Fuels Regulation in California
(Vapor Recovery & Enforcement)

Fuel Standards Workshop
International Best Practices
And Regulation In Mexico

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Industrial Strategies Division

California Environmental Protection Agency
Air Resources Board

Agenda

Day 1

- California Reformulated Gasoline Regulations
- California Diesel Fuel Regulations
- Fuel Additives
- Low Carbon Fuel Standard

Day 2

- Vapor Recovery
- Enforcement

Policy Drivers

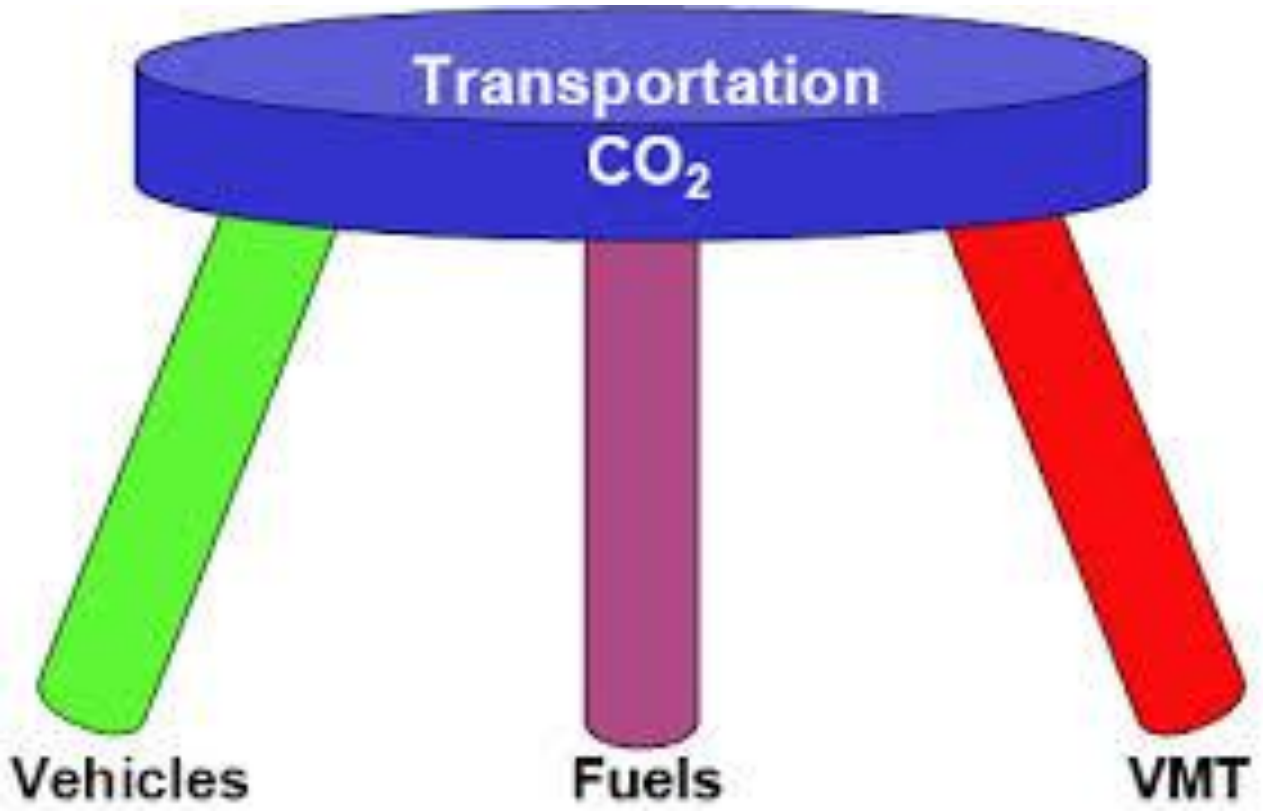
- 34 million Californians, 25 million cars
- Transportation: single largest source of emissions
  - 40% greenhouse gas (GHG) emissions
  - 80% of smog forming emissions
  - 95% of toxics (diesel particulate matter)
- Cleaner fuels enable cleaner vehicle technologies
  - Catalytic converters, diesel particulate filters (DPF)

Policy Drivers (cont.)

Additional new drivers: Climate change, petroleum reduction, diversification

- AB 32: to1990 levels by 2020
- Interim and long term: GHGs to 40% below 1990 levels by 2030, 80% below by 2050
- Up to 50% reduction in vehicle petroleum use by 2030
- Infrastructure to support 1.0 million ZEVs by 2020
- Deployment of over 1.5 million ZEVs by 2025
- At least 100 hydrogen fueling stations

Policy Drivers (cont.)



ARB Vapor Recovery Program

Outline

- Background
- Phase I Vapor Recovery
- Phase II Vapor Recovery
- In-Station Diagnostics (ISD)
- ARB Certification Process
- Program Implementation

