ARID TECHNOLOGIES INC.

Gasoline Storage Tank Evaporative Loss Dynamics

NESCAUM Stage II Meeting

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ARID Technologies, Inc.

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Topics of Discussion

- Evaporative loss dynamics in gasoline storage tanks
- Stage II and ORVR interaction
- Activities in Other States related to Storage Tank Emissions caused by evaporative losses
- Third-party test w/EPA Oversight

Primary Components of Gasoline Vapor

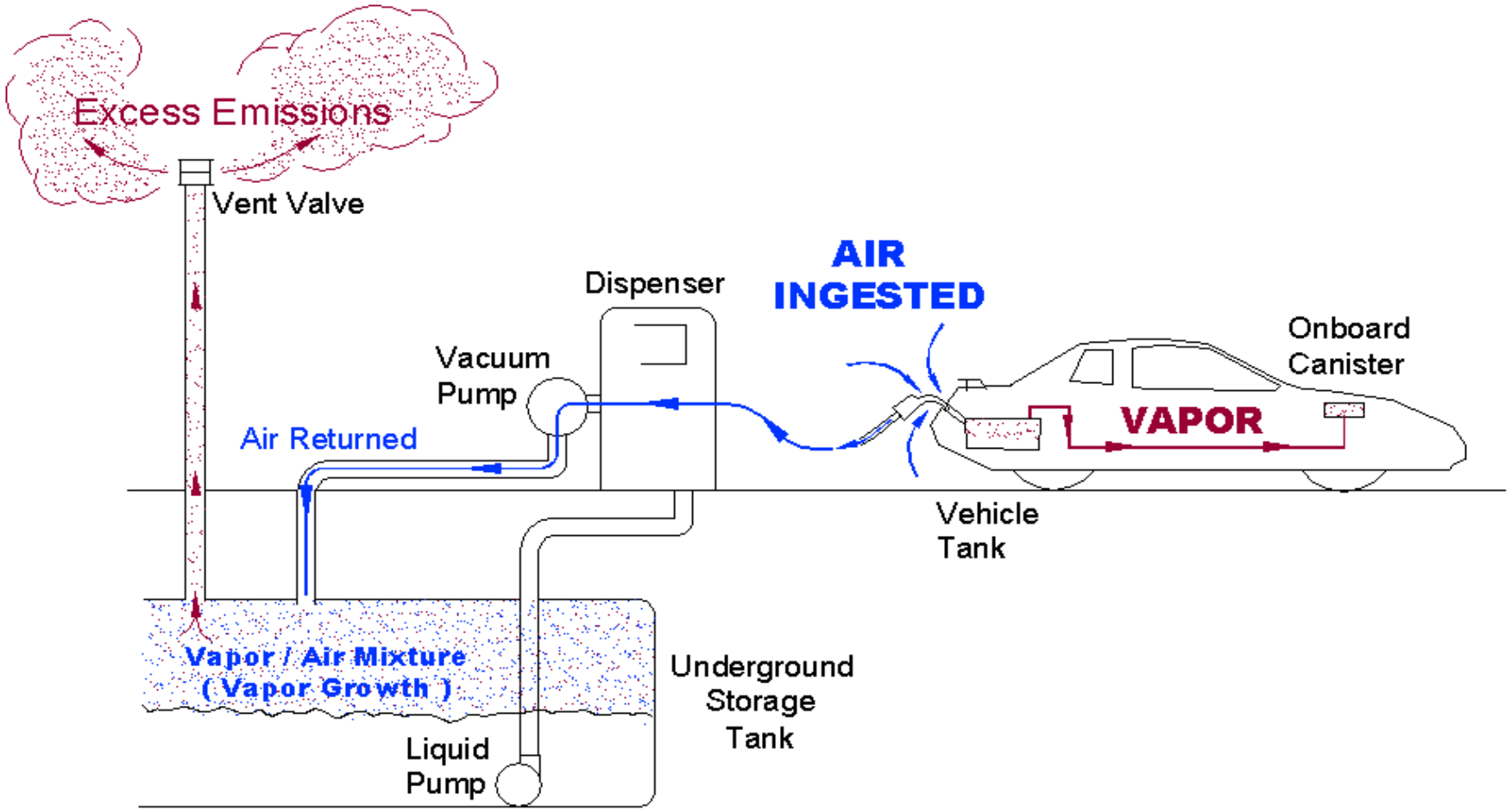
VOC's and HAPS (Hazardous Air Pollutants)

Methane
Ethane
Ethylene
Propane
Cyclopropane
Propylene
Isobutane
N-Butane
Trans-2-Butene
Cyclopentane
Isopentane
N-Pentane
2,3 Dimethylbutane
2-Methylpentane
3-Methylpentane
Hexane
Benzene – known human carcinogen

ORVR Compatibility

- Onboard Refueling Vapor Recovery, or ORVR, provides for collection of the refueling vapors in a carbon canister on the vehicle. It performs the same function as a Stage II vapor recovery system for newer cars.
- Minimizing impact of air ingestion while refueling ORVR equipped vehicles

ORVR - Phase II Incompatibility



Onboard Refueling Vapor Recovery or "ORVR"

