



Petro Specialties, Inc.

PetroVac - Vacuum Pump System (Patent Pending)

Full Specification

Section XX XX XX – PetroVac Vacuum Pump System

Part of VPH Interstitial Monitoring with TLS-450Plus ATG

1. General

1.1 Description

- Provide a factory-assembled PetroVac Vacuum Pump System by Petro Specialties, Inc. for use as the dedicated vacuum source for interstitial monitoring of double-walled tanks, piping, and containment sumps in Vacuum, Pressure, or Hydrostatic (VPH) continuous monitoring systems.^{[1][2]}
- System shall be designed for integration with the Veeder-Root TLS-450Plus automatic tank gauge (ATG) equipped with Secondary Containment Leak Detection (SCLD) module and configured for vacuum-based interstitial monitoring in lieu of a submersible turbine pump (STP) vacuum source where STPs are not present or not permitted.

1.2 Performance and Regulatory Intent

- PetroVac system shall provide continuous or sequenced vacuum sufficient to maintain required negative pressure in designated interstitial spaces and to enable the TLS-450Plus/SCLD to meet California VPH continuous monitoring requirements for underground storage tank (UST) systems regulated under CCR Title 23 and equivalent state programs.
- The system shall be suitable as an Automated Interstitial Monitoring System (AIMS) method for secondary containment monitoring and shall be supported by a third-party evaluation (Ken Wilcox Associates or equal) and NWGLDE application/acceptance, as available.

1.3 Approved Manufacturer

- Basis of Design: PetroVac Vacuum Pump System, Petro Specialties, Inc., Temecula, CA.
- Substitutions: Not permitted without prior written approval of Owner and AHJ and demonstration of equal performance and compatibility with TLS-450Plus/SCLD.

1.4 Coordination

- Coordinate all PetroVac control points and interstitial assignments with the TLS-450Plus/SCLD programming, alarm setpoints, and site sequence of operations.
- Coordinate with tank, piping, and sump manufacturers to confirm interstitial materials, design vacuum ratings, and allowable operating ranges.

2. System Function

2.1 Functional Overview

- PetroVac shall be a positive displacement vacuum pump system that draws and maintains vacuum on designated interstitial spaces of:
 - Double-walled USTs.
 - Double-walled product piping (secondary containment).
 - Double-walled or monitored containment sumps, as specified.
- System shall operate automatically in conjunction with TLS-450Plus/SCLD to:
 - Establish and maintain interstitial vacuum within specified setpoint range.
 - Enable leak detection through TLS-450Plus-monitored vacuum decay or alarm conditions.
 - Annunciate trouble/failure conditions at the TLS-450Plus console and local control panel.
 - Execute positive shutdown of the PetroVac vacuum pump if liquid is detected in any vacuum sensor by the associated liquid sensor.

2.2 Application Conditions

- PetroVac shall be used in applications where:

- No STP is installed (e.g., generator day tank systems, dedicated chemical/alcohol tanks, high-rise or specialty fuel systems); or
- STP cannot be used as a vacuum source due to fluid properties (e.g., alcohol, heavy hydrocarbon or waste products) or engineering/regulatory constraints.
- Engineer shall assign specific interstitial volumes to be served by PetroVac and confirm they are within the manufacturer's allowable volume and line length limitations, including any maximum total interstitial volume (tanks plus piping plus sumps) published in current PetroVac documentation.

2.3 Operating Modes

- Normal Mode: Periodic or demand-based vacuum pump operation to maintain interstitial vacuum within preset band, with status/alarm feedback to TLS-450Plus.
- Alarm Mode: Upon vacuum loss beyond alarm threshold or loss of communication/power, system shall annunciate alarm at TLS-450Plus and at local control enclosure; optional interlocks may shut down affected system(s) if required by AHJ or Owner.
- Liquid Detection Mode: Upon detection of liquid in any vacuum sensor by its associated liquid sensor, the TLS-450Plus shall immediately command positive shutdown of the PetroVac vacuum pump and annunciate a high-priority alarm condition to prevent further vacuum draw and potential product migration.
- Test/Service Mode: Local controls shall allow qualified personnel to isolate PetroVac, perform functional testing, and restore normal operation without compromising ATG alarm integrity.

3. Components

3.1 PetroVac Vacuum Pump Assembly

- Positive displacement vacuum pump sized per manufacturer's recommendations for total connected interstitial volume.
- Factory-mounted motor, pump head, check valves, isolation valves, and internal protections as required.
- Vacuum gauge and local service port(s) for field testing and evacuation.

3.2 Control Panel

- NEMA-rated enclosure suitable for installed location (indoor mechanical room or outdoor weather-exposed as noted on drawings).
- Red Jacket turbine relay / motor starter/contactors, overload protection, control transformer (if required), HOA (Hand-Off-Auto) switch, run light, alarm indicators, and terminal strips for ATG interface.
- Control logic to:
 - Start/stop PetroVac based on vacuum setpoints or TLS-450Plus commands.
 - Provide dry contacts or equivalent signals for "Pump Run," "Pump Fault," and "System Trouble" to TLS-450Plus/SCLD.^{[9][21][8]}
 - Accept shutdown command from TLS-450Plus upon liquid detection in any vacuum sensor and prevent automatic restart until alarm condition is cleared and manual reset is performed.

3.3 Piping and Manifold Assembly

- Vacuum header and branch lines from PetroVac to each monitored interstice, including:
 - Isolation valves per interstice.
 - Check valves as needed to prevent backflow or cross-communication.
 - Vacuum-rated tubing/piping and fittings compatible with product vapors and site environment.