Background: Gasoline Marketing Operations

Terminals or Bulk Plants

Cargo Truck

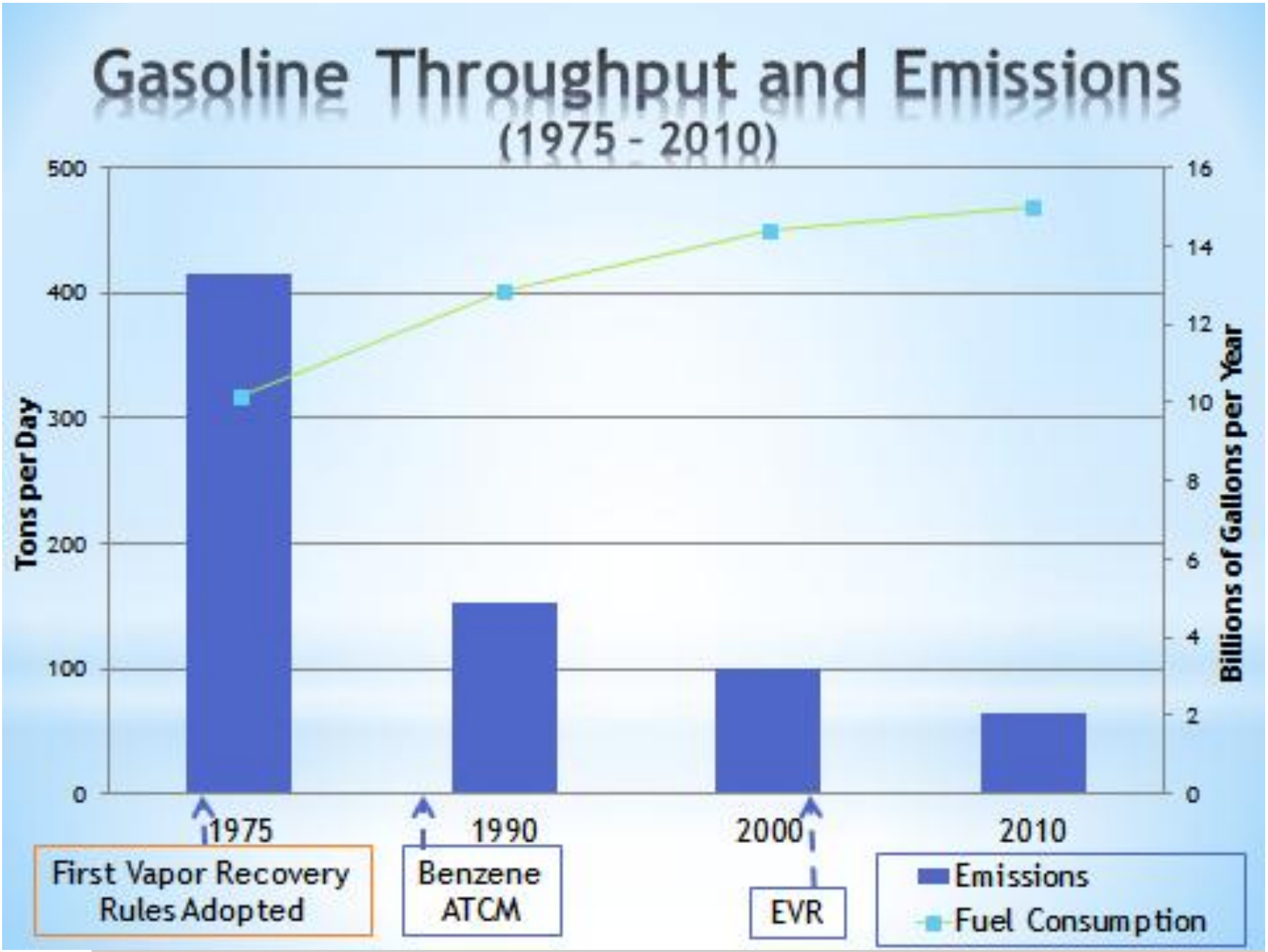
Service Stations

Vehicle Fueling

Aboveground Tanks

Background: Program History

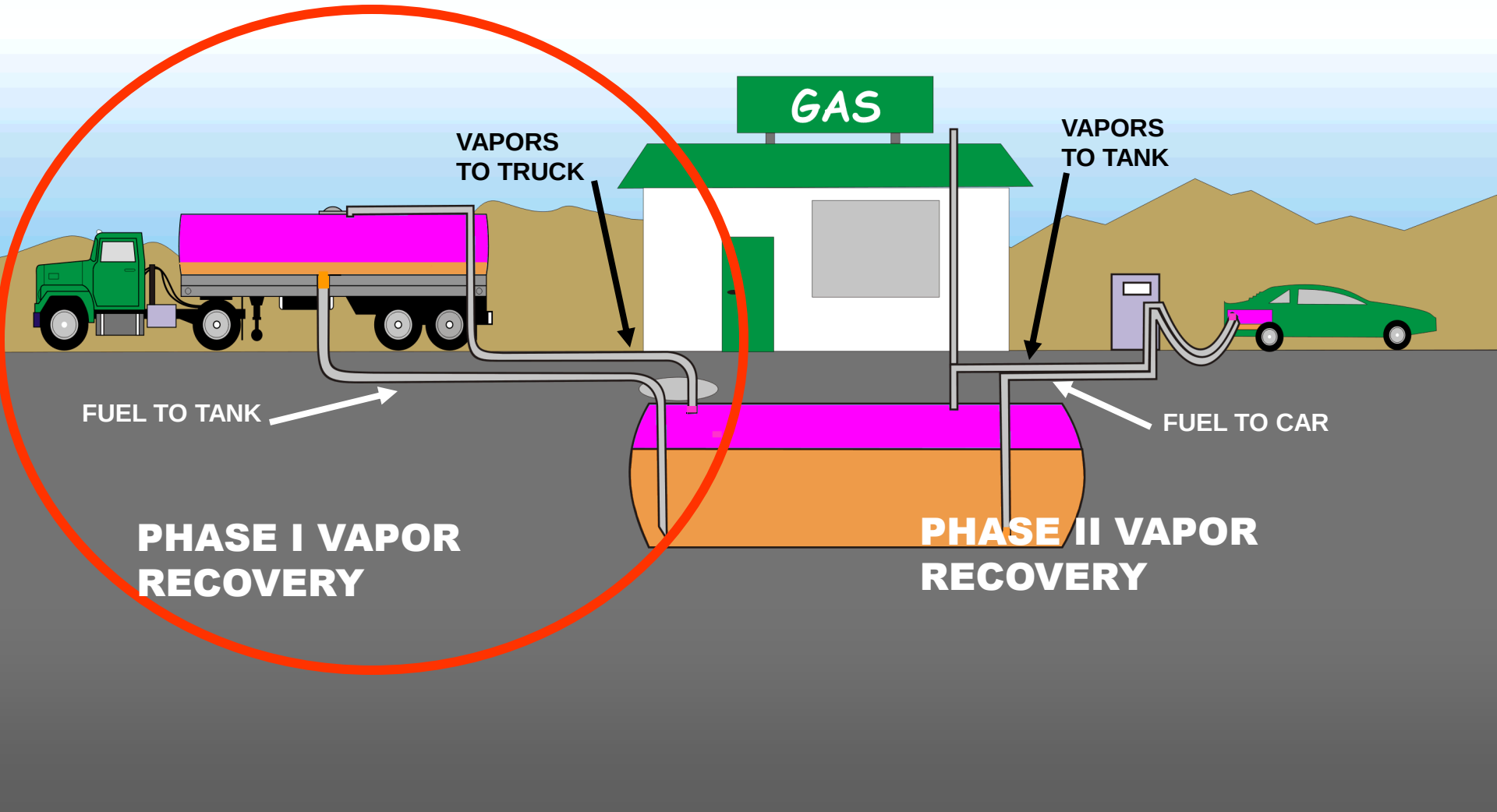
Year	Regulation
1975	First Vapor Recovery Regulations
1988	Benzene ATCM
1995	Onboard Refueling Vapor Recovery (ORVR) Equipped Vehicles
2001	Enhanced Vapor Recovery (EVR) for Underground Storage Tanks
2008	EVR for Aboveground Storage Tanks
2011	Low Permeation Hoses
2015	Enhanced Conventional Nozzle (ECO)


