

**National Biodiesel Conference, February 4, 2008**

# **Crankcase Oil Dilution Using Alternative Diesel Fuels**

**Stuart Johnson  
Engineering and Environmental Office  
Volkswagen Group of America**

**T D I**

Volkswagen Group of America, EEO,  
February 4, 2008

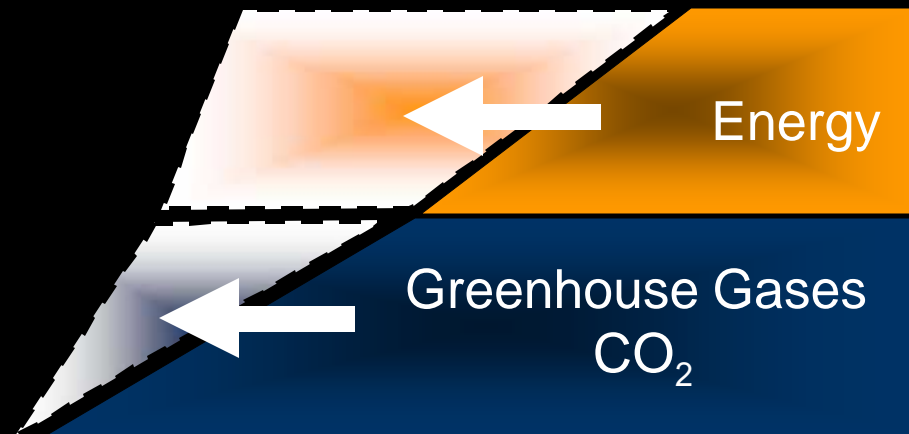


# Agenda

- 
- 
- 
- 
- 
- 
- 



# Social Mobility Issues



Exhaust Emissions CO, NO<sub>x</sub>, HC, PM



# Environmental Goals in Vehicle Development



## Production:

- save resources (energy, materials)
- low GHG impact
- build durable products

