

# Secondary containment, remediation, tanks, piping, hoses, leak detection, etc.

## 1995: the patented truth

(Part Two)

by Wolf H. Koch, Ph.D.

*Editor's note: In this article, Dr. Koch covers secondary containment, remediation, tanks, piping, hoses, leak detection, service station design and alternative fuels. This is the second in a two-part series on 1995 patents issued in the area of service station technology. The first covered dispensers, nozzles and point-of-sales systems, and appeared in the May/June issue of Petroleum Equipment & Technology. Dr. Koch will present new patents in future issues of PE&T.*

*The illustrations in this article are copies of the original patent drawings, and include the labels and numbers as shown. The color has been added for emphasis and clarity by PE&T, and was not specified by any of the patent holders. The labels identified under each illustration are provided for clarification, and were not shown on the original patent drawings.*

### Technology highlights

As I did in the May/June issue of *PE&T*, I will highlight inventions that illustrate and depict an effective application of the technology in each respective category.

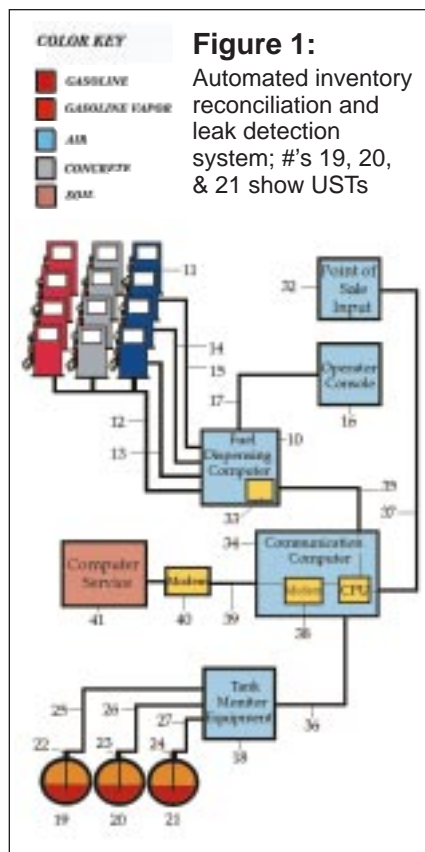
### Statistical Inventory Control

**Patent:** Paul O'Conner; US 5,400,253 assigned to Southern Power, Inc.

**Abstract:** Automatic statistical inventory reconciliation system for service stations.

**Background:** Federal rules mandate the use of leak detection equipment as one option toward compliance with the December 1998 UST upgrade requirements. This patent illustrates one method of compliance.

**Design:** *Figure 1* illustrates the data flow for a statistical inventory reconciliation system. Tank monitors (#18) continuously provide inventory information. The fuel dispensing computer(s) (#10), together with sales data, provide a check for the inventory. Integral to this invention is a central computer system (#34). This system gathers and analyzes data from multiple sites and provides the owner with statistical data on any store's inventory and sales.



### Automated Leak Detection

**Patent:** Glenn Thompson, et. al.; US 5,447,055 assigned to Tracer Research Corporation.

**Abstract:** Automated leak detection method using low concentrations of tracer compounds to determine leakage.

**Background:** This technology represents an alternative method for meeting the EPA's UST upgrade requirements.

**Design:** *Figure 2* illustrates the operation of the automated tracer leak detection method. Low concentrations of tracer additive are mixed into the underground product tanks. Sensor probes (#20) are placed into monitoring wells throughout the site. A sample valve (#30) pulls vapor sample sequentially from the wells and analyzes them for the tracer with a gas chromatograph (GC) (#44). Periodic comparisons to

a calibration standard (#32) are made to ensure proper response of the equipment. Output from the GC is stored in a computer that displays the status of the unit.