Gasoline Throughput and Emissions
(1975 - 2010)
Tons per Day
Billions of Gallons per Year
500
400
300
200
100
0
16
14
12
10
8
6
4
2
0
1975
1990
2000
2010
First Vapor Recovery Rules Adopted
Benzene ATCM
EVR
Emissions
Fuel Consumption

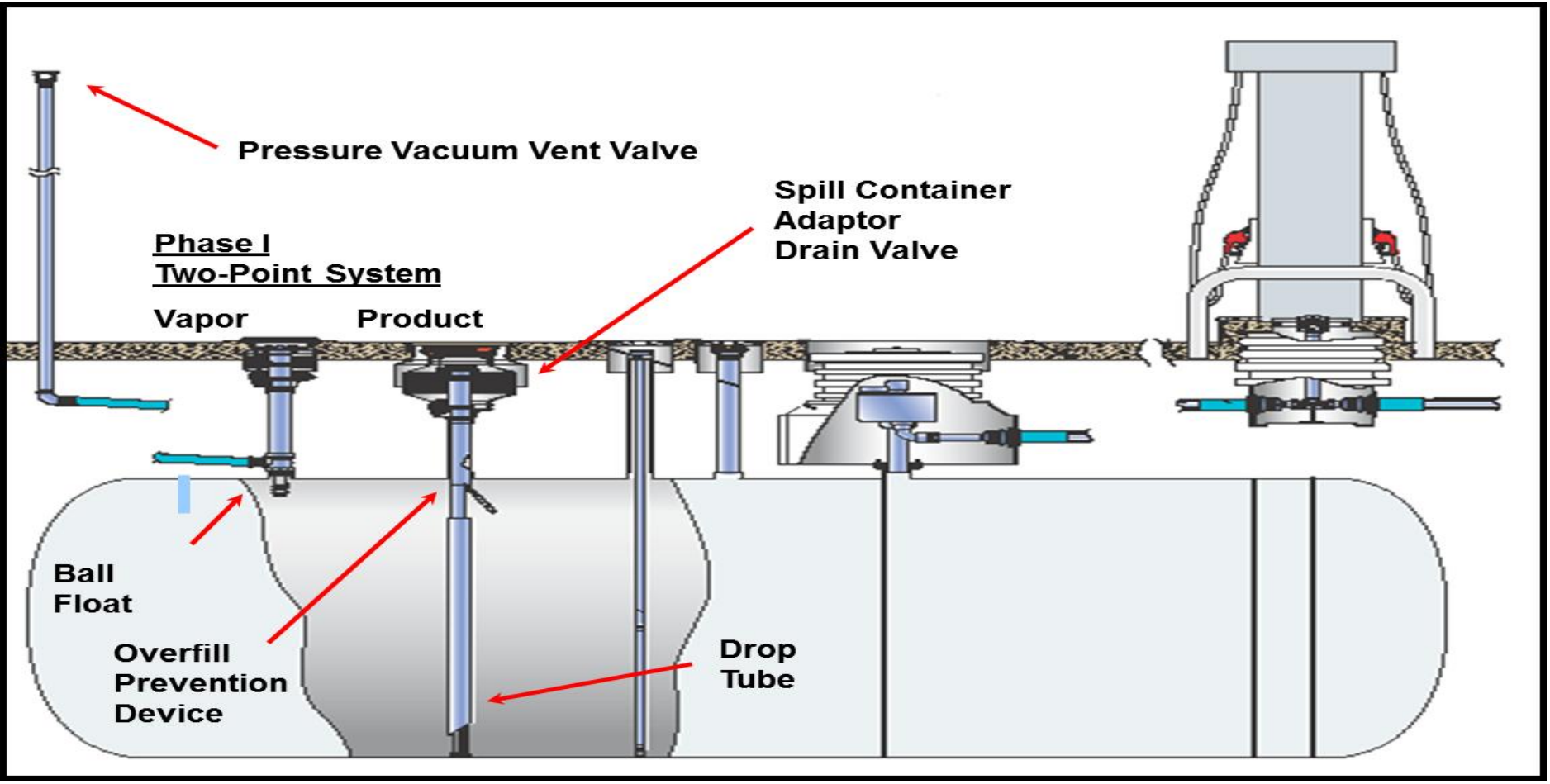
Background: Program Benefits

- ~15 billion gallons of gasoline per year
- Vapor recovery reduces emissions ~372 tons/day
- Equal to 120,000 gallons (454 kl) per day
- Approximately 15 tanker trucks full

