ARID TECHNOLOGIES INC.

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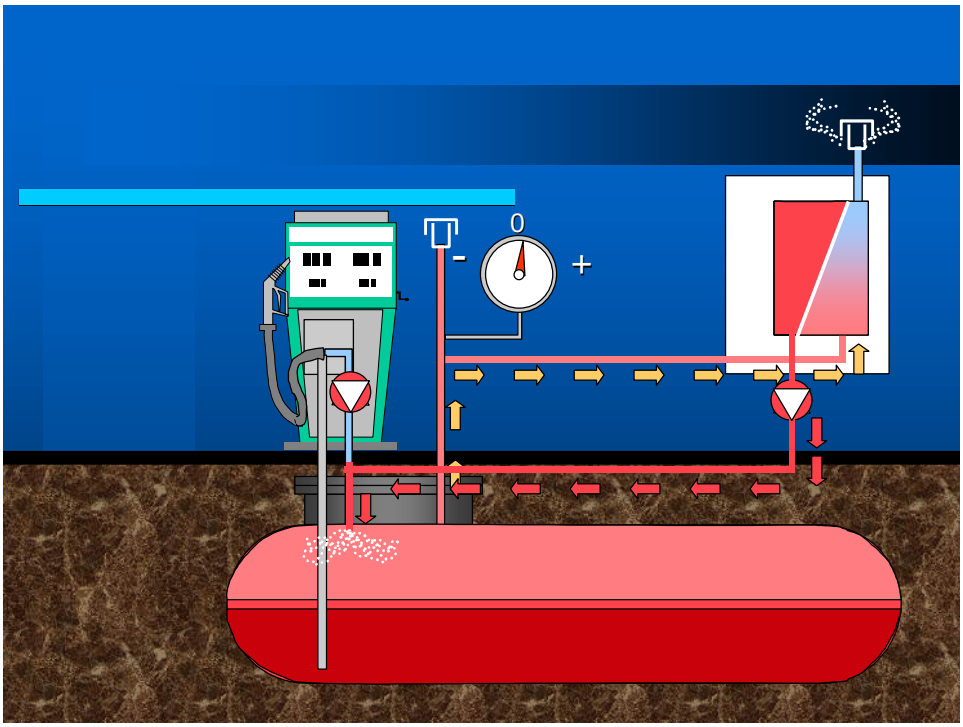
PERMEATOR ™

The *PERMEATOR* is designed to prevent the venting of volatile organic compounds (VOC's) and the resulting product loss from retail gasoline storage tanks. The system virtually eliminates evaporative emissions via a patented membrane separation technology proven since 1989 in large tank storage and refinery applications. Arid Technologies, Inc. is now bringing this same robust technology to the retail station environment.

1. The *PERMEATOR* increases salable product volume by up to 0.5% of throughput while reducing evaporative emissions of hydrocarbon vapors by over 95%.
2. The *PERMEATOR* can be installed without excavation and is simple to maintain.
3. The compact unit can be retrofitted to existing Stage II vapor recovery systems (vacuum-assisted or balance) or installed at facilities that have no recovery system in place.
4. For Stage II systems the *PERMEATOR* allows for improved refueling vapor recovery efficiency at the nozzle without sacrificing evaporative emissions from the storage tanks.
5. The *PERMEATOR* will provide increasing benefits to gasoline marketers and the environment as on board refueling vapor recovery (ORVR) equipped vehicles gradually enter the nations fleet. Inventory savings measure between 0.16% and 0.50% of gasoline throughput.



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Technical Summary

Refueling emissions are generated from all liquid fuel storage and delivery systems when volatile liquids, like gasoline, are transferred from a storage tank to a receiving tank. Whether from tanker ship to terminal or underground storage to automobile -- vapor emissions escape into the atmosphere costing valuable product and damaging the environment.

The vapors initially present in the receiving tank are displaced from the headspace by the incoming liquid during the filling process. In the case of vehicle refueling, these “refueling emissions” can be directed back to the storage tank headspace or to an activated carbon canister located on the vehicle. If the refueling emissions are not directed back to the headspace of the storage tank, atmospheric air enters the storage tank to equalize the negative pressure caused by the outflow of liquid. The air dilutes the concentration of vapors in the storage tank headspace below the natural equilibrium saturation value. This results in the evaporation of additional liquid from the storage tank to reestablish equilibrium in the headspace.