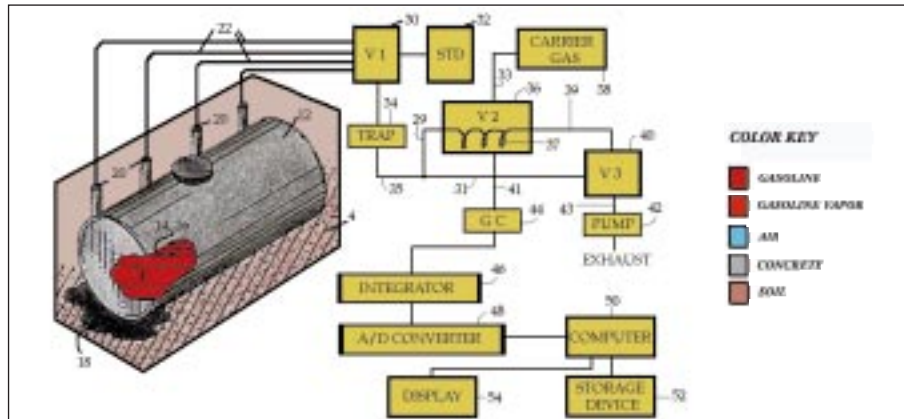
### Secondary Containment

**Patent:** Morris Lewis; US 5,421,671 unassigned.

**Abstract:** A remotely monitored and controlled secondary containment system that provides for cleanup and repair of tanks without excavating the tanks.

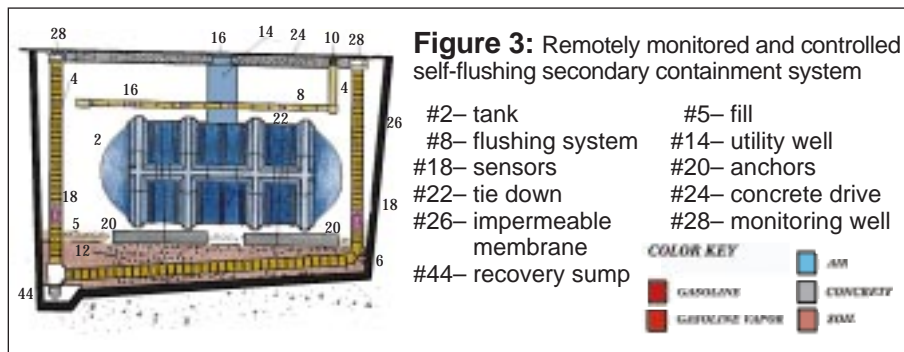
**Background:** The invention provides a method of installing remediation equipment during tank installation.

**Design:** Use of this invention requires planning for remediation during the construction phase. *Figure 3* illustrates monitoring wells with sensors (#18), a flushing system and a recovery sump (#44). The excavation is protected by a liner that is impervious to the product. Any potential leak will migrate to the recovery sump from where the product can be recovered.



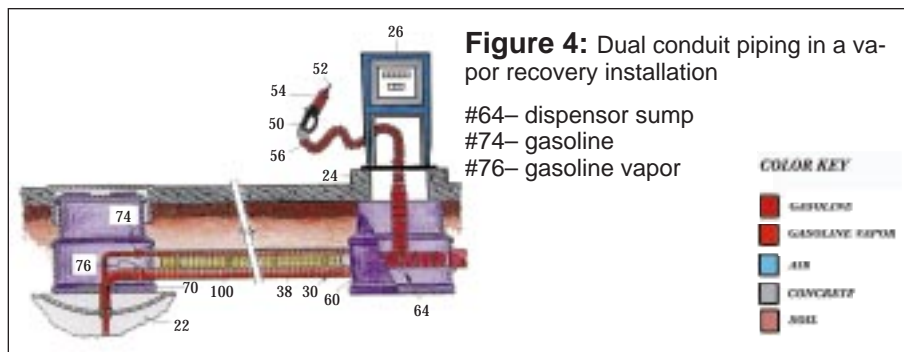
**Figure 2:** Automatic continuous leak detection apparatus

- #20— sensor probes
- #30— sample valve
- #36— control valve
- #22— sample conduit
- #32— calibration standard,
- #44— gas chromatograph



**Figure 3:** Remotely monitored and controlled self-flushing secondary containment system

- #2— tank
- #8— flushing system
- #14— utility well
- #18— sensors
- #22— tie down
- #26— impermeable membrane
- #44— recovery sump
- #5— fill
- #20— anchors
- #24— concrete drive
- #28— monitoring well



**Figure 4:** Dual conduit piping in a vapor recovery installation

- #64— dispenser sump
- #74— gasoline
- #76— gasoline vapor

The patent has provisions for remediation, including bioremediation.