PHASE I AND PHASE II VAPOR RECOVERY SYSTEMS



Phase I Vapor Recovery System

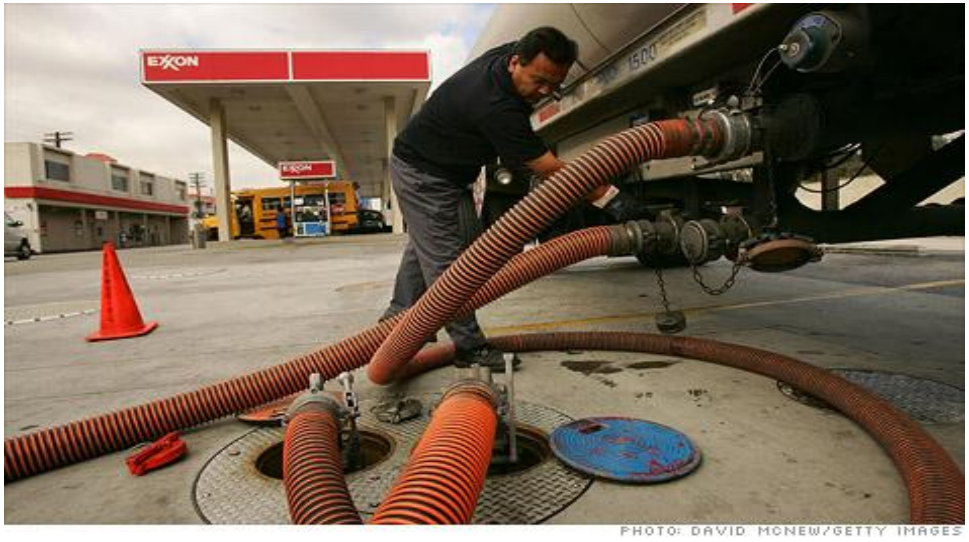


Phase I EVR Components

Delivery Adaptors

Pressure / Vacuum Vent Valve

Typical Delivery Connection

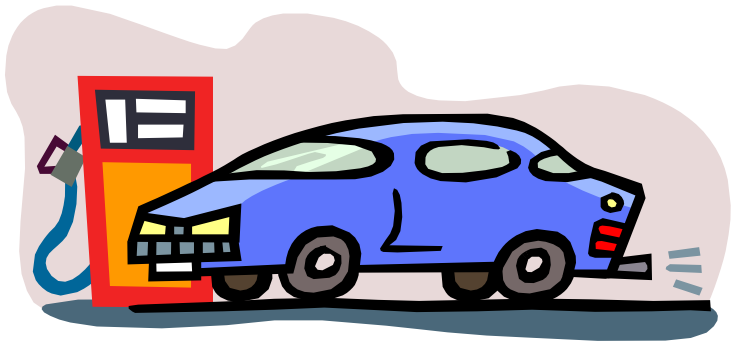


Phase I Key Performance Specifications

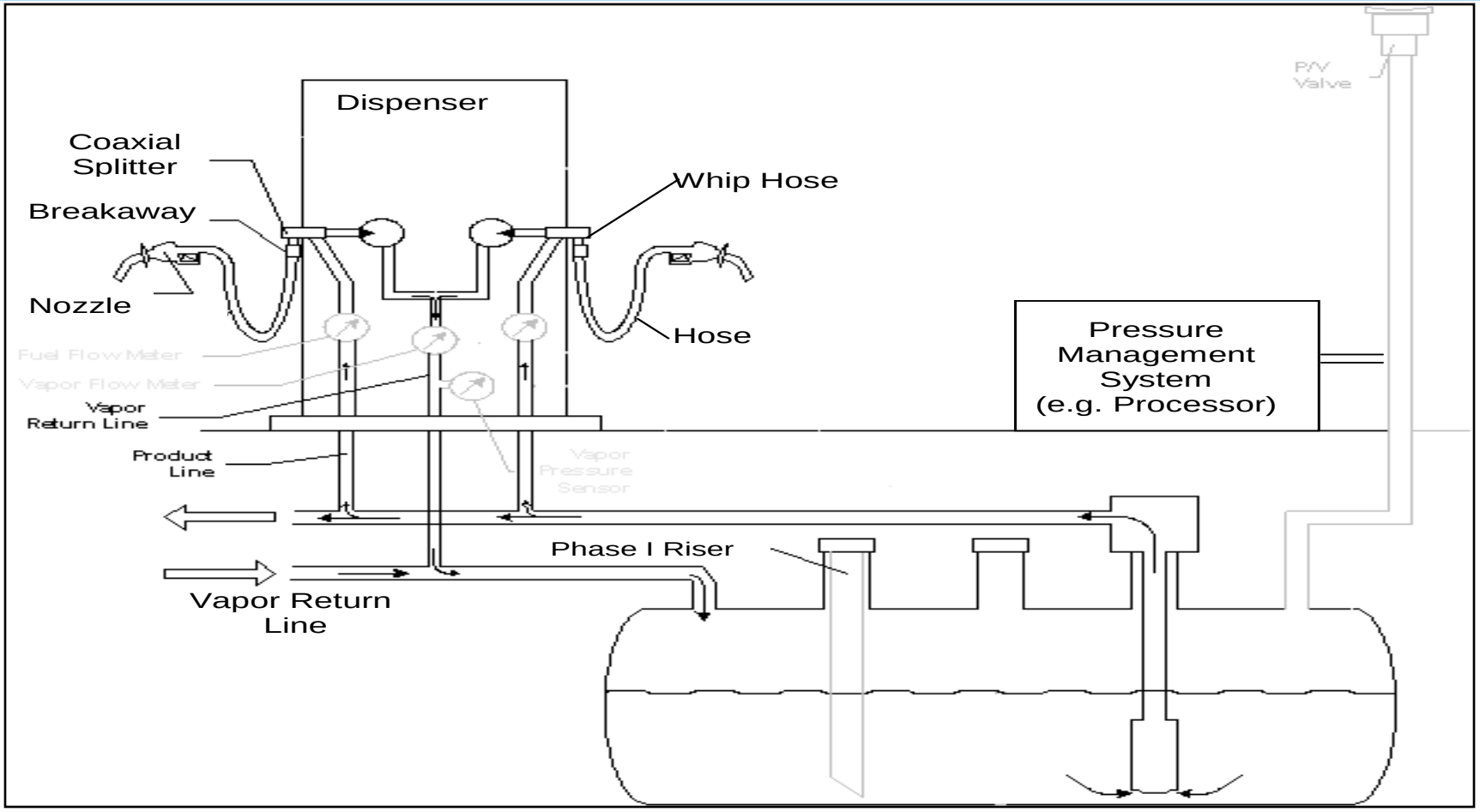
- 98% efficiency of vapor collection during fuel transfer from truck to storage tank
- Standardized connections to delivery truck
- Very low leak rate for all components
- Tank vent valve opens at specified vacuum and pressure