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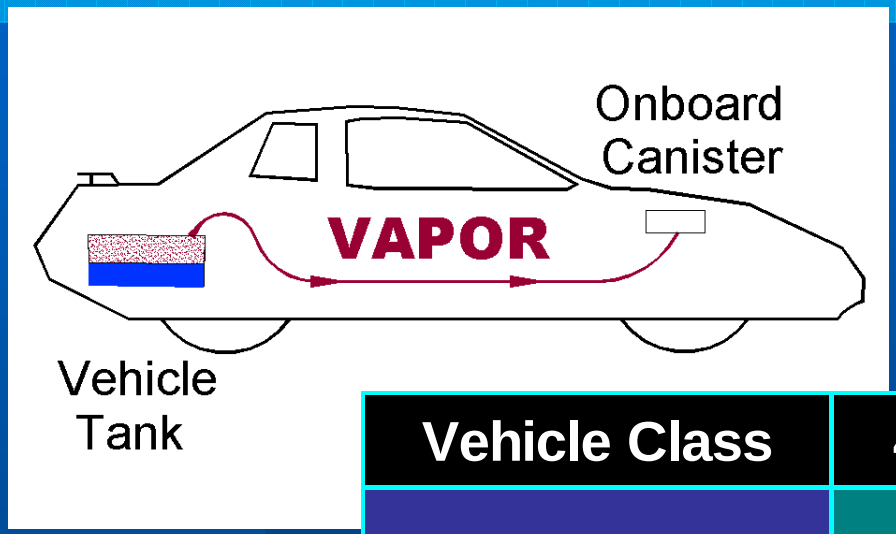