## Vehicle Characteristics:

- clean emissions



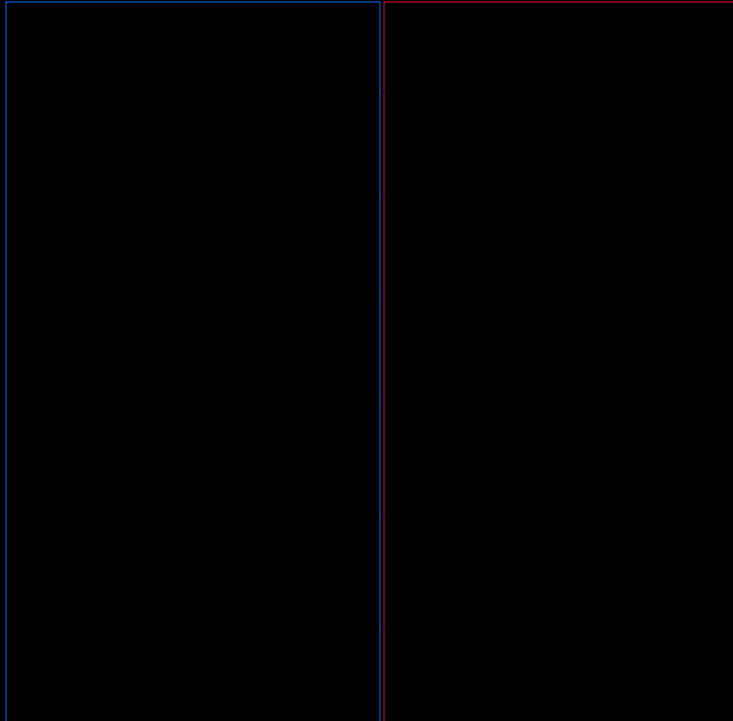
# Volkswagen Golf Diesel



Volkswagen Group of America, EEO,  
February 4, 2008



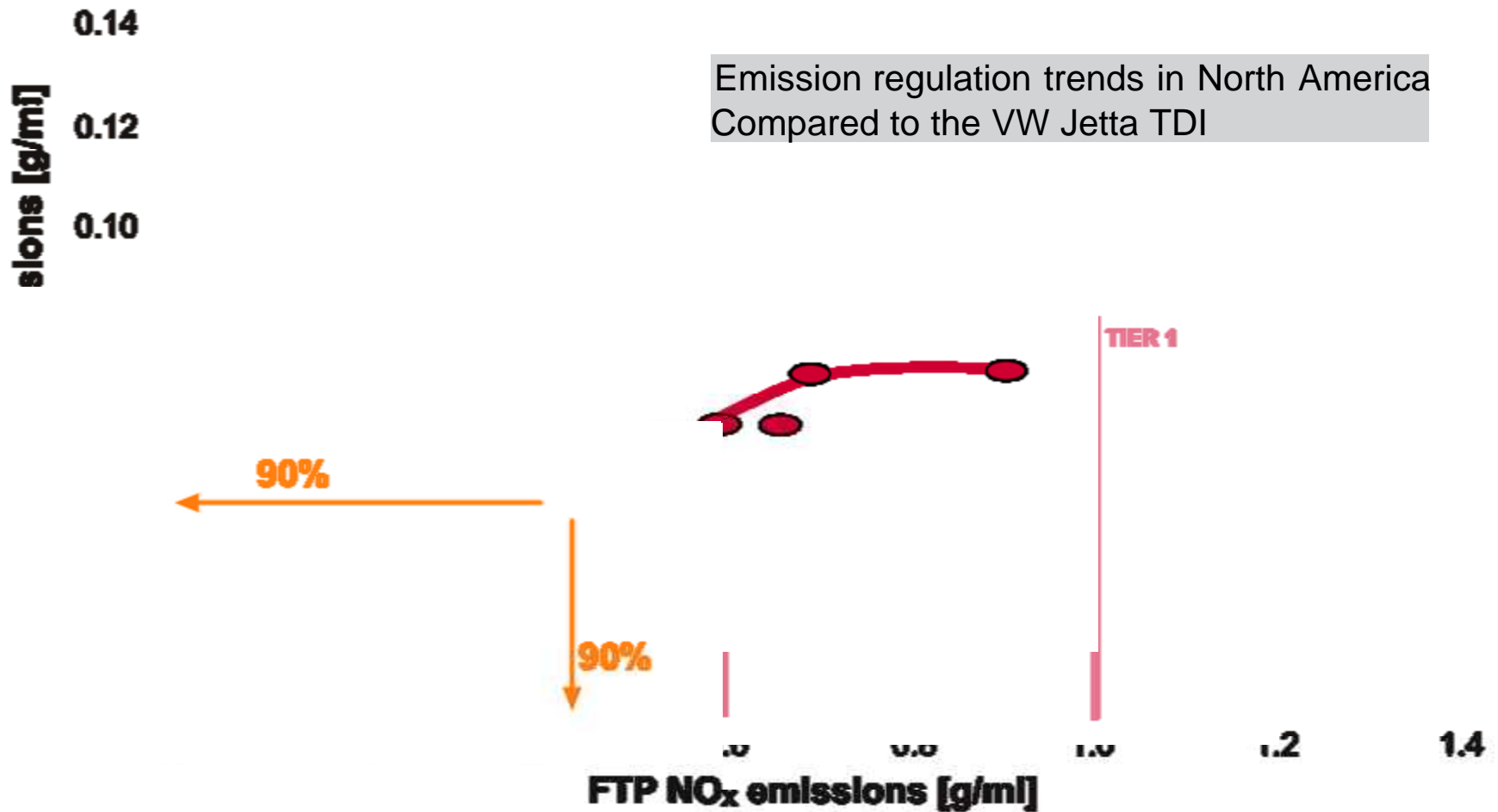
# Diesel/Gasoline Comparison



Volkswagen Group of America, EEO,  
February 4, 2008

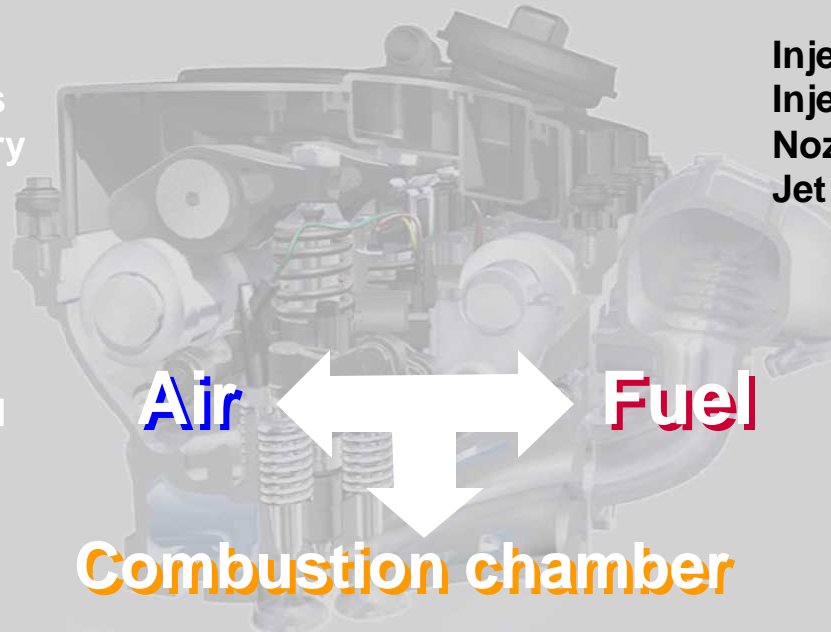


# North American Region Emission Results



# Optimization of Combustion

Air and flow quality  
Number/layout of valves  
Timing/degree of delivery  
Rest gas and EGR  
Inlet/swirl  
Compression/inner flow  
Tumble  
Tightened flow  
Turbulence/3D flow field