Phase II System Components

- Dispenser & associated vapor return piping
- Hanging Hardware:
  - Nozzles and boot
  - Hoses, break-aways, swivels
- Vapor processor
- In-station diagnostics (ISD)



Phase II Vapor Recovery System



Phase II Is Highly Effective

Enhanced Vapor Recovery Nozzles

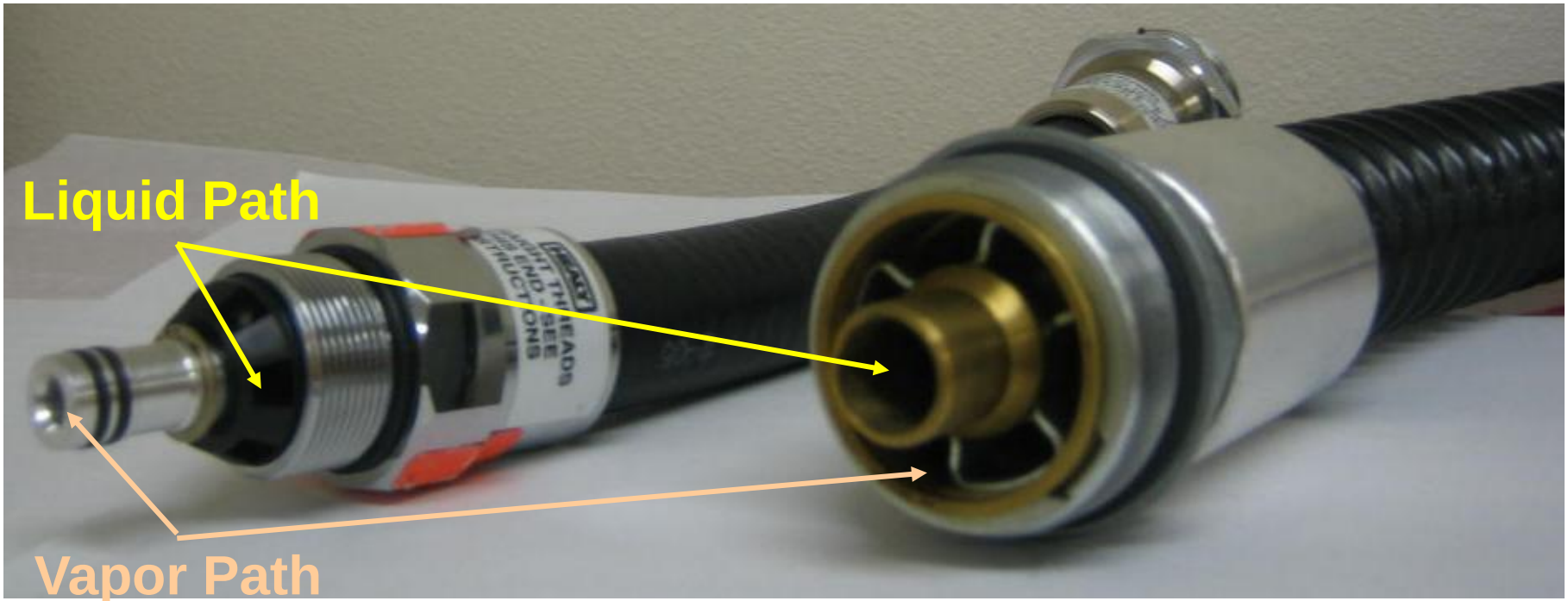
Healy / Franklin

VST

EMCO

Enhanced Vapor Recovery Hoses

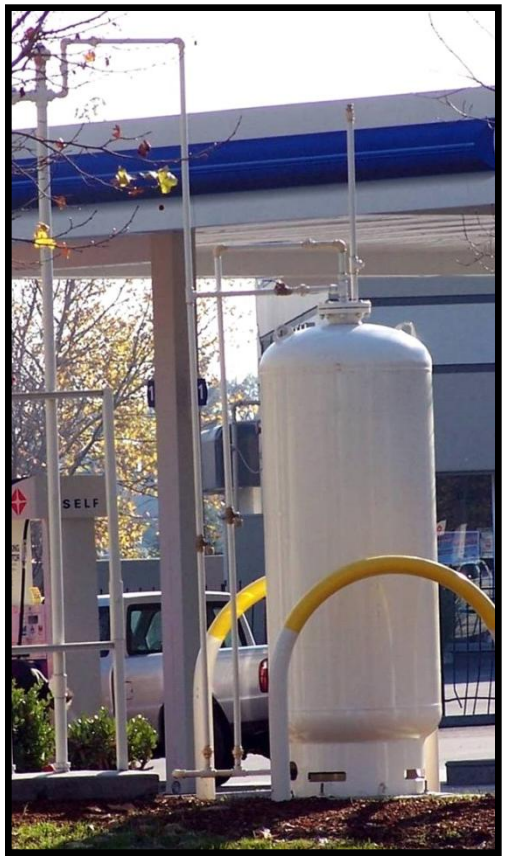
Vapor recovery hoses are co-axial



Vacuum Assist Hose

Balance Hose

Vapor Recovery Certification
Phase II Processors



Franklin / Healy

Veeder-Root

VST

Hirt

Phase II Key Performance Specifications

- 95% efficiency of vapor collection during fuel transfer from tank to vehicle
  - Vacuum assist nozzles (active)
  - Balance nozzles (passive)

- Limit on spills and drips from nozzles
  - Automatic shutoff when vehicle tank is full
  - Less than 3 drips per fueling