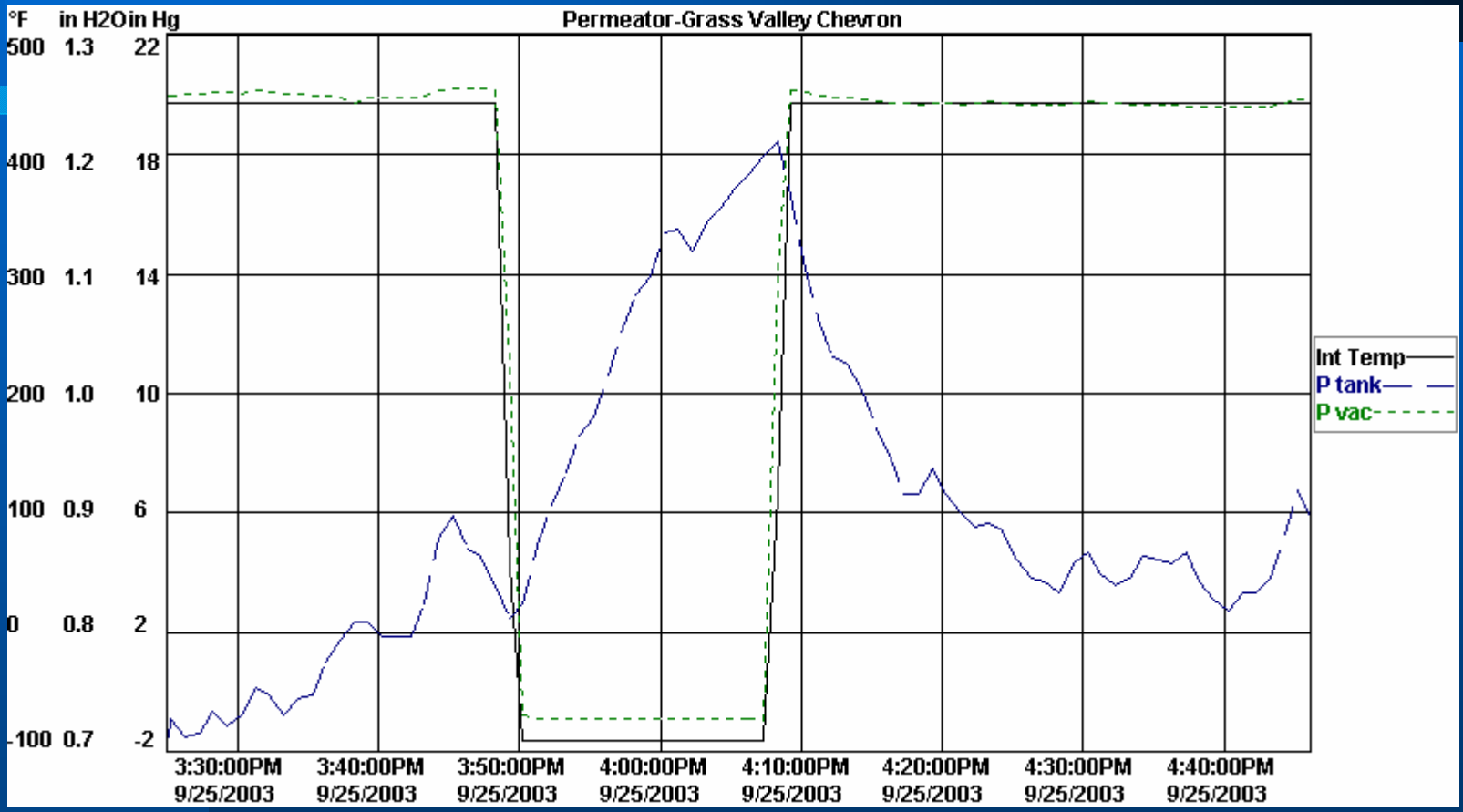
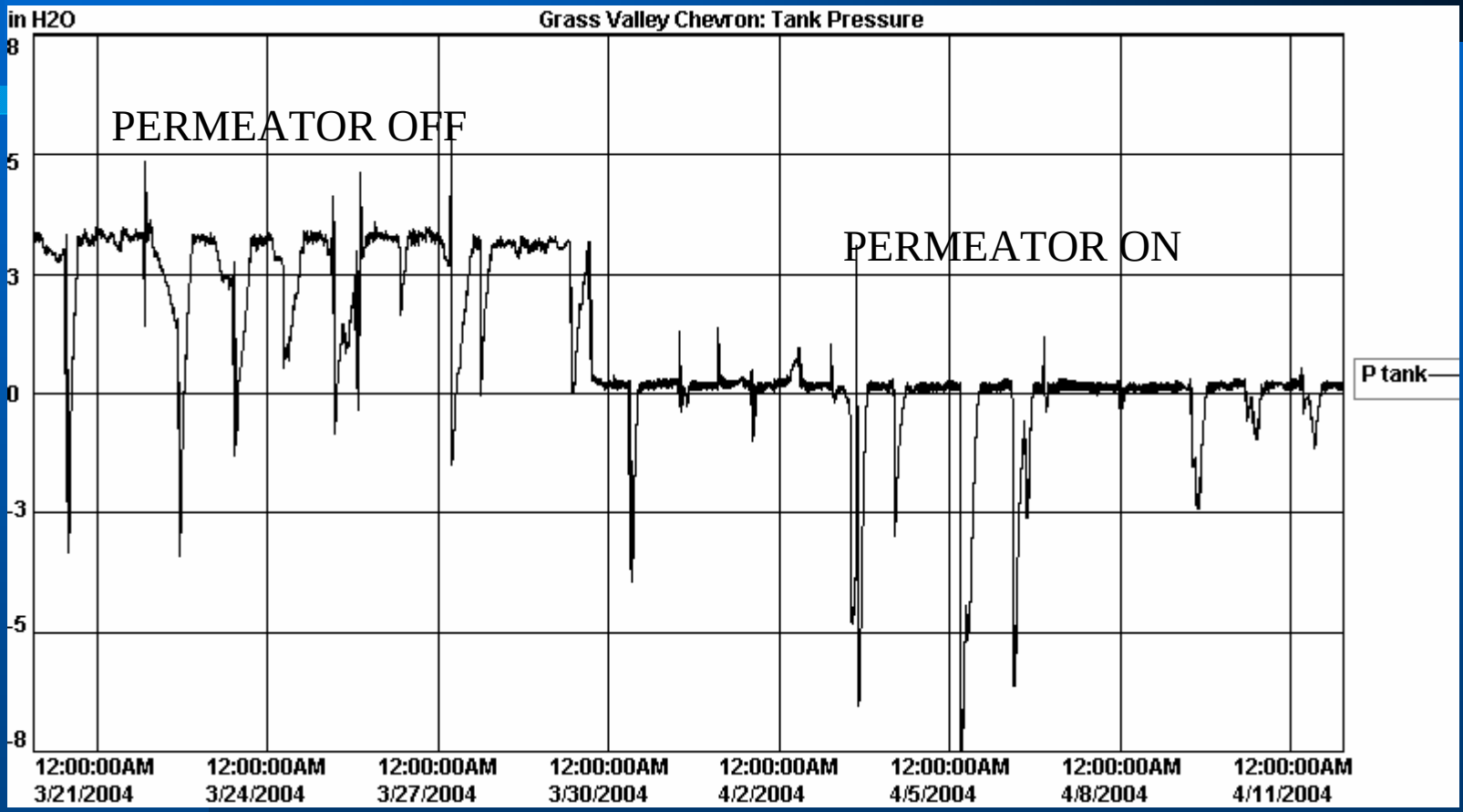
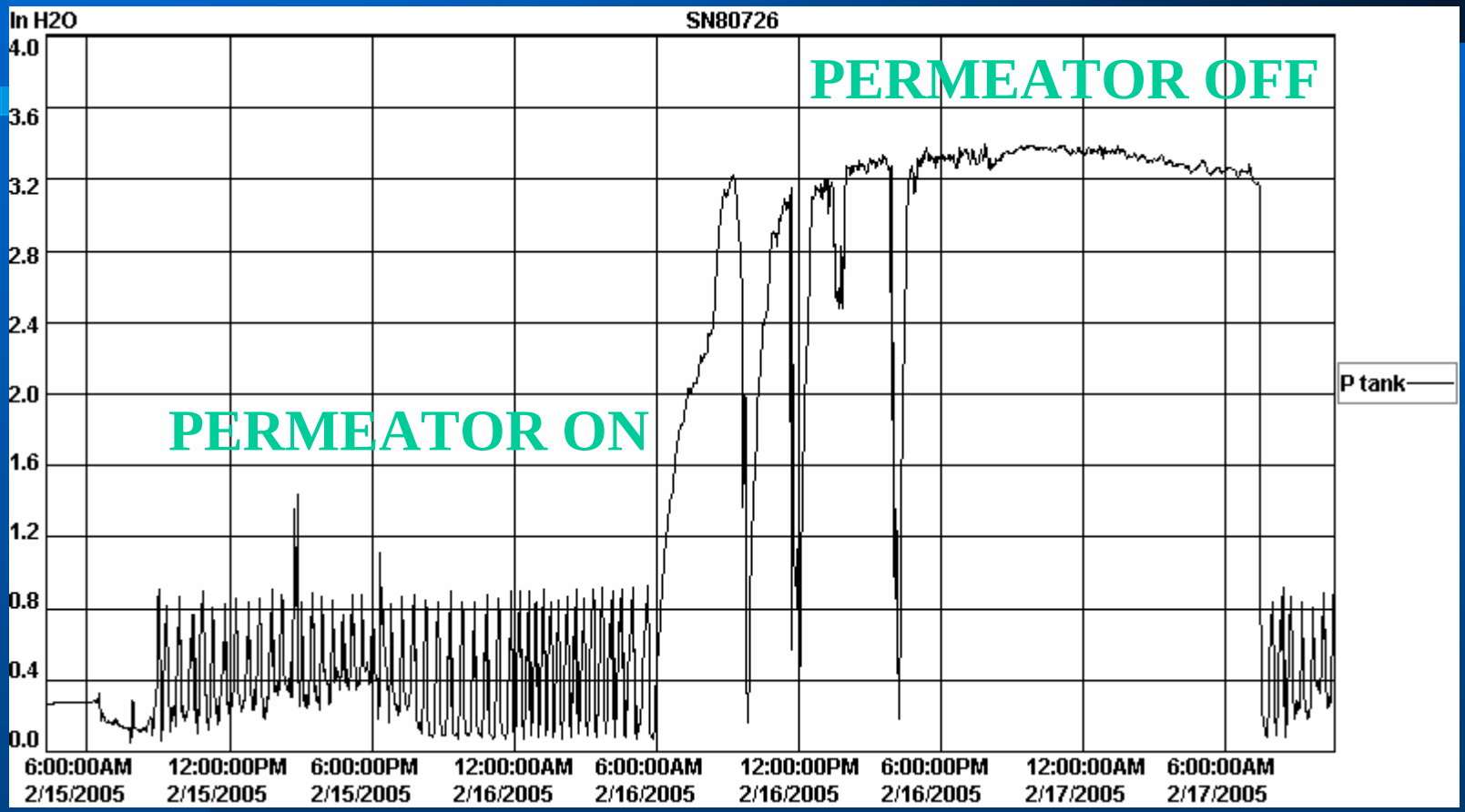