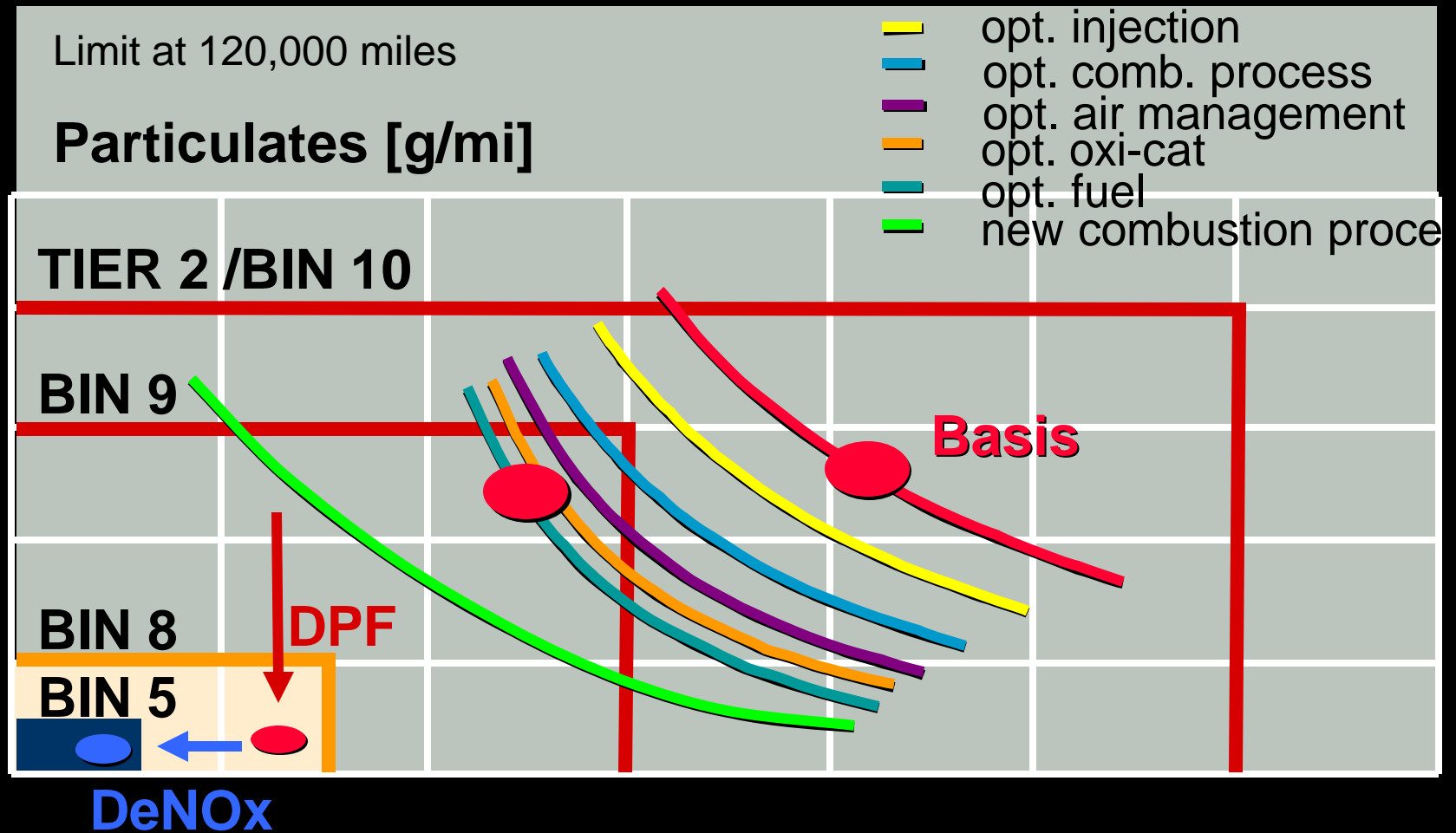
Injection pressure  
Injection pattern  
Nozzle inner flow  
Jet spread  
Jet speed  
Droplet current density  
Droplet diameter  
Intrusion depth  
Fuel quantity

