The Future of Remote OBD

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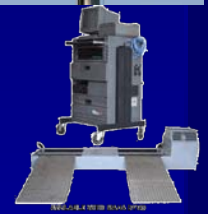
California Environmental Protection Agency
Air Resources Board



Outline

- Background
- Current OBD I/M Strategies
- Continuous Testing Concept
- California CTP
- Path to Widescale Remote OBD

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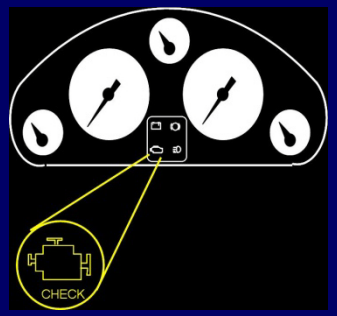
Background - OBD II Goals



- Detect all emission-related faults
  - Emission-related components
  - Components critical to OBD II
- Faster diagnosis and repair of malfunctions
- Assist Technicians in Fixing Complex Vehicle/Emission Control Systems

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Background: OBD II and I/M

- OBD II designed from the beginning as an I/M Tool
  - Comprehensive monitoring requirements
  - Fault thresholds based on emission standards
- Readiness Indicators
- Tamper Resistance Requirements

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Background: OBD II Implementation

- Applies to 1996 and newer vehicles
- Active Continuous Enforcement
  - Stringent certification process
  - In-use performance investigations
    - Corrective action for in-use vehicles
    - Fast implementation of corrections going forward
- Constant Improvements
  - New monitoring/performance requirements
  - New/Improved Data Handling Requirements

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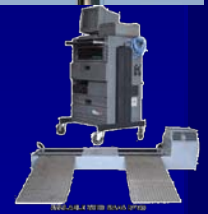
Current OBD I/M Strategies

- Most states rely only on OBD II inspections for ’96 and newer vehicles.
- Benefits over tailpipe I/M
  - More comprehensive fault detection
    - All emission-related components individually monitored
    - Cold start problems
    - Evaporative emission problems
    - Broad operating conditions
    - OBD vs ASM failure rates
  - Convenience
    - Faster
    - No surprises
    - Less cost

Continuous Testing



- Made possible by remote technologies
- More emission benefits
  - shortens time between detection and repair
  - directly addresses code clearing
- Better year round compliance
- Added convenience for passing vehicles

Increased Benefits over Biennial Testing (Oregon CY 2015)	
HC	25.8%
NOx	22.1%

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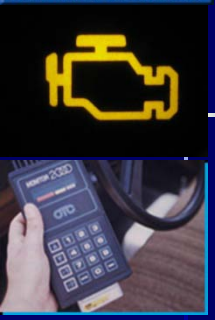
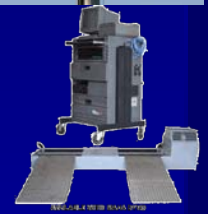
- FACA Transitioning I/M report http://obdclearinghouse.com/index.php?body=get_file&id=1269

Remote OBD Technologies





- Cellular
- Short Range
  - Wifi
  - FM
  - Bluetooth
- OEM Telematics
  - On-star

Wi Fi ZONE

Bluetooth

OnStar by GM

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California CTP

- Continuous Testing Program –
  CA's Pilot remote OBD program
- Government and private fleets
- OBD link must communicate with vehicle at least every two minutes
- Triggers for forwarding data to vendor/vehicle owner
- Current active participants
  - Networkfleet
  - Webtech Wireless
- About 1300 vehicles total

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Path to widescale remote OBD

- Guidelines for program design and implementation
- Dealing with open issues
- Legislative Changes (California)

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Remote OBD Protocol Development

- Government/Industry effort through FACA
- Guidance would provide basis for state credits
- Minimum requirements and more stringent options defined
- Technology Neutral

