

Pipeline Leak Detection Systems Permanent Installation Solutions

Offered commercially since 1996, Vista’s automated pipeline leak detection system technology enjoys wide acceptance and success throughout North America. In 1999, *Aviation Week & Science Technology* awarded the HT-100 one of its Annual Technology Innovation Awards. Selected as the automated leak detection systems of choice, our products are in use at 35 fuel storage and distribution facilities worldwide in a variety of applications ranging from small truck rack fueling systems to commercial airport hydrant re-fueling systems of one million gallons volume.

This document summarizes Vista’s product offerings for permanent installation at bulk fuel storage and distribution facilities.

Products	Attributes	Applications
LT-100	Line volumes less than 3,400 gallons Volumetric Method Fixed and Mobile Systems	Truck Rack Fueling Systems Small Fuel Farms
HT-100	Line Volumes larger than 3,000 gallons up to 612,000 gallons Volumetric Method Fixed and Mobile Svstems	Hydrant Refueling Systems Larger Fuel Farms Fuel Transfer Lines
HT-100 PM	Line Volumes of any size up to 320,000 gallons Pressure Method	Type III Hydrant Refueling Systems Fuel Transfer Lines

Vista's product offering information is presented in the following sections -

1. Leak Detection Methodology/Technology Type
2. Permanent Installation Type
3. Installation Requirements
4. Leak Detection System Performance
5. Certifications and Approvals

1. Leak Detection Methodology/Technology

Vista Precision Solutions offers two technology types to owner/operators of fuel storage and distribution systems. Each technology has its advantages for specific applications and are described below.

Volumetric Test Methodology - The LT-100 and HT-100 use the same basic volumetric technology to overcome temperature and pressure effects on precision integrity testing. The tests are volumetric measurements and although conducted at two different pressures, eliminate the physical effects of varying pressure on the tests. In addition, fuel volume changes related to thermal influences are eliminated by the application of this straight-forward technology.

Volumetric technology is best applied to the following applications:

- existing fuel distribution systems
- non-automated fuel distribution facilities
- fuel distribution systems that may be expanded in the future
- systems comprised of above- and below-ground piping segments

The LT-100 and HT-100 automatic leak detection system test equipment are comprised of the following components:

Sensor Unit Skid - includes a measurement cylinder, a fuel storage cylinder, differential pressure sensor measuring level changes in the measurement cylinder, a pump to increase and maintain line segment pressure, and a pressure management manifold. All this equipment is housed on a small footprint skid and is easily installed on site.

Control System - the programmable logic controller (PLC) directs the test, collects and processes the test data, and issues the test result. The PLC uses commercial off-the-shelf hardware and software for maintenance ease and effortless upgrading.

Operating Computer - a Windows PC is used by operating personnel to initiate testing activity and monitor test progress. Resident to the PC is the graphical user interface and leak detection operating software. Test results are archived for technical support.

Pressure Methodology - The HT-100 Pressure Method (PM) is a pressure-based automatic leak detection system technology designed to fully integrate with existing SCADA fuel facility operating hardware and software. The HT-100 PM technology is best applied to the following applications:

- new fuel distribution systems
- automated fuel distribution facilities
- below-ground piping systems
- constant pressure loop systems such as a Type III hydrant refueling systems

The HT-100 PM is comprised of the following components:

Control System - the programmable logic controller (PLC) directs the test, collects and processes the test data, and issues the test result. The PLC uses commercial off-the-shelf hardware and software for maintenance ease and effortless upgrading.

Operating Computer - using either the pump control operating computer or stand alone computer, the graphical user interface is programmed to fit the specific application.

Data Collection Sensors - pressure sensors must be installed on each line segment for test data collection. In addition, communication cabling and conduit must be installed to each segment requiring a pressure sensor.

Fuel Management Skid - in some situations a fuel management skid is required, in the event existing piping infrastructure cannot support installation.

Other supporting systems that could benefit the application of HT-100 PM are valve control systems, pump control systems and fuel farm automation in general.

2. Permanent Installation Type

In addition to technology selection, another important consideration in applying leak detection is whether the technology is installed fixed-in-place or on a transportable chassis; each has its advantages.

Fixed-in-Place Systems

LT-100 - Designed for small fuel distribution systems, the LT-100 is specifically applicable to line segment volumes less than 3,400 gallons, about 2,500 feet of 6-inch piping. A variety of test lengths are available to the system operator ranging from a quick 15-minute 3 gallon per hour test to a 2-hour test capable of detecting leaks as small as 0.1 gallon per hour.

HT-100 - The award winning flagship leak detection system is applicable to larger fuel systems. With certified performance testing line segment volumes ranging from 3,000 to 612,000 gallons, over 35 HT-100 systems are in use currently worldwide today. Typical applications include aircraft fueling hydrant systems found at commercial and military installations, however, the system is also used on longer length fuel transfer lines, some as long as 20 miles.