Vehicle Class	40%	80%	100%
Passenger	1998	1999	2000
LD Trucks & MDV (<6000 lbs)	2001	2002	2003
MD Vehicles (6001-8500 lbs)	2004	2005	2006


Permeator-Grass Valley Chevron
°F
in H2O
in Hg
500
400
300
200
100
0
-100
1.3
1.2
1.1
1.0
0.9
0.8
0.7
22
18
14
10
6
2
-2
3:30:00PM 9/25/2003
3:40:00PM 9/25/2003
3:50:00PM 9/25/2003
4:00:00PM 9/25/2003
4:10:00PM 9/25/2003
4:20:00PM 9/25/2003
4:30:00PM 9/25/2003
4:40:00PM 9/25/2003
Int Temp
P tank
P vac


in H2O
Grass Valley Chevron: Tank Pressure
8
5
3
0
-3
-5
-8
PERMEATOR OFF
PERMEATOR ON
P tank
12:00:00AM 3/21/2004
12:00:00AM 3/24/2004
12:00:00AM 3/27/2004
12:00:00AM 3/30/2004
12:00:00AM 4/2/2004
12:00:00AM 4/5/2004
12:00:00AM 4/8/2004
12:00:00AM 4/11/2004

Lantana, Florida Test Site



What do we know?

- Evaporation losses are caused by air ingestion into fixed roof storage tanks
- Even with Stage I vapor balancing operations, excess emissions occur due to vapor growth
- Evaporative vapors escape the storage tank system and are emitted to the local surroundings
- Magnitude of evaporative losses is typically 0.10% to 0.50% of throughput; value depends upon RVP, Temperature and air ingestion volume

Impact of Storage Tank Evaporative Losses

- Storage tank pressures are elevated and the tanks typically operate at the cracking pressure of the p/v valves for extended periods of time
- Elevated pressures result in vapor leaks above and/or below grade
- Vapor leaks above grade are air emissions
- Vapor leaks below grade can become air emissions or lead to water contamination