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Protocol: Issues Addressed

- Network Design
- Repair/Retest Considerations
- Communication Protocols
- Acceptance Criteria
- Security and Tamper Detection
- Record Structure and Format
- Reporting Triggers and Frequency
- Audit and Compliance Monitoring

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- http://www.obdclearinghouse.com/index.php?body=wireless

Issues for Jurisdictions

- Mandatory vs Voluntary Participation
  - Cars needing remote OBD the most may be the least likely to participate
- Overcoming “big brother” issues
  - Remote obd data use

California Legislation

- Health and Safety Code currently requires loaded model tailpipe tests for most vehicles
- AB2289 - Would permit OBD II-based inspections for 1996 and newer vehicles

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Summary

- OBD II is a comprehensive and effective I/M Tool
- OBD-based inspections save time and money
- Remote OBD offers the potential to further increase benefits and convenience
- Careful implementation will be key to success

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References

- OBD-Only Based Smog Check Inspections
  - http://www.arb.ca.gov/msprog/smogcheck/march09/transitioning_to_obd_only_im.pdf
- Transitioning I/M paper
  - http://obdclearinghouse.com/index.php?body=get_file&id=1269
- FACA subgroup charter and SOW
  - http://obdclearinghouse.com/index.php?body=get_file&id=1309
  - http://obdclearinghouse.com/index.php?body=get_file&id=1323

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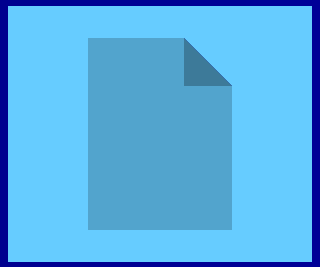
State of California
LICENSED
SMOG CHECK
INSPECTION AND REPAIR STATION

Major Emission Controls

- Fuel System
- Ignition System
- Exhaust Gas Recirculation
- Secondary Air Injection
- Catalytic Converters
- Oxygen, Air/Fuel Ratio Sensors and Heaters
- Fuel Vapor Control
- Evaporative System Integrity



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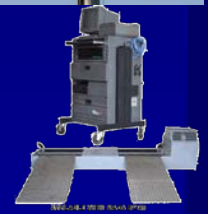
State of California LICENSED SMOG CHECK INSPECTION AND REPAIR STATION

OBD II Critical Components



- Intake Air Temperature Sensor
- Thermostat
- Transmission shift solenoids
- Variable valve timing
- Powertrain Control Module
- Variable length intake systems
- Camshaft Position Sensor
- Engine Coolant Temperature Sensor
- Ambient Temperature Sensor
- Transmission Temperature Sensor
- Transmission Speed Sensors
- Idle speed control
- Manifold Absolute Pressure Sensor
- Transmission shift solenoids
- Mass Air Flow Sensor
- Crankshaft Position Sensor
- Transmission Control Module
- Cooling system fans
- Throttle Actuator
- Barometric Pressure Sensor
- Fuel Level Sensor

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Failure Rates: OBD II vs ASM

Smog Check Database Jun-Dec 2007	Number of Failures (1996+ Model Years)
ASM Tailpipe Test	78,954
OBD II Inspection	192,342 (2.4 X ASM)

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Revised / Added Requirements

Misfire monitoring under expanded operating conditions	1997-1999
Improved catalyst efficiency thresholds	1998-2002
Thermostat monitoring	2000-2002
Storage of software calibration identification number	2000-2002
Calculation and storage of calibration verification number	2000-2002
0.020 inch evaporative system leak detection	2000-2003
Positive crankcase ventilation monitoring	2002-2004
Minimum in-use monitoring frequency requirements	2005-2007
NOx malfunction criteria for catalyst monitoring	2005-2009
Monitoring cold-start emission reduction strategies	2006-2008
Post catalyst oxygen sensor monitoring improvements	1999-2011
Primary oxygen sensor monitoring improvements	2010-2012
Permanent fault code storage protocol	2010-2012
Monitoring air/fuel ratio imbalances between cylinders	2011-2014