## Combustion chamber

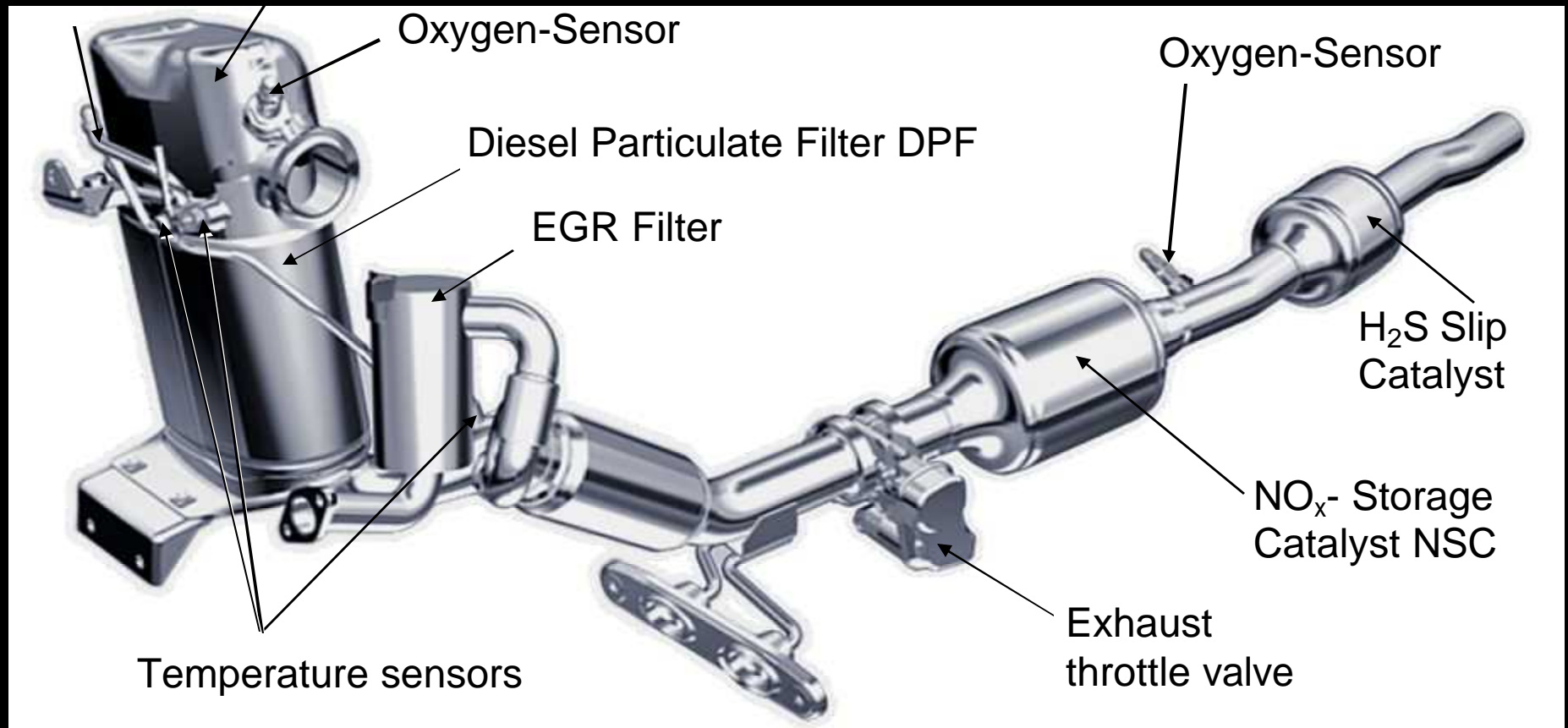
Jet intensity  
Wall influence  
Evaporation  
Ignitable mixture  
Advanced reactions  
Ignition delay/self ignition  
Premixed combustion  
Diffusion combustion  
Flame spread