Activities in Other States

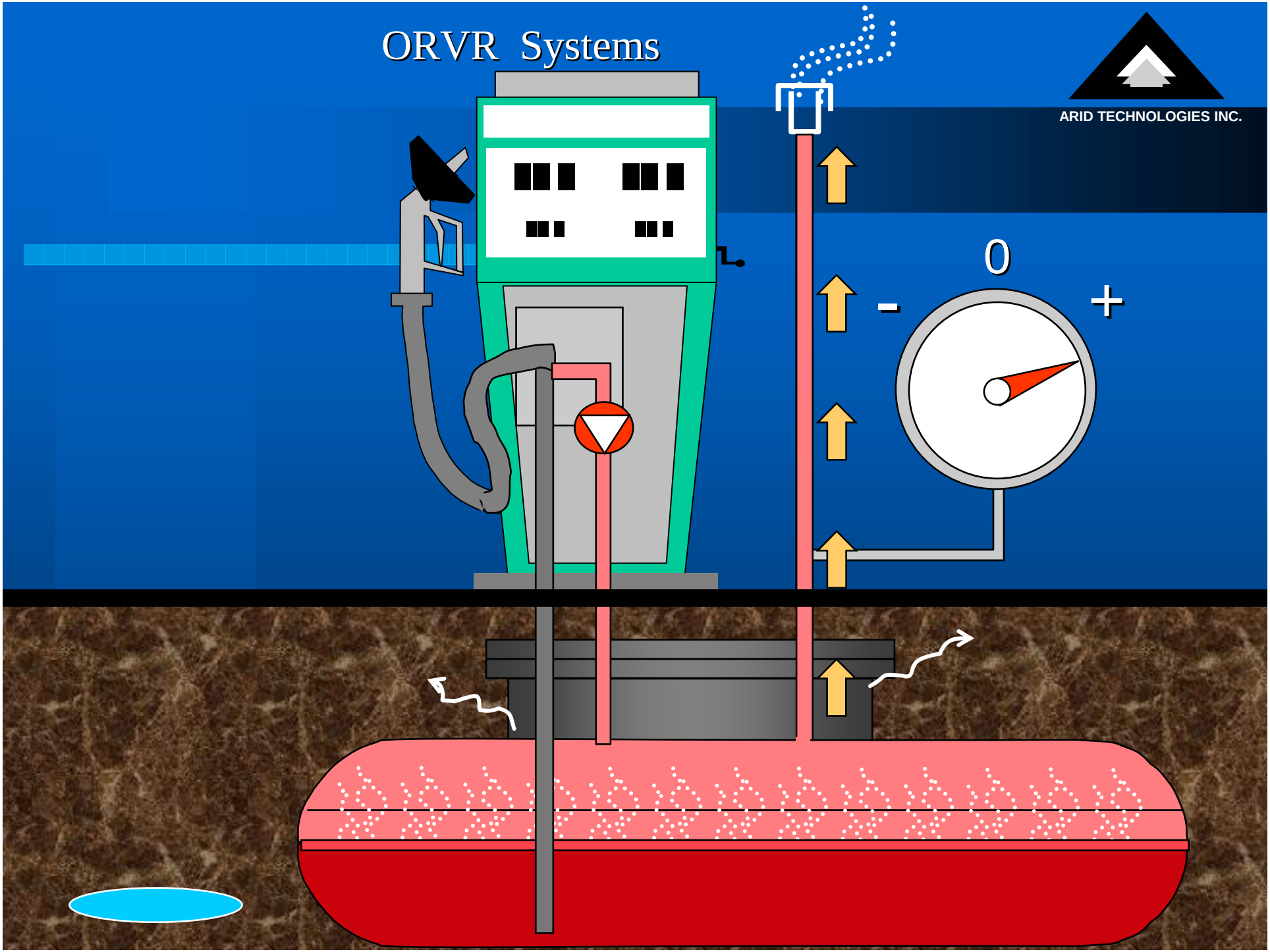
- State of Vermont, Dept. of Conservation (Shively) uncovered significant vapor leakage originating in an in-tank monitor probe riser. Vapors were introduced directly into the indoor store space.
- State of Maryland, Department of the Environment (Meade) has attributed MTBE contamination of drinking water wells to below grade vapor leaks.

Other States (cont'd.)

- State of New Hampshire, Department of Environmental Services (Lynn) has correlated MTBE groundwater contamination with elevated storage tank pressures
- Texas TCEQ has initiated a third-party certification program for ORVR Compatibility

Maryland Regulations

- Beginning 26 January 2005
  - New, replacement or upgraded UST
    - double walled piping for product, vapor and vent piping
    - have a containment system at both tank top and under product dispenser
    - test for leaks all spill catch-basins yearly
    - test for leaks all containment sumps every two years


ORVR Systems
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Maryland Regulations (cont'd)

- High Risk Groundwater Use Area
  - New systems
    - submit documents to demonstrate the storage system does not pose a threat; OR
    - test the system for vapor leaks, using MDE protocol, prior to start-up
    - use interstitial monitoring
    - implement one of the following

Maryland Regulations (cont'd)

- Install three or more groundwater monitoring wells (2" diameter wells are acceptable);
- Install a pressure control device; or
- Install a Soil Vapor Extraction System
- Also, UST's with a capacity > 2,000 gallons or for multiple tanks in the same tank excavation install four monitoring pipes connected in a manner that allows for the rapid installation of a soil vapor extraction system

TCEQ's View on Vapor Recovery

- Existing systems yield adequate vehicle vapor recovery efficiency
- In-use efficiency of existing sytems could be improved through more frequent testing and by increased oversight of individual tests
- ORVR compatibility is a significant issue in Texas due to the very high percentage of vacuum assist vapor recovery systems in the state (>90%) and due to the high proportion of ORVR vehicles (approx 45% in 2005)