### Vapor Recovery Piping

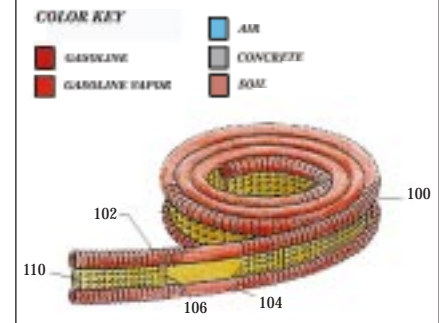
**Patent:** Marc Guindon, et. al.; US 5, 407, 300 assigned to Total Containment, Inc.

**Background:** Vapor recovery requirements in California and most major metropolitan areas have required installation of additional piping to collect vapors and return them to the underground tanks.

**Figure 5:**

A detailed drawing of dual conduit piping used in Figure 4

- #102— 2 inch vapor tube
- #104— 11 inch auxiliary vapor tube



**Design:** The invention offers a dual conduit vapor pipe that eliminates the potential for liquid blockage in the system, since it contains an alternative vapor path. By providing vertical rigidity and allowing no sharp turns in the horizontal plane, the pipe eliminates the need for conventional curved joints and couplings. It is easily transported and installed. *Figure 4* shows the pipe installed in a typical station layout, while *Figure 5* shows it ready for shipping.

### Secondary Containment for Piping

**Patent:** Terrel Silvers; US 5,427,474 assigned to Ameron, Inc.

**Abstract:** Secondary containment piping system with bridging pipes for continuity.

**Background:** Product release and potential contamination can be eliminated with secondary containment for product piping.

**Design:** *Figure 6* illustrates the use of secondary containment in piping systems. The invention uses clam shell couplings (#30) for joining secondary containment conduit. At line intersections, bridges are used to provide continuity across the conduit. This allows for centralized tight-

## Table 1—1995 Patent Review

### Secondary Containment and Remediation

WO 9,518,686	Knackstedt, H.G. Hydrogeologie GmbH	Bioremediation of API and carwash sludge using multi-tank cascades.
US 5,403,491	Holland, H.W. Unassigned	Monitor well hydro-carbon absorber.
US 5,407,300	Guindon, M., et.al Total Containment Corp.	Vapor recovery piping and blockage preventer, which is bendable and is installable without surveying equipment.
US 5,421,671	Lewis, Morris E. Unassigned	A remotely monitored and controlled self-flushing secondary0 containment system for USTs.
US 5,422,330	Kaylor, J.B. Valkyrie Scientific Proprietary	Sorbent compositions, uses and manufacturing methods.
US 5,455,005	Clawson, L.G., et.al Cedarapids, Inc.	Solid material remediation in multi-functional retort.

### Tanks and Piping

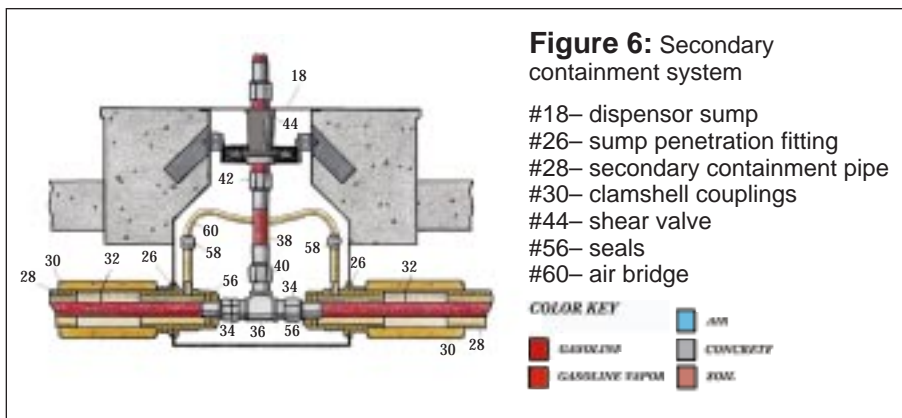
US 5,383,769	Williams, J.R. The Marley Pump Co.	Retrofit strainer attachment for Marley gasoline pumps.
US 5,400,924	Brodie, R.G.	Aboveground fuel storage and dispensing apparatus.
US 5,427,474	Silvers, T.W. Ameron, Inc.	Double containment piping system.
US 5,435,335	Klop, E.P. EBW, Inc.	Overflow valve assembly for use in vapor return lines.