Phase II Key Performance Specifications (cont.)

- Low restriction in all vapor pathways to ensure efficient vapor recovery
  - Standard for each component
  - Standard for entire system, as installed
- Storage tank pressure must be maintained within specific limits
  - Vapor space typically kept under slight vacuum
  - Vapor space should not leak

In-Station Diagnostics (ISD)

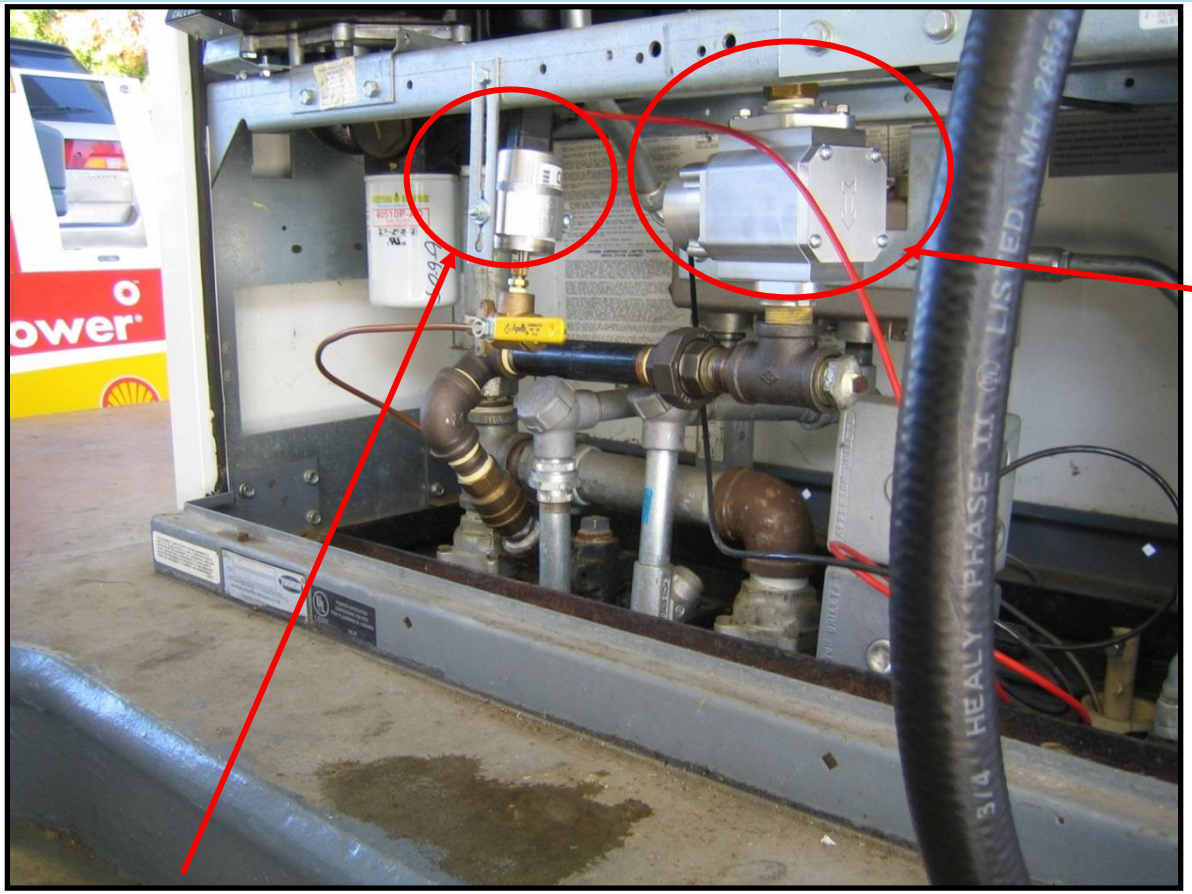
- ISD provides continuous monitoring of the performance of the vapor recovery system.
- Identifies equipment failures & notifies station operator automatically
- Reduces emissions by early detection & prompt repair

How ISD Works

Monitors Two Primary Functions:

- Collection of Vapors during Fueling
  - ISD vapor flow meter
- Containment of Vapors in UST system
  - ISD vapor pressure sensor
  - ISD leak test

ISD Components



ISD Components (cont.)