Current TCEQ Rules

- Third party certification
  - Evaluation of systems and components independent of CARB
  - Requires an independent testing organization using a nationally recognized protocol
  - System must demonstrate equivalent or better efficiency than currently approved systems
  - TCEQ will review third-party evaluation and determine whether the system or component will be approved for use in Texas

Cities and Counties Impacted

- Houston/Galveston
  - Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller
- Beaumont/Port Arthur
  - Hardin, Jefferson, and Orange
- El Paso
- Dallas/Ft. Worth
  - Collin, Dallas, Denton, and Tarrant

ORVR Compatibility Timetable

- All installations of Stage II vapor recovery systems in select counties installed on or after 1 April 2005 must be ORVR compatible
- All Stage II vapor recovery systems installed in select counties before 1 April 2005 must be upgraded to an ORVR compatible system no later than 1 April 2007

PETROLEUM MARKETER CHALLENGES

1. Compliance
   - **Meet current and anticipated future regulatory requirements using an approach which will minimize overall expenses and minimize interruptions to refueling**

2. Economics
   - **Install technology which provides a savings in wet stock inventory that exceeds the expenses associated with the equipment**
   - **Investigate a Metered Volume approach to provide incremental revenue at deal operated stations**

Benefit Summary for PERMEATOR System

1. Direct Economic Benefits

- Increase in salable product volume by 0.10 to 0.50 % of throughput
- Generation of emissions offsets to satisfy New Source Review for upstream projects
- Trading discrete emissions reductions credits, DER's
- Increased operating margins
- Investment tax credits
- Lease payment tax shields

2. Indirect Economic Benefits

- Increased health and safety of employees and customers
- Proactive installation of system provides favorable public opinion and product differentiation
- Cleaner air as VOC emissions are dramatically reduced
- Compliance with ORVR Compatibility regulatory requirements

Third Party Test w/EPA Oversight

Test Site Conditions

- Average overall V/L = 0.97
- ORVR Population via CARB penetration figures = 38.9%
- Gasoline RVP = 11.1 psia
- Storage Tank Temperature = 74 F
- Altitude = 25 feet above sea level

Third Party Test Results

- 1.) Measured loss of gasoline with P/V valves OFF = 21.31 gallons per day
- 2.) Measured loss of gasoline with P/V valves ON = 11.08 gallons per day
- 3.) Predicted loss with ARID's proprietary Evaporative Loss Model (ELM) = 23.12 gallons per day
- 4.) Predicted loss using ELM for year 2014 = 58.04 gallons per day

Results Compared to 1999 CARB Study

- With P/V valve “ON”:
  - 1.53 to 2.60 x higher than Gilbarco results
  - 22.90 to 38.77 x higher than Dresser/Wayne results
- With P/V valve “OFF”:
  - 12.04 times higher than Dresser/Wayne results

Additional Observations

- Average emissions for a single refueling facility over period 2005 to 2014 = 33.8 tons per year
- Evaporative loss rate when the station is closed for business exceeds the evaporative loss rate when the station is open for business
- ARID's PERMEATOR recovery efficiency measured at 99.27%

Additional Observations (cont'd.)

- Discrepancy between measured losses with the P/V valves "ON" vs. "OFF" are due to fugitive leaks
- Overfill drain valve in fill bucket of premium storage tank was leaky at elevated pressure
- Components may "pass" the leak decay test at +2.0 iwc, but exhibit leaks at higher pressures which are still below the p/v valve setting of +3.0 iwc