HT-100 Pressure Method - VPSI's newest product offering is in response to client's needs for a fully integrated, automated pipeline leak detection system. The HT-100 Pressure Method (PM) is designed to integrate seamlessly with facility fuel distribution SCADA systems and piping infrastructure. Taking advantage of the standard, patent-protected HT-100 technology, VPSI has gone one step farther to offer a automatic leak detection solution to fuel system owners. Applicable to commercial and military aircraft refueling systems, the HT-100 PM test line segment volumes of any size up to 320,000 gallons in a 1-hour test.

Mobile Systems

In addition to fixed-in-place leak detection systems, many fuel system owner/operators appreciate the need to test smaller line segments periodically to complete their pipeline integrity management programs. With the same testing capabilities as the fixed-in-place systems described above, owner/operators are able to take their leak detection system “on the road” to test remote line segments on an existing facility or at a nearby site also owned by the operator. The mobile version of the leak detection systems include on-board power generation, spill containment basin, test hoses and accessories, and a comfortable personnel compartment. VPSI offers the following skid-based leak detection systems on a mobile (Truck or Trailer) chassis offering ultimate user flexibility.

LT-100 - With the same testing capabilities as the fixed-in-place system, the LT-100 is best used at facilities with small volume line segments, such as a bulk storage fuel farm or truck refueling facility.

HT-100 - Designed for larger facilities, many owner/operator’s combine the stationary HT-100 with a mobile system to provide leak detection coverage for their entire facility. When “parked”, the mobile HT-100 acts just like a stationary system in its operation.

3. Installation Requirements

Installation requirements vary broadly depending upon the application. The following summarizes the general installation requirements for each type of leak detection system.

Fixed-in-Place LT-100 & HT-100 Systems -

Pump electrical - 115/230-VAC, 60-Hz single- or double-phase electrical

Valves, PLC, computer electrical - 115-VAC, 60-Hz single-phase

Sensor Controls - separate conduit for control wiring

PLC-Computer Communication - separate conduit for communication wiring

Line Interface - 1 1/2 - inch piping connection, schedule 80, 150-pound flanges

Concrete Pad - skid is placed on a suitable sized concrete pad with containment curb.

Enclosure - in areas of extreme exposure, the equipment is placed in an suitable enclosure.

Fixed in Place HT-100 PM Systems -

Sensor Controls - separate conduit for control wiring

PLC-Computer Communication - separate conduit for communication wiring

Mobile LT-100 & HT-100 Systems-

Line Interface - 1 1/2 - inch piping connection, schedule 80, 150-pound flanges

Vista designs specific installation requirements for each fixed-in-place leak detection system. To support the design and installation, Vista furnishes the *LT-100 & HT-100 Installation Primer* to owner/operators.

The HT-100 automated pipeline leak detection systems take advantage of commercial, off-the-shelf programmable logic controller (PLC) software and graphical user interface software. Using this software allows integration and operation through existing fuel farm automation suites to include Fuel Automated System (FAS), Automated Fuel Handling Equipment (AFHE), and other commercially accepted SCADA systems. Vista HT-100 automated pipeline leak detection equipment is operated through FAS at FISC-San Diego, California and integrates with valve/pump control systems at a number of commercial airports.

4. Leak Detection System Performance

Vista leak detection system performance is evaluated and certified by independent third party companies. The performance for each permanently installed system is summarized here:

Leak Detection Method	Minimum Detectable Leak Rate (MDLR)	Leak Detection Threshold (LDT)
LT-100, Version 1.0 ($P_D = 97\%$, $P_{FA} < 3\%$)	0.2 gph	0.148 gph
LT-100, Version 1.1 ($P_D = 97\%$, $P_{FA} = 3\%$)	0.1 gph	0.07 gph
HT-100, Version 1.0 ($P_D = 95\%$, $P_{FA} = 1.25\%$)	0.004% line capacity	0.0028% line capacity
HT-100, Version 1.1 ($P_D = 95\%$, $P_{FA} = 5\%$)	0.00209% line capacity	0.00092% line capacity
HT-100 PM, Version 2.1 ($P_D = 95\%$, $P_{FA} = 5\%$)	0.0019% line capacity	0.00095% line capacity

The methods can be applied in a variety of scenarios depending upon the P_D and P_{FA} values required by the owner/operator and regulatory requirements. The standard requirement is $P_D = 95\%$ and $P_{FA} = 5\%$. Performance will also vary by application.

5. Certifications and Approvals

All Vista Precision Solutions test methodologies are evaluated and their performance certified by Ken Wilcox Associates as meeting U.S. EPA testing protocols. Final Evaluation and Certification reports available upon request.

All technology and methods are listed by the **National Work Group on Leak Detection Evaluations** as complying with U.S. EPA testing protocols.

The **Energy Institute** accepts the HT-100 technology for application throughout the world.

Many states list the LT-100 and HT-100 as accepted technologies for regulatory compliance.