Veeder Root Console

INCON Console

Certification Process

- Minimum of 180-Day Operational Test for any new component or system
  (Equipment installed at an operating gas station)
- ARB staff conducts testing and analyzes data throughout the operational test period
- 80 Performance Standards and Specifications
- 21 Test Procedures
- Failure of any standard and specification during operational test is cause for termination

Certification Process (cont.)

Implementation

- Successful equipment receives an ARB Executive Order containing:
  - Legal requirements
  - Compliance specifications and standards
  - Compliance test procedures
  - Installation, operation, and maintenance manual
  - Description of all certified components and allowable configurations
- EOs publicly available at http://www.arb.ca.gov/vapor/eo.htm.

Regulatory Roles

California Air Resources Board

Adopts VR standards

Certifies Phase I/II systems

State Fire Marshal

Approves VR certification

Water Resources Control Board

USTs

Overfill Prevention

Secondary Containment

STATE

LOCAL

Local Air Pollution Control Districts

Permit GDFs

Enforce VR rules

Local Fire Agencies

Enforce fire codes

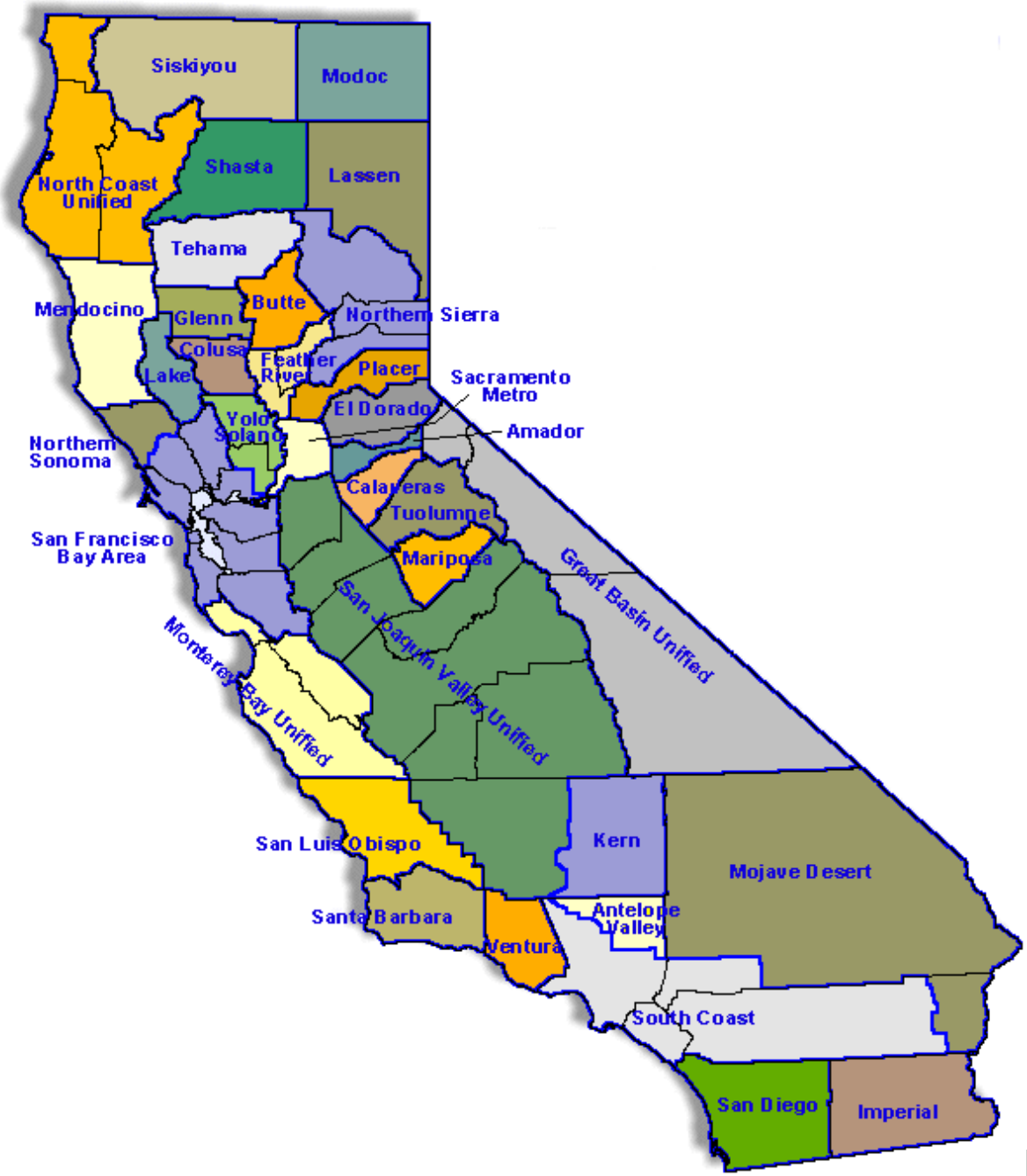
Approve upgrades

Certified Unified Program Agencies (CUPAs)

Permit GDFs

Enforce UST program rules

California Air Districts



There are 35 Air Districts in California

Fuels Enforcement

- ARB's Program
  - Air Quality & GHGs
- Dept. of Food and Agriculture (Div. of Measurement Stds.)
  - Fuel Quality
  - Metrology