### Hoses

WO 9,519,291	Sanders, J.D. Dayco Products, Inc.	Vapor hose assembly method.
US 5,430,929	Sanders, J.D. Dayco Products, Inc.	Method for attaching hose coupling.
US 5,456,296	Berger, J.M., et.al Dayco Products, Inc.	Venturi section for removing condensate from vapor hose.

### Leak Detection

US 5,384,714	Kidd, R.E. Emerson Electric Co.	Submersible pump controller program.
US 5,390,532	Anthony, M. Unassigned	Test apparatus for leak detection.
US 5,397,995	Anderson, R.V. Unassigned	Capacitance level probe with overflow leak detection capabilities.
US 5,400,253	O'Connor, P.M. Southern Power, Inc.	Automated statistical inventory reconciliation system for service station USTs.
US 5,423,457	Nicholas, M.P., et.al Suntronic Technology Group	Real time tank product loss detection system for USTs with volume measuring devices.
US 5,440,918	Oster, E.H. Unassigned	Self-contained portable line leakage tests without actuation of pumps.
US 5,447,055	Thompson G.M., et.al Tracer Research Corp.	Automated leak detection detection system for leaks from fluid storage tanks uses distinctive tracer in automated soil gas sampling.
US 5,461,906	Bogle, T.G., et.al Tanknology Corp.	Leak detection by measuring rate of pressure increase during successive vacuum cycles.
US 5,471, 867	Tuma, J.E., et.al Tanknology Corp.	Inventory reconciliation for ASTs.
WO 9,510,033	Denby, C. Unassigned	Detecting fluid leakage from the UST by measuring pressure drop over time



ness testing of the entire secondary containment conduit with one test. The system can be retrofitted to existing piping.

### Other 1995 patents

All patents recovered by my search are

summarized in *Table 1* and grouped into relevant topics. There are a total of six patents in secondary containment and remediation; four on tanks and piping; three covering hoses; ten in leak detection; three on station design; five covering

alternative fuels; and six on miscellaneous topics.

The patent search covered US, European and World patents, but not individual countries other than the US. I noticed particularly that in the area of hose material composition, the Japanese patent office issued more than 20 patents. □

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## Table 1—Continued

### Station design

WO 9,530,564	Weimann, G. Rheinruhr Maschinenbau	Modular service station design.
US 5,454,205	Bol, J.B. Unassigned	Leak-proof filling station floor.
US 5,454,544	Del Zotto, W.M. Guardian Containment Corp.	Storage vault cover assembly.

### Miscellaneous

WO 9,523,366	Indey S. Rhone-Poulenc Inc.	Fuel additive metering system.
US 5,383,769	Williams, J.R. Marley Pump	Strainer attachment, for the inlet fitting of a submersible pump.
US 5,406,995	Gantzer, C.J. Viking Industrial Products	Container for mixing liquids in predetermined ratios.
US 5,420,797	Burns, R.R. Unassigned	Method of delivering petroleum products using electronic identification tags and reading probe.
US 5,466,386	Stewart, H.E., et.al. Powsus, Inc.	Fire extinguishing compositions.
US 5,476,126	Hillard, H.T. Jr., et.al. Unassigned	Method and apparatus for venting a storage vessel.

### Alternative fuels

WO 9,532,405	Miller, C.E. Marcum Fuel Systems, Inc.	Density compensated compressed natural gas flow meter.
US 5,385,176	Price, B.F. Price Compressor Co., Inc.	Compressed natural gas dispensing.
US 5,406,988	Hopkins, P.F. Pacific Cryogenic, Inc.	Method and apparatus for dispensing compressed gas into a vehicle.
US 5,409,046	Swenson, P.F., et.al. Unassigned	System for fast-filling compressed natural gas vehicles with liquified natural gas.
US 5,454,408	DiBella, F.A., et.al. Thermo Power Corp.	Variable-volume storage and dispensing apparatus for compressed natural gas.