3.4 Vacuum and Liquid Sensor Monitoring Kits

- Provide Veeder-Root Vacuum Sensor Monitoring Kits (pre-assembled) for each monitored interstitial space, including:
 - Vacuum Sensor for continuous vacuum monitoring connected to TLS-450Plus/SCLD.
 - Liquid Sensor paired with each Vacuum Sensor to detect the presence of liquid in the interstice and trigger positive shutdown of the PetroVac.
- Each tank annulus, piping secondary containment interstice, and monitored sump shall be equipped with one (1) complete Vacuum Sensor Monitoring Kit.
- Sensors shall be installed per Veeder-Root installation instructions and wired to dedicated input channels on the TLS-450Plus/SCLD module.

3.5 ATG Integration

- Provide all necessary wiring between PetroVac control panel and TLS-450Plus/SCLD modules, including I/O for run status, alarms, and any dedicated sensor inputs required by Veeder-Root configuration.
- ATG programming shall be coordinated to:
 - Monitor all Vacuum Sensors and associated Liquid Sensors.
 - Execute positive shutdown of the PetroVac vacuum pump upon liquid detection in any vacuum sensor.
 - Prevent automatic restart of PetroVac after liquid detection until the alarm is acknowledged, the condition is corrected, and a manual reset is performed by qualified personnel.
- ATG programming shall be coordinated so that PetroVac serves as the vacuum source for designated VPH zones and is tied to appropriate alarm logic and fail-safe actions.

3.6 Documentation

- Provide the following PetroVac-specific documents in the design and closeout packages:
 - Installation Manual.
 - Operation & Maintenance (O&M) Manual.
 - One-Year Limited Parts Warranty.
 - Installation Checklist.
 - Equipment Check Guidelines for Inspectors.
- Provide Veeder-Root Vacuum Sensor Monitoring Kit installation instructions and TLS-450Plus programming guide for liquid detection shutdown logic.

4. Design Requirements (Engineer to Show on Drawings)

4.1 Interstitial Assignment and Volumes

- Clearly identify each interstitial space served by PetroVac (tank annulus, piping secondary, sumps) on plans and P&IDs.
- Indicate estimated interstitial volumes and confirm compliance with PetroVac published limits.

- Show the location and quantity of Veeder-Root Vacuum Sensor Monitoring Kits (Vacuum Sensor + Liquid Sensor) for each monitored interstice on tank and piping plans.

4.2 Setpoints and Alarm Logic

- Specify required vacuum operating range (normal setpoint and alarm thresholds) coordinated with:
 - Tank/piping manufacturer's allowable vacuum rating.
 - PetroVac capabilities.
 - TLS-450Plus/SCLD configuration and regulatory criteria (e.g., VPH continuous monitoring, AIMS Category 1 equivalence).
- Specify alarm setpoints and shutdown logic for liquid detection in vacuum sensors, including:
 - Immediate cessation of PetroVac operation.
 - High-priority alarm annunciation at TLS-450Plus and remote monitoring locations (if applicable).
 - Lockout/manual reset requirement before system restart.

4.3 Power and Environment

- Provide dedicated power circuit to PetroVac control panel in accordance with manufacturer requirements (voltage, phase, full-load amps, short-circuit rating).
- Show mounting location, support details, and environmental conditions (temperature, ventilation) necessary for reliable operation.

4.4 Access and Service

- Provide adequate clearances around PetroVac and control panel for installation, inspection, and service in accordance with manufacturer instructions and Equipment Check Guidelines and local codes.

5. Installation, Testing, and Acceptance

5.1 Installation

- Install PetroVac system strictly per manufacturer's Installation Manual, Installation Checklist, and project drawings.

- All vacuum lines shall be pressure/vacuum-tight and protected from physical damage and environmental exposure per code.
- Install Veeder-Root Vacuum Sensor Monitoring Kits per manufacturer instructions, ensuring each Vacuum Sensor is paired with its associated Liquid Sensor and properly wired to the TLS-450Plus/SCLD.

5.2 Start-Up and Functional Testing

- Perform manufacturer-recommended start-up and functional tests, including:
 - Leak tightness of vacuum header and branch lines.
 - Demonstration that the system achieves and maintains design vacuum in each interstice.
 - Verification that TLS-450Plus/SCLD properly displays system status and alarms.
 - Functional test of liquid detection shutdown logic:
 - Simulate liquid detection in each vacuum sensor (per Veeder-Root test procedures).
 - Verify that TLS-450Plus immediately shuts down PetroVac, annunciates alarm, and prevents automatic restart.
 - Confirm that manual reset is required to restore PetroVac operation after alarm clearance.

5.3 Training and Turnover

- Provide on-site operator and maintenance training using the PetroVac training outline, including normal operation, alarm response, and basic troubleshooting.
- Training shall include specific instruction on:
 - Liquid detection alarm response procedures.
 - Manual reset and restart protocol after liquid detection shutdown.
 - Inspection and testing of Vacuum Sensor Monitoring Kits.
- Deliver all final documentation, warranties, and approval letters at project closeout.

6. Warranty

- PetroVac Vacuum Pump System shall be furnished with a one-year limited parts warranty as published by Petro Specialties, Inc.; labor and consequential damages are excluded unless otherwise noted in project documents.
- **Warranty registration form must be completed and submitted to validate the warranty.**
- Veeder-Root Vacuum Sensor Monitoring Kits shall be covered under manufacturer's standard warranty; coordinate warranty terms with Veeder-Root and include in project closeout documentation.

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