ARB's Fuels Enforcement Program

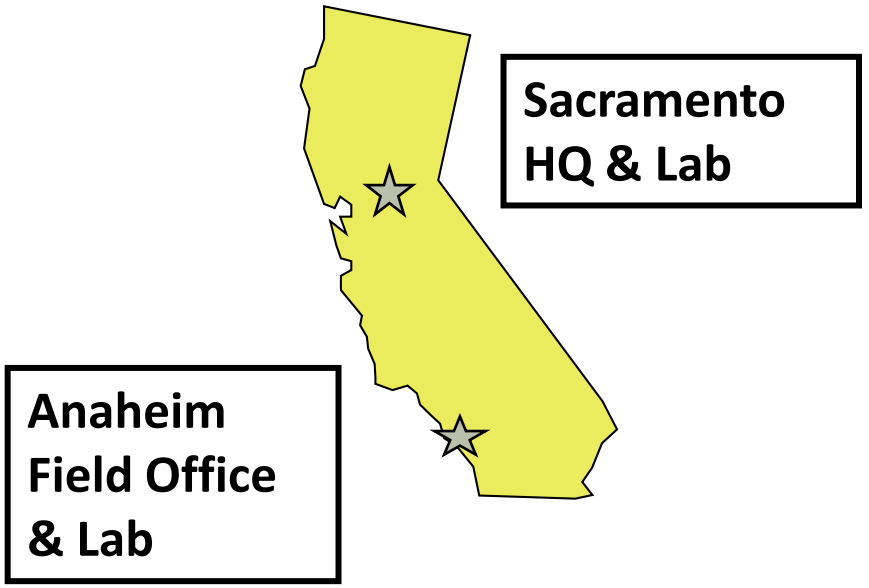
Mobile Fuels Laboratory

ARB's Fuel Enforcement: 2014 Results

- Total 3,267 samples collected
- Represents ~2.60B gallons of gasoline and 706M gallons of diesel fuel
- Approx. 24,000 analyses of samples collected
- Closed 16 fuels cases
- $1.6 Million in penalty assessments.

CDFA's Fuels Enforcement Program

- Assure quality stds
- Labeling & price advertising
- Adopt consensus stds.
- Enforce specifications
- $1.5M lab services, $1.1M enforcement



DMS Tests Fuels & Various Products

- Conventional fuels
  - Gasoline
  - Diesel Fuel
- Alternative fuels
  - Biodiesel
  - Ethanol Flex Fuels
  - Methanol Flex Fuels
  - Compressed Natural Gas
  - Liquid Petroleum Gas
  - Hydrogen
- Automotive products
  - Motor oil
  - Gear oil
  - Brake fluid
  - Automotive Transmission Fluids
  - Engine coolants
- Kerosene
- Fuel Oil

Fuel Quality Specifications

• Gasoline	ASTM D4814
• Diesel Fuel	ASTM D975
• Diesel-Biodiesel Blends	ASTM D7467
• Ethanol Fuel	ASTM D5798
• LPG	ASTM D1835
• Dimethyl Ether	ASTM D7901
• Hydrogen	SAE J2719

Gasoline Tests

Test	ASTM Method	Description of Instrument
Color Visual	Lab Vis	Visible inspection
Distillation	D86	ADA Optidist
Gravity	D1298	Hydrometers & API Tables
Octane Scan	None	FTIR
Octane MON	D2700	Waukesha Engine
Octane RON	D2699	Waukesha Engine
Vapor Pressure	D5190	Vapor Pressure apparatus
Water and Sediment	D4814 Workmanship	Visual Inspection

Diesel Fuel Tests

Test	ASTM Method	Description of Instruments
% Biodiesel	D7371	FTIR
Cetane	D613, D6890, D7170, or D7668	Cetane engine or derived cetane number (DCN)
Color Visual	Lab Vis	Visible inspection
Distillation	D86	Automatic Distillation
Flash Pensky-Martin	D93	Flash Point Analyzer
Gravity	D4052 or D1298	Digital Density Meter or Hydrometers & API Tables
Kin Vis 40 C	D445 D975	Kinematic Viscometer
Water and Sediment	Workmanship	Visual Inspection
Sulfur	D4294	X-ray Diffraction

DMS Sample Testing Capacity

- Gasoline - 2000/year
- Diesel Fuel & Biodiesel Blends - 2000/year
- Motor Oil - 600/year
- Automatic Transmission Fluid - 500/year
- Engine Coolants - 500/year
- Gear Oil - 200/year
- Brake Fluid - 200/year

Fuel Sampling 101

- All 58 counties
- >10,000 retail stations
- 250,000 retail fuel pumps
- Fuel Distribution Facilities
- Refineries

Fuel Sampling 101 (cont.)

- Random Surveillance Sampling
- Market Place Surveys
- Complaints
- Follow Up on All Product Failures

DMS Field Enforcement Actions

- Issue Notice of Violation
- Remove Product from Sale
- Civil Penalties
- Criminal Citations
- Permanent Injunction
- Present Cases to County District Attorneys/City Attorneys

Conclusions

- ARB's vapor recovery program achieves substantial emission reductions and benefits
- Vapor recovery program implemented at multiple State and local levels
- Fuels enforcement implemented at ARB and CDFA
- Enforcement applied at all points of a distribution and marketing chain
- Strong enforcement program ensures fuel emission standards, fuel quality, and metrology requirements are met

Contact Information

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  - Dr. Michael Benjamin, Chief, Monitoring and Laboratory, (916) 323-2915, Michael.Benjamin@arb.ca.gov
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  - Andrea Alley, Supervising Special Investigator, (916) 229-3000, Andrea.Alley@cdfa.ca.gov

Questions and Answers