The re-equilibration of the storage tank vapor space is a dynamic process that occurs over time and lags the liquid dispensing event. In gasoline retail outlets, the duration between bulk tanker deliveries provides ample time for re-equilibration of the storage tank headspace to occur. Re-equilibration results in the evaporation of hydrocarbons and corresponding pressure increases within the headspace of the storage tank. (Note: 1 gallon of liquid gasoline evaporates to ~520 gallons of vapor @ 40% hydrocarbon concentration). Increased pressure in the tank leads to vapor emissions through pressure/vacuum relief vents and through leaks in the vapor pathway. Without additional processing evaporative emissions result in substantial product loss, environmental emissions, and health & safety hazards. These evaporative emissions are costly. Unfortunately, the new ORVR systems, that are effective in reducing refueling emissions, actually increase evaporative emissions from storage tanks.

Membrane Separation

The gas separation membranes used in the *PERMEATOR* consist of extremely thin, selectively permeable, polymeric film attached to a porous support structure. Membrane films are integrated into modules to provide maximum surface area per unit volume of pressure housing. Unlike conventional particle filters which separate materials based on physical size differences, vapor separation membranes utilized by Arid Technologies, Inc. separate compounds based on differences in the solubility and diffusivity of specific molecules. Hydrocarbon molecules pass through, or permeate the thin polymer film more rapidly than other molecules and are returned to the underground storage tank (Figure 1). Molecules such as oxygen and nitrogen (air) are much slower permeators, and are “rejected” by the membrane film and vented to the atmosphere. The difference in permeation rates between hydrocarbon and air molecules allows for the “selective” separation of gasoline vapors from air.

ARID’s membrane-based system provides a simple, safe and economical solution that eliminates emissions of gasoline vapors at dispensing facilities. Removing excess air from storage tanks prevents over pressurization from occurring and virtually eliminates fugitive emissions. Storage tanks can be controlled to keep them at a slight negative pressure relative to atmospheric pressure to eliminate fugitive and vent emissions.

System Operation

1. Air and hydrocarbon vapors fill the space left in a storage tank when liquid gasoline is transferred to an automobile.
2. The pressure in the storage tank headspace increases as liquid gasoline in the storage tank evaporates to increase the hydrocarbon concentration in the headspace. A pressure switch connected to the ullage actuates the PERMEATOR system.
3. The air/hydrocarbon mixture expelled from the storage tank vent line is directed to a membrane module where a vacuum pump creates a differential pressure that causes the hydrocarbon molecules to preferentially permeate, or pass through, the membrane.
4. The hydrocarbon-rich permeate stream is returned to the storage tank while the air-rich non-permeate stream is vented to the atmosphere. (Note: The purity of the exiting air stream that has been depleted of hydrocarbons is determined by feed flow rate, membrane area and the pressure ratio between the feed and permeate streams.)
5. As tank pressure decreases to a pre-set level, the pressure switch automatically deactivates the *PERMEATOR* system.
6. The above sequence is repeated when the storage tank pressure exceeds a pre-set maximum level.

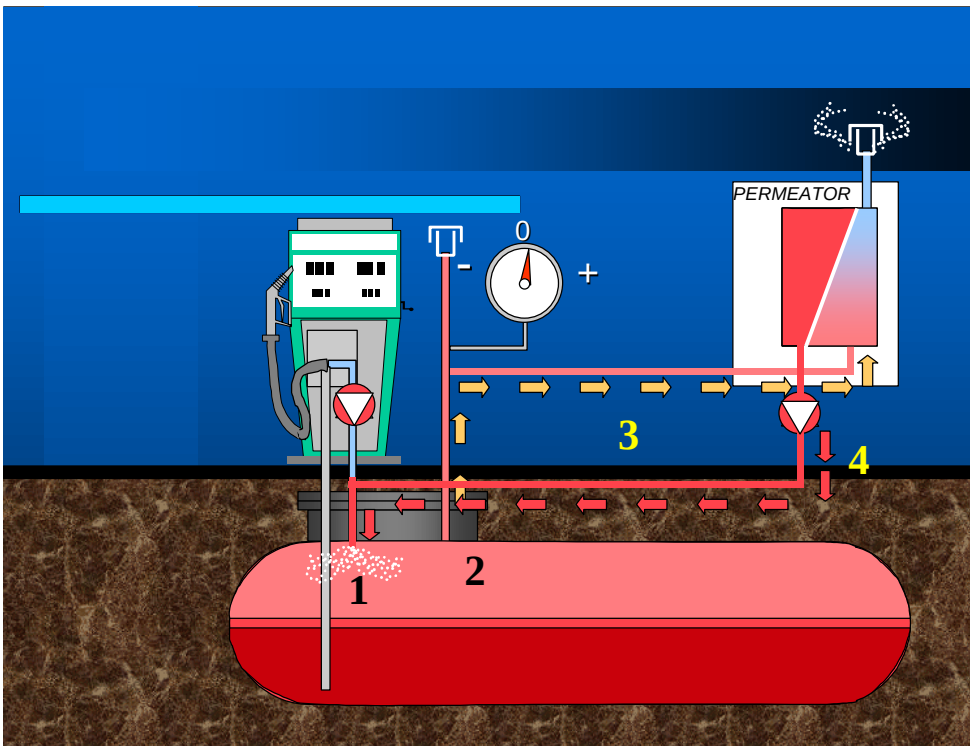

Figure 1

Key Innovations

1. A unique and patented membrane separation film
2. A special membrane separation module which is highly effective in removing contaminants.
3. An effective accurate means to monitor and control storage tank pressure.

