

**OREGON TRUCKING ASSOCIATION
TECHNOLOGY & MAINTENANCE COUNCIL
*SOUTHERN OREGON CHAPTER***

Presents:

*“Achieving the Best Performance
From Your 2007-2009 Engines”*

A Panel Discussion of
The Most Current Improvements
And Best Operating Practices

Diesel Engine Evolution Targets

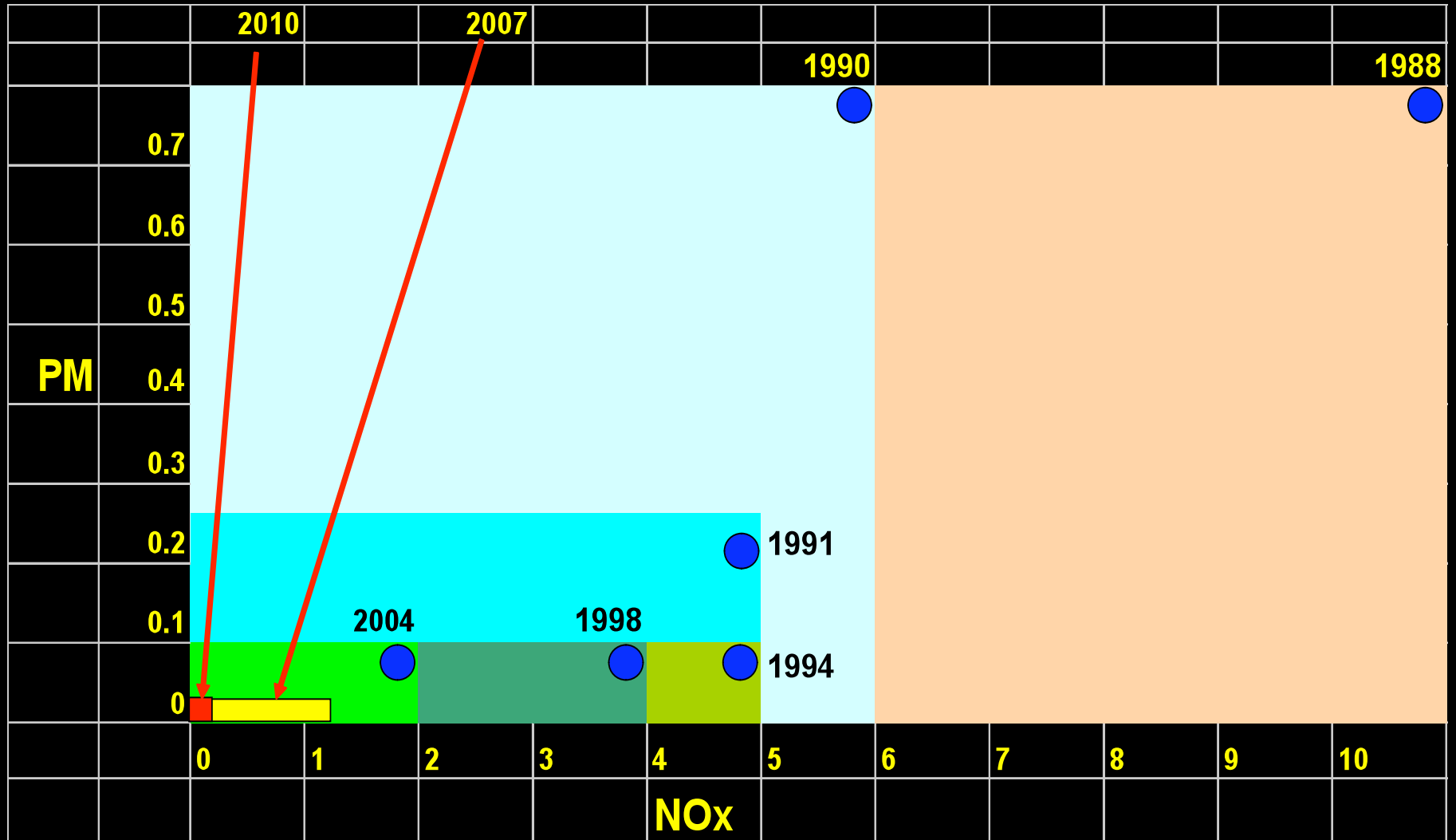
CUSTOMER TARGETS *driven by Market Forces*

- Improved Performance (more HP & Torque)
- Improved Fuel Economy (better MPG)
- Improved Durability (more miles, less failures)
- Lower Cost of Operation (lower CPM)

EPA TARGETS *driven by Federal and California Law*

- Reduced Exhaust Emissions (less PM & NO_x)

Highway Heavy Duty Diesel Emission Standards (g/bhp-hr)



CONTROL STRATEGIES

PM STRATEGY - pre 2007

- * Raise Combustion Efficiency
- * Timing & Injection Controls
- * Higher Injection Pressures
- * Piston Design Changes
- * Lower Sulfur Fuels (LSF)

PM STRATEGY - 2007 and on

- * Total PM Capture (DPF)
- * Ultra Low Sulfur Fuels (ULSF)

NO_x STRATEGY - pre 2004

- * Lower Combustion Temps
- * Retarded Timing
- * Improved Air Flow Control

NO_x STRATEGY - 2004 (2002)

- * Reduced Oxygen via EGR
- * (Caterpillar ACCERT, catalyst)

NO_x STRATEGY - 2007

- * Increased EGR (Cat CGI)

NO_x STRATEGY - 2010 and on

- * Advanced EGR
- * SCR Aftertreatment

NOx Control - 2004 and Later

Method: Introduce cooled inert gas (exhaust) to replace a calculated percent of oxygen during combustion to lower temperature and reduce NOx emissions.

Major Components:

- * **Air Flow** Controls (variable turbochargers, etc.)
- * EGR Exhaust **Piping and Cooler** (heat exchanger)
- * **Mixing Valve** (controlling exhaust-fresh inlet ratio)
- * Supporting **Sensors and Controls**
- * Changes to other engine systems (**injection**, etc.)
- * **ECM Parameters** changed to add new systems
- * Engine “**Performance Curve**” (“how it is driven”)

PM Control - 2007 and Later

Method: Pre-condition exhaust (in catalyst) before capturing all particulates (soot) in a fine filter. Periodically “regenerate” (burn off) soot into ash by “passive” (normal engine exhaust heat) or “active” (controlled burn) actions. Remove ash by cleaning DPF.

Major Components:

- * Diesel Particulate Filter (with catalyst)
- * Exhaust Pressure and Temperature Sensors (monitoring DPF)
- * Active Regeneration - Fuel Nozzle, Igniters, Pump, Controls
- * ECM Parameters (including DPF monitor and control)
- * DPF Maintenance Strategy (cleaning & troubleshooting)
- * “The Truck Driver” (highest maintenance item in system)

TONIGHT'S PRESENTATION

- Each engine uses their own version of these strategies.
- Each engine has specific details unique to them.
- All engines got off to a “rough start” with 2002-2004 NO_x and 2007 PM components.
- All engines have evolved their product through improvements to hardware and software.
- Improvements continue. Engines in this period can be brought to “best performance” with this information.
- Take advantage of this information to bring *your* engines to a “Best Performance Level”.