# Diesel development for passenger cars in U.S.



# After-Treatment Components



# Fuel Properties and Their Influences

*Viscosity*  
*Metals*  
*Additive package*

*Boiling range,*  
*Cetane number,*  
*energy content*

*Boiling range,*  
*Cetane number,*  
*biodiesel content*

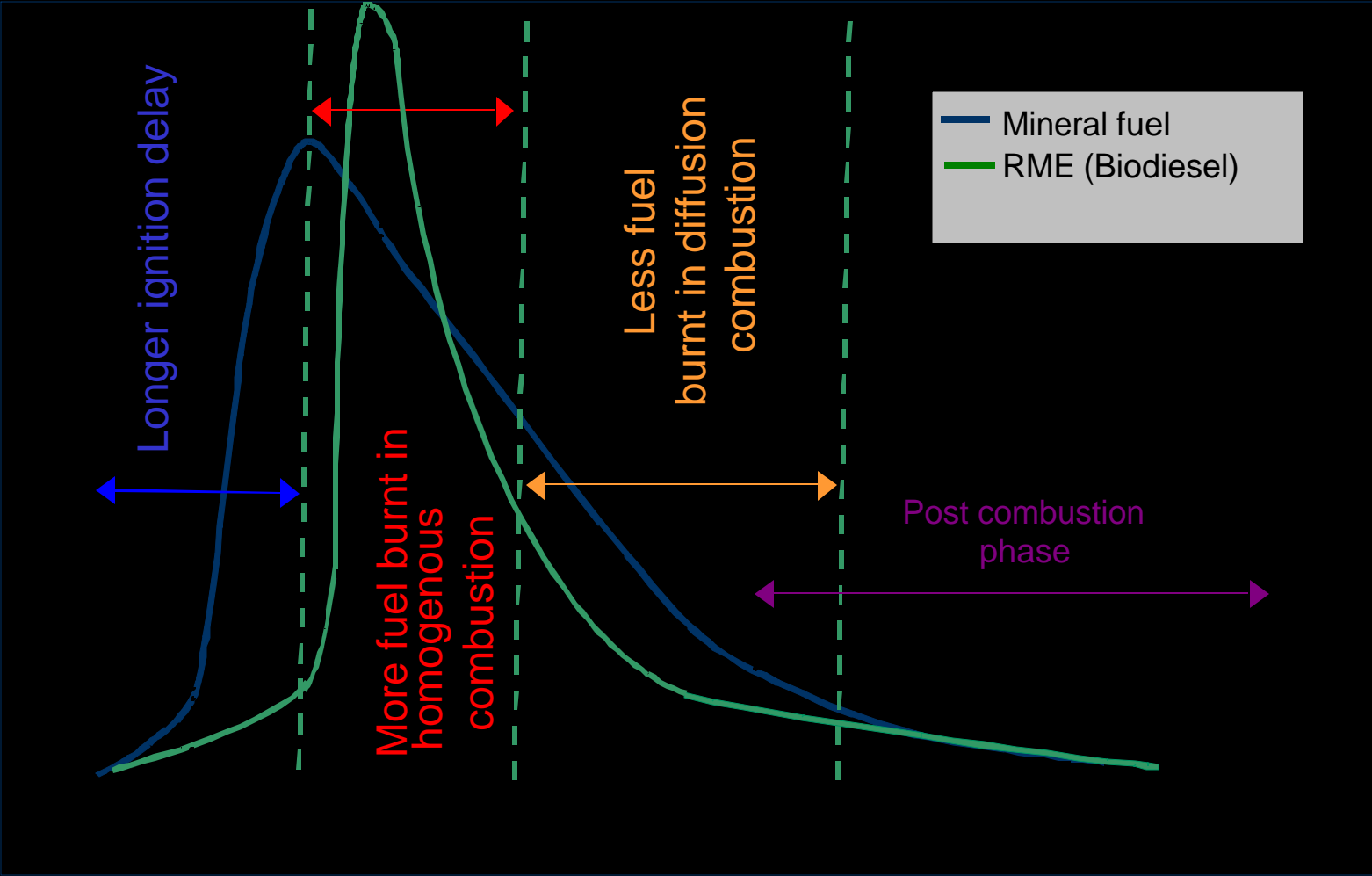
*Sulfur content*  
*Phosphorous content*  
*Cetane number*