Features	Benefits
Low initial cost. Less than 1-2% of typical outlet construction costs. Similar cost as new Multiple product dispenser (MPD)	High return on investment (15-40%) and short pay back period.
1. High hydrocarbon vapor recovery efficiency (> 95%) without wasting natural resources or generating secondary air pollution. 2. Allows vacuum-assisted systems to operate with higher (V/L) ratios and to achieve higher collection efficiencies at the nozzle/automobile interface.	Environmentally Friendly - exceeds current federal, state, and local emission requirements. Provides consumer and environmental protection while at the same time recovering salable product.
Retrofits both uncontrolled and Stage II compliant refueling facility.	Can be installed in any existing refueling facility. 1. Allows uncontrolled dispensing facilities to avoid large evaporative losses as storage tanks ingest air from vent lines. 2. Allows dispensing facilities using balance or vacuum assisted systems to avoid large evaporative losses as the ORVR vehicle population increases.
Unique membrane technology that selectively recovers toxic compounds such as benzene, toluene and MTBE.	Membrane vapor recovery eliminates evaporative losses of VOC's or hazardous air pollutants (HAP's) by converting them into useable product.
Elegant, compact, durable design.	Easy installation with little or no excavation.
Safe solution for variable vapor concentrations generated by ORVR equipment on new cars. *	Eliminates the potential for increased vapor emissions as the population of ORVR vehicles increases over the next 10 years.
1. Simple operation since membrane module has no moving parts. 2. Energy efficient -- no phase changes are involved in the separation because all streams enter and exit the system in the vapor phase.	Very low operating costs. $25 - $60/month

* In contrast, thermal destruction systems will require supplemental fuels to maintain combustion as inlet hydrocarbon concentrations vary widely. Supplemental fuels will be derived from stored liquid gasoline and/or compressed hydrocarbon gases, the use of each will create safety hazards and increased operating costs.

Frequently Asked Questions:

1. Is the PERMEATOR system compatible with various Stage II vapor recovery systems? Yes, our system can be retrofit to any gasoline dispensing facility; including uncontrolled stations and those using balance; dispenser-based vacuum assisted systems and centralized vacuum assisted systems. For centralized vacuum-assisted systems using combustion based vapor processors, our membrane system simply replaces the burner.

2. Do we have to break ground to install the PERMEATOR unit? No, depends on the specific vapor-piping configuration. If the storage tanks are manifolded underground, no excavation is required. If storage tanks are not manifolded below ground, a small diameter vapor return line can be coaxially located within the existing vent lines or minimal excavation can be used to allow for tie-in of the vapor return line.

3. Do different size tank capacities present a problem? No, headspace pressures will equalize.

4. Is the system safe? Yes, the unit has received safety approval from the German PTB, analogous to a "UL" Listing here in the United States. The vacuum pump is equipped with internal flame arrestors.

5. Life of membrane? Existing terminal vapor recovery systems installed in Europe since 1989 with the same membranes. A 7-10 year life is anticipated for our application; replacement involves only the re-packing of the module, an entire new module does not have to be purchased.

6. Does the membrane accumulate hydrocarbons or become depleted? No, the membrane selectively separates hydrocarbon molecules from air.

7. Is current ATG (Automatic Tank Gauge) technology sensitive enough to measure existing evaporative losses and the savings in salable product with the PERMEATOR system? Yes, these systems are capable of measuring 1/1000 th of an inch level differences. For example, in a 10,000 gallon horizontal tank, at half height (8 ft. diameter, 1/2 height = 48 inches), one inch of gasoline is equivalent to about 135 gallons. Product losses for a station pumping 150,000 gallons per month (with V/L = 1.3) are on the order of 8 gallons per day, which requires a measurement accuracy of 8/135 or .06 inches; well within the stated accuracy of these gauges.

8. Will water vapor harm the membrane? No, water vapor passes through the membrane.

9. What happens if the station loses power? The PERMEATOR system does not create any restrictions to the existing system - the station will operate as though the PERMEATOR is not installed.