TIRE SALES


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0135 X100

Delivery Impact on P tank and Pulse Counts
Typical Impact and Extreme Impact

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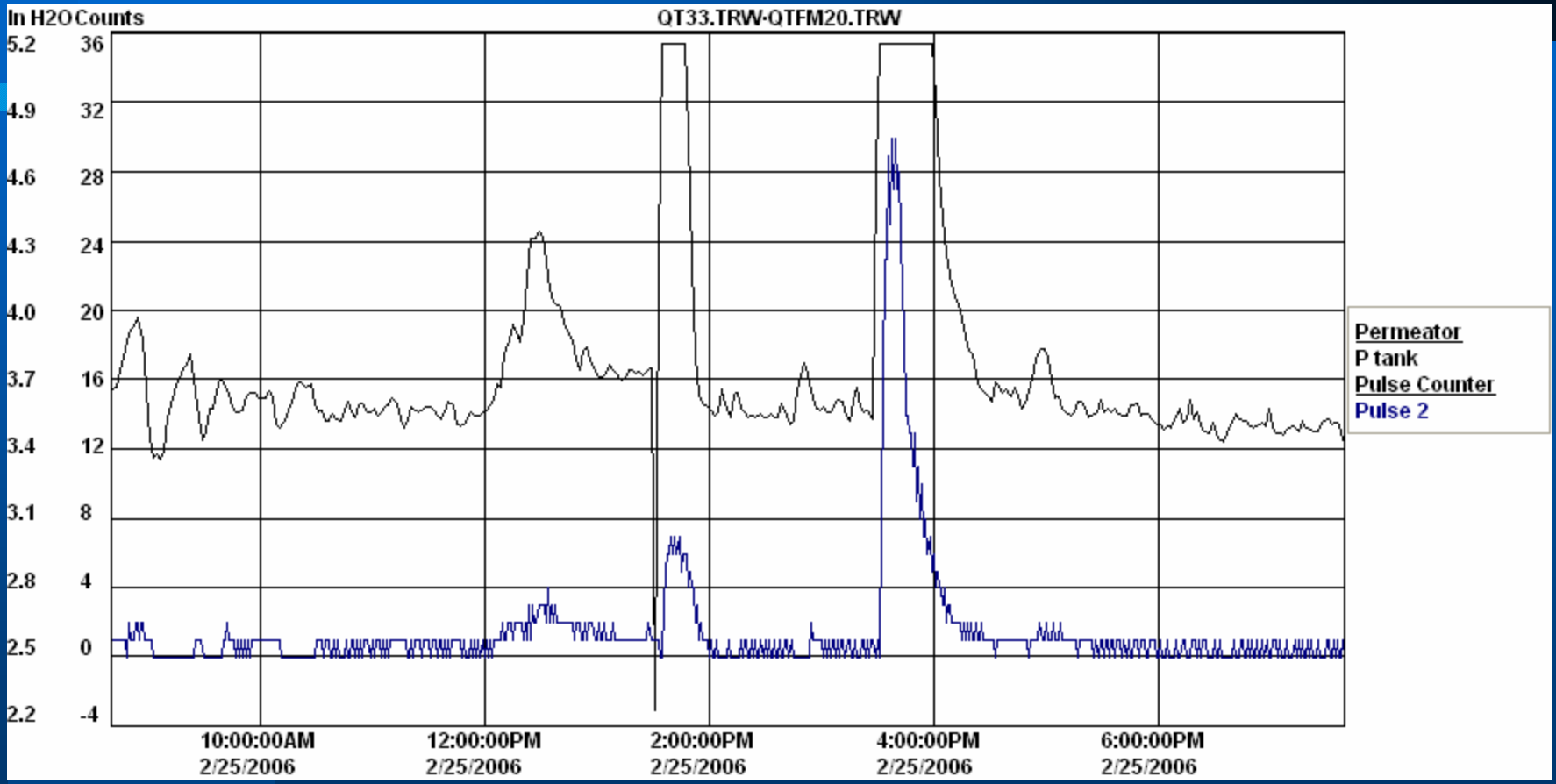