*Sulphur content*  
*Biodiesel content*  
*Ash precursors,*

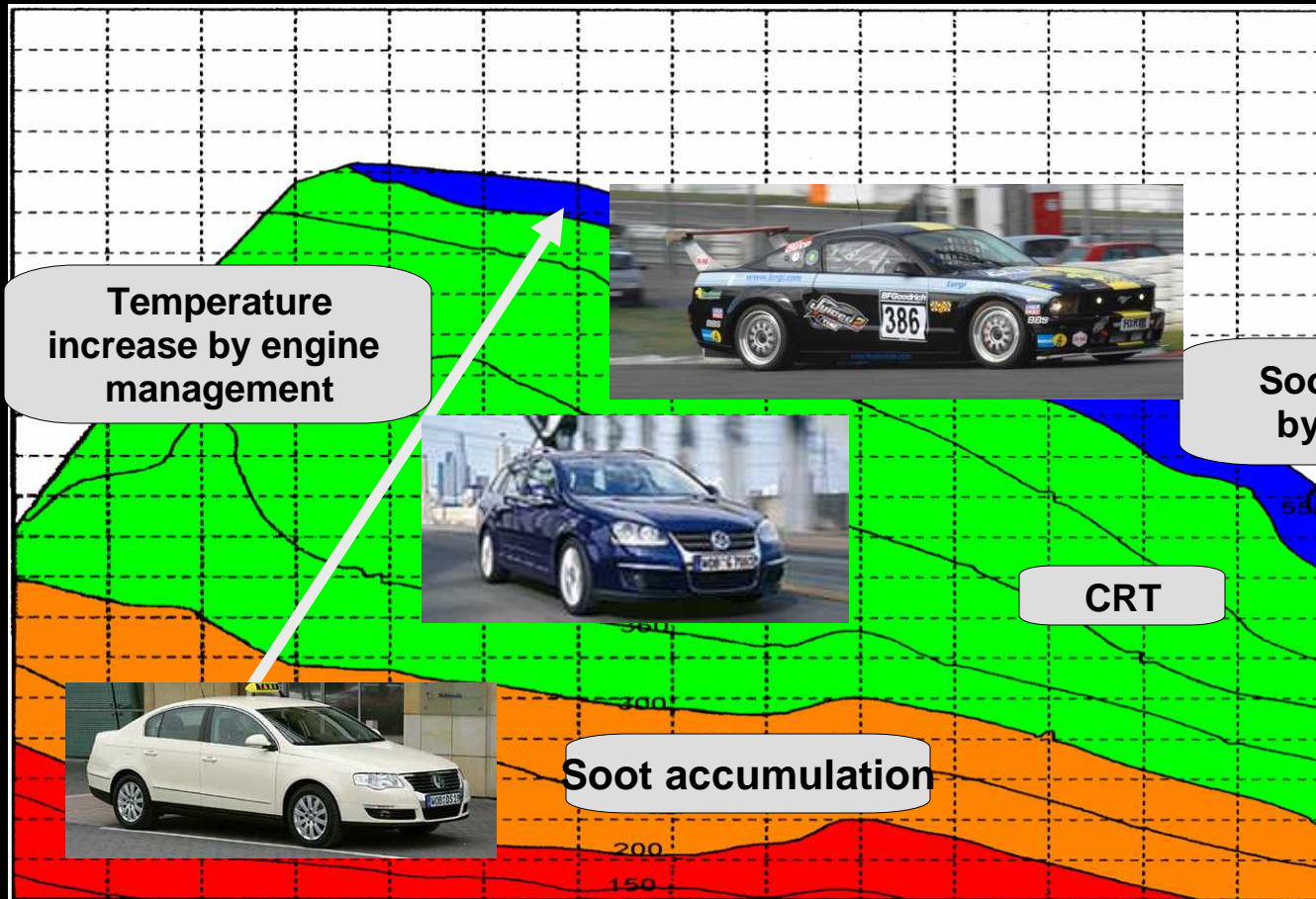
*Sulfur content*  
*Phosphorous content*



