for Double-Wall Fiberglass tank

A. The interstitial sensor for a double-wall fiberglass tank shall be 2.13" long, 1.27" wide, and 0.58" high. The sensor shall be designed to fit in the interstitial area of any size double-wall fiberglass tank from 4' in diameter to 12' in diameter.

B. The sensor shall utilize a float and reed switch technology to sense and alarm for the presence of liquid.

C. The sensor shall be designed with a pull cord hole where a pull cord may be attached to install the sensor in the interstitial area of the tank.

D. The sensor shall be designed with a protective braid covering the switch assembly and cable to provide mechanical protection.

1. Operating temperature: Hydrocabons: -25 C to +70 C.
   Freezing Liquids: 0 C to +70 C.
2. Can be used in the annulus of fiberglass tanks with a sensor riser pipe of 4".
3. Two-wire connection to the monitor.

3.4 Communications

3.4.1 RS-232 Serial Communications Interface

A. The system shall have the capability of communicating directly with a computer, teletype, or printer.

B. The system shall provide direct interface via a 25-pin D connector using standard RS-232 serial communications hand-shaking signals.

3.4.2 Auxiliary RS-232 Serial Communications Interface

A. The system shall provide an auxiliary 25-pin D connector for multiple console communications connections.

B. The system shall have the capacity for two 25-pin D connectors to interface a second tank monitor, as well as connect directly to a PC, teletype, or remote communications device.

Part 4 - Manufacturer's Support/Field Service

4.1 Technical Support

A. The manufacturer shall provide technical phone support available to customers from 8:00 AM to 7:00 PM EST

B. The manufacturer shall provide technical phone support available to authorized distributors and service contractors for on-site troubleshooting of UST system problems. Phone support shall be available from 8:00 AM to 7:00 PM EST.

4.2 Field Service

A. The manufacturer shall maintain a nation-wide field service staff to provide on-site customer support and training, as well as over seeing installation of tank monitoring system by installation contractor.

B. The distributor/contractor field service representative shall be available for on-site training of company maintenance personnel on installation, programming and troubleshooting of tank monitoring system.

C. The manufacturer shall have a territorial field service staff to support the distributor/contractor field service network.

4.3 Certification Training

A. The manufacturer shall require and provide mandatory certification training for all of its authorized distributors and

service contractors/installers.

B. The certification program shall consist of three certification levels covering installation, setup/operation, and service/troubleshooting of the manufacturer's UST monitoring systems.

C. The manufacturer shall provide certification information on contractor/installer to regulatory agencies that require certification documentation.

D. The manufacturer shall offer recertification training to keep contractors/installers current with updated information.

E. The manufacturer shall conduct regional training seminars throughout North America.

F. The manufacturer shall provide a home study certification program for installing contractors.

4.4 Warranty Registration and Checkout Form (WRACO)

A. The manufacturer shall require that all UST/AST monitoring systems be started up by an authorized distributor.

B. The startup shall consist of installation checkout, operation checkout, and customer training on use of the equipment.

C. The manufacturer shall supply a Warranty Registration and Checkout Form to properly document the site information to include:

1. Installation location
2. Installer
3. Equipment identification
4. Tank information
5. Leak detector information
6. Start up distributor information
7. Customer approval

D. The manufacturer shall compensate the authorized distributor for the start up procedure when a properly completed Warranty Registration and Checkout Form is submitted to the manufacturer.

E. Upon receipt of the Warranty Registration and Checkout Form, the manufacturer will initiate the system warranty and input the data into a site database.

4.5 Replacement and Service Parts

A. The manufacturer shall offer Authorized Distributors preselected parts kits to service UST monitoring systems.

8. The manufacturer shall offer a preselected Parts kits designed for service truck and shop.

C. The manufacturer shall offer a quick ship service for parts that shall ensure that a parts shipment is sent within 24 hours of request/order.

4.6 Delivery

A. The manufacturer shall have the ability to ship tank monitoring systems in three (3) working days from the time that an order is entered into the computerized system to the ship date.

4.7 ISO-9001

A. The manufacturer shall maintain an ISO-9001 rating, ensuring quality management of design, manufacturing, training and technical documentation.

Part 5 - Documentation

5.1 Manuals

A. The manufacturer shall supply product documentation that addresses the following categories as additional support:

1. Site preparation and installation instructions.
2. System setup instructions.
3. System operating instructions.
4. Individual sensor installation instructions.
5. Probe installation instructions.
6. Individual module installation instructions.
7. Product data sheets.
8. Troubleshooting and repair manuals.
9. Wiring diagrams which include the following:
    a. Identification of all devices and equipment terminals, and all external connection terminal blocks.
    b. All external wiring connections with approved wire colors and circuit designations.
10. Serial communications manuals.

5.2 Third-Party Certification

A. The manufacturer shall supply third-party documentation for all products, certifying that performance meets or exceeds EPA requirements.

5.3 Authorized Service Personnel Listing

A. The manufacturer shall supply a formal list of all Authorized Distributors and Service Contractors for sales, installation, training, and support.

Part 6 - Warranty

6.1 System Warranty

A. The tank monitoring system shall be warranted for a period of one year from date of installation or 15 months from date of invoice.

B. The warranty is to include parts and labor, with all warranty work performed on site by an authorized manufacturer's representative.