10. What about diesel vapor recovery? No need, the diesel vapor pressure is too low to justify a recovery system.

11. Do you need a PERMEATOR system on each storage tank? No, one system handles the vapors from manifolded storage tanks. In some cases, the vapor return stream may have to be directed to the lowest grade fuel storage tank.

12. What are the typical maintenance items? Maintaining oil level in the vacuum pump - checked once per quarter.

13. What is the warranty on the equipment? Twelve months.

14. Would ARID put on a class for our technical personnel to learn the operation, installation and maintenance of the PERMEATOR unit? Yes.

15. Where does the unit get mounted? The PERMEATOR can be placed on the roof, at grade or below ground.

16. How much does a standard unit weigh and what are the dimensions? A standard unit (for a station pumping 150,000 gallons per month, V/L= 1.3) weighs about 800 pounds and has dimensions of 4.5 ft. W x 4.1 ft. H x 2.75 ft. D.

17. Will the increased proportion of ORVR equipped vehicles take away the need for your system? No, it will amplify the need.

18. Does your system impact the efficiency of Stage I vapor recovery? Yes, since the storage tank vapors will be at a high equilibrium concentration, evaporation losses from the tanker truck during product deliveries will be reduced. Also, pressure spikes and fugitive losses during deliveries will be reduced. In addition, the recovery efficiency at the bulk terminal will be increased since the concentration of returned vapors in the bulk tanker will be increased to saturation levels (40%-60%, by volume).

19. Is the system approved for recovery efficiency/fire safety by any organization? Yes, the German TUV Rheinland has approved the system for recovery efficiency and the German PTB has approved the safety of the unit. Moreover, the vacuum pump uses a UL listed electric motor rated for Class I, Div. I, Group C & D environments.

20. Is this technology currently in-use anywhere (USA or worldwide)? Yes, in the United States, BP Amoco has successfully operated ARID's PERMEATOR system for over 14 months at a retail refueling facility located in Warrenville, Illinois. The system has been operating automatically and unattended since October 1998 at a Stage II equipped station pumping about two million gallons of gasoline per year.

Internationally, five dispensing facility units based on GKSS membrane technology are operating in Germany, and two units are running in Luxembourg. The German applications are TUV Rheinland, Cologne; DEA, Wiesbaden; BK, Munich; BK, Herrsching; Municipal refueling station in Gaggenau.

The Luxembourg units are installed at Copal ARAL, and each system serves a dispensing facility with annual throughput of approximately 2.5 million gallons of gasoline. The first unit has been running for one year, and the second unit has been operational for about six months. The performance of both units is currently being monitored in the framework of a DGMK project. DGMK is a technical organization that conducts projects for all the German oil companies. Shell, Texaco and Kuwait Oil have ordered an additional three units for use in Luxembourg. These units are scheduled for installation and commissioning in the spring of 2000. In

Luxembourg, the membrane vapor recovery system is considered best available technology (BAT), and all new stations being constructed in densely populated areas must use the system.

Bulk terminal gasoline vapor recovery systems using the GKSS membranes have been successfully operating throughout the world since 1989. Each of the 66 systems installed since 1989 has been consistently operating in tank farms and ship loading terminals without any membrane replacements. The performance and long-term stability of these hydrocarbon-selective membranes are commercially proven and such systems are considered an established technology in Europe.

21. Are competitive systems based on membrane technology being used to recover gasoline vapors at an efficiency greater than 95%? We are not aware of any commercially proven membrane based systems operating at retail stations or bulk terminals.

22. Has ARID published any information in Trade Journals or Magazines related to gasoline marketing? Yes, please refer to "Membranes, Molecules and the Science of Permeation", TP Tiberi, Petroleum Equipment & Technology (PE&T), April 1999; page 30-34.

23. Is the PERMEATOR system or any key components covered by patents ? Yes, patents owned, assigned to or licensed by ARID include the following; 4,994,094; 5,537,911; PCT/DE 95/00383; 5,220,799; 5,367,882; P4410597. Also, the following US and European patents cover GKSS process technology, membrane and module technologies: 4,673,418; 4,695,380; 4,818,452; 4,933,085; 5,076,923; DE4214551; 0637987, and 0752974.

24. What is the nominal purchase price of PERMEATOR and the price range based on specific station conditions? Typically, ARID provides our PERMEATOR system to customers under an operating lease. The savings in salable gasoline inventory exceed the monthly payments made by the end-user, including operating expenses. Other factors affecting financial attractiveness include tax shields generated by rental payments and potential revenue from trading of emission reduction credits (ERC's).

25. Is it possible to have a PERMEATOR system installed without making any up-front payments to ARID? Yes, no up-front payments and periodic rental payments are made from a portion of the on-going savings generated.