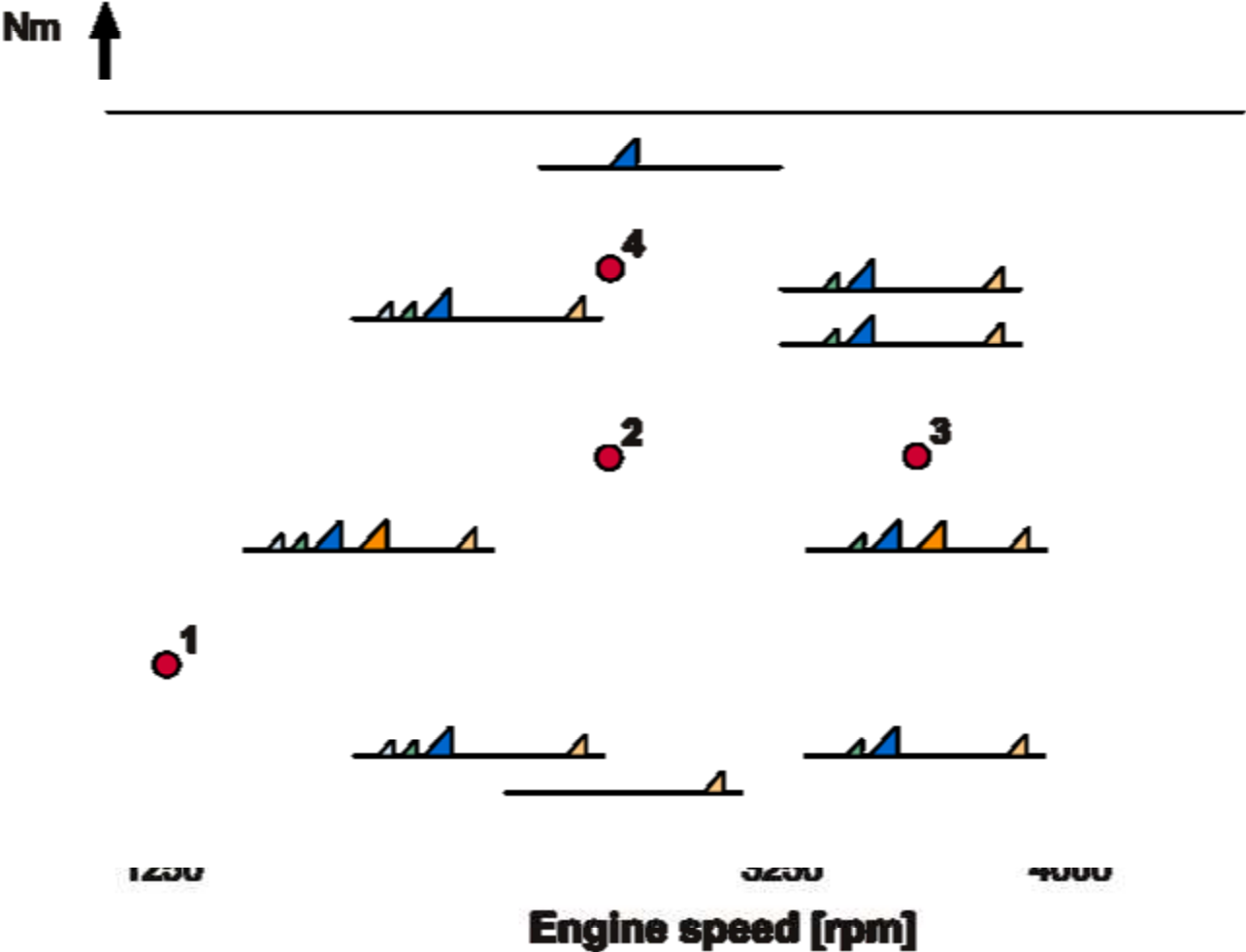
# Combustion of Diesel and Biodiesel



# Temperatures in Front of the Particulate Trap



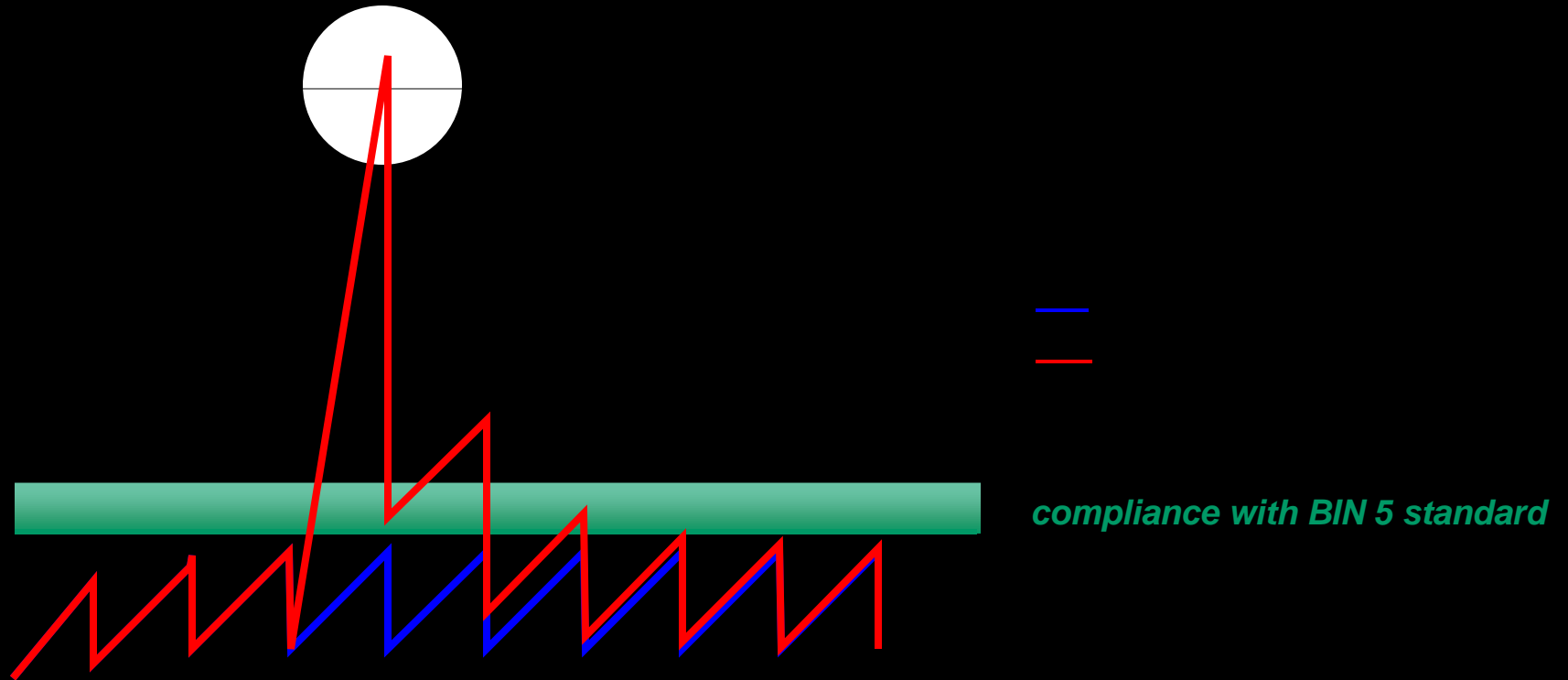