Typical Delivery Impact

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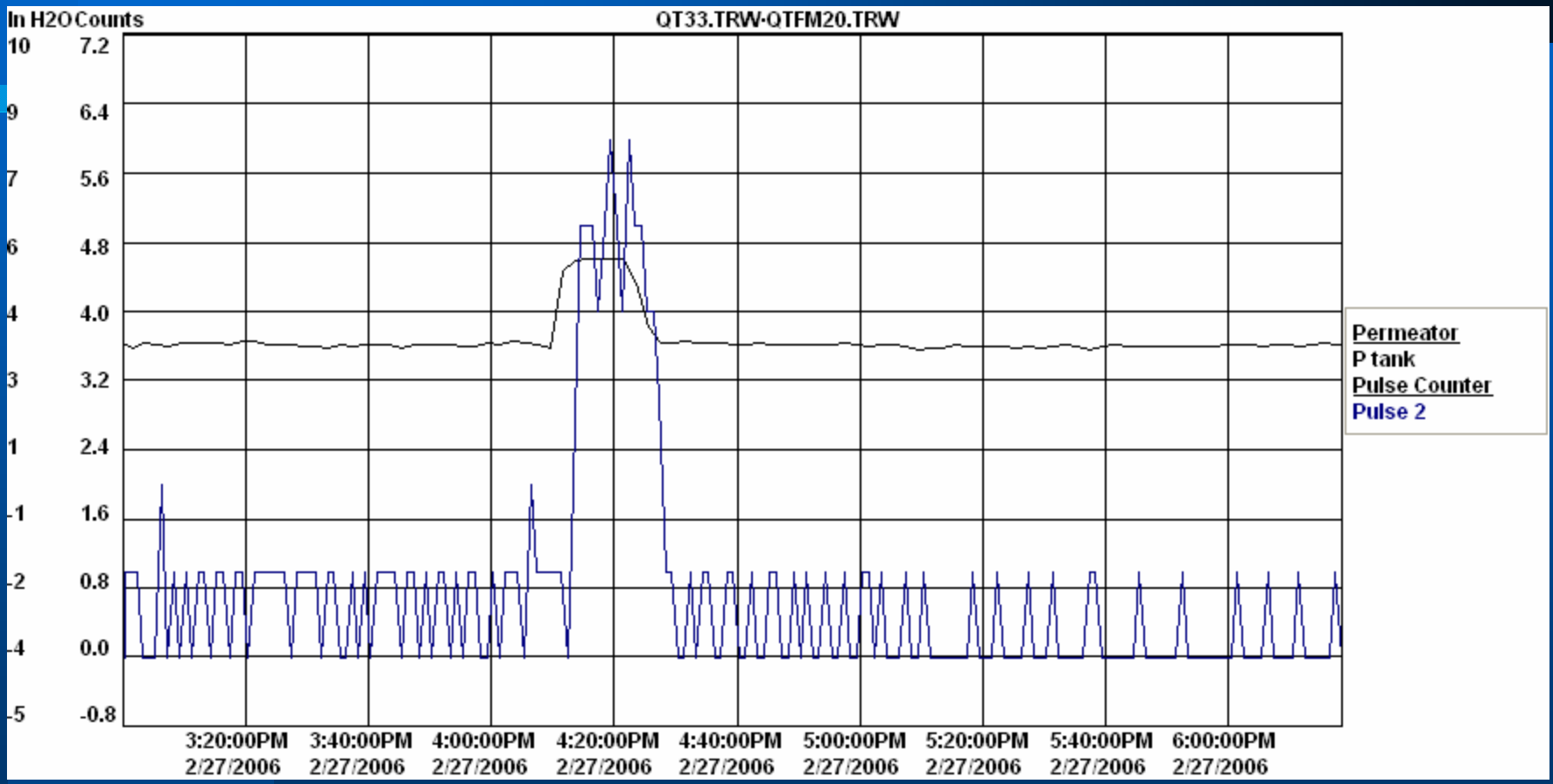
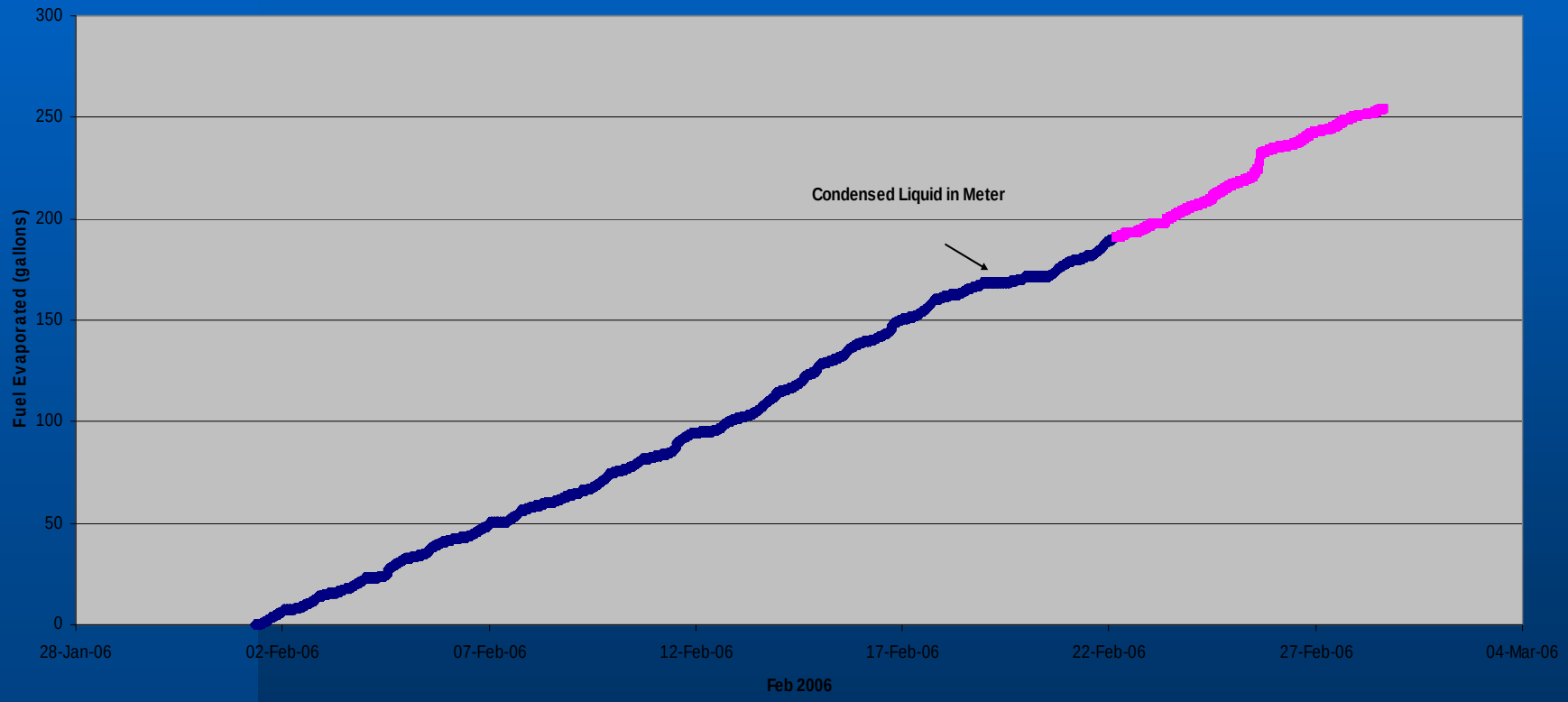


Cumulative Fuel Evaporated: QT 854, Arlington, Tx

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HANDICAPPED
PARKING
SPECIAL PLATE REQUIRED
OTHER VEHICLES
WILL BE TOWED.
VAN ACCESSIBLE
AIRCLEAN
SERVICE TECH, INC.
FILTRATION EQUIPMENT & SERVICES
NO
SMOKING


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ARIDAS 150 - Data Acquisition System