# DPF Regeneration Mode



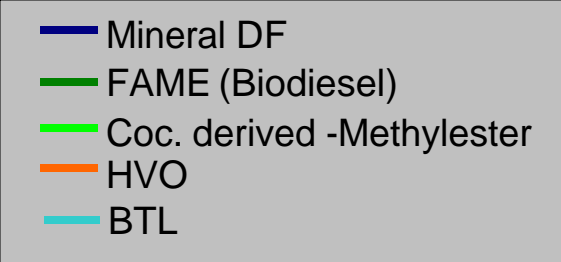
- = PI12
- = PI1
- = MI1
- = Pol2
- = Pol1



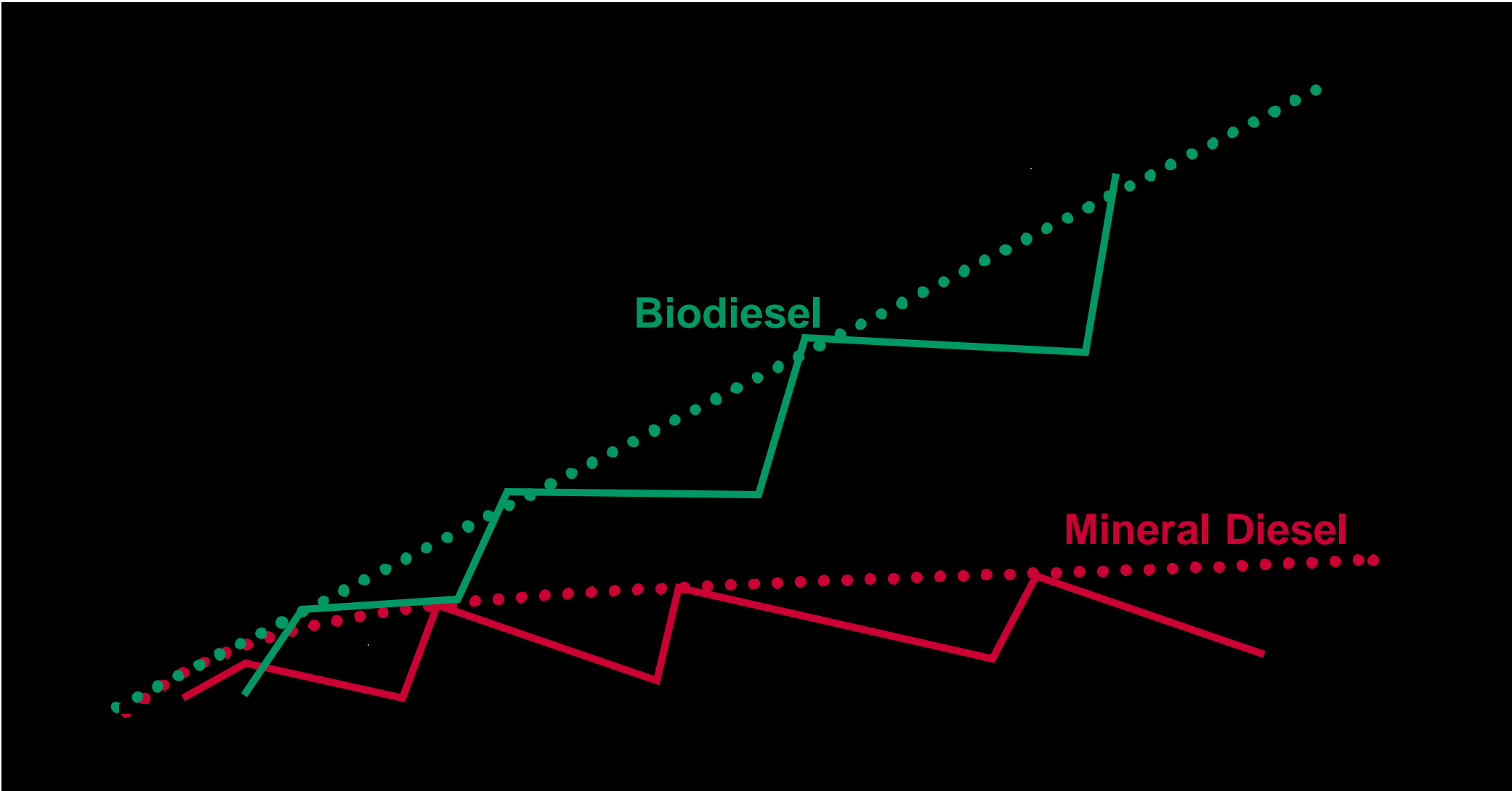
# Effect of „Misuse“ with 350 ppm Sulphur Fuel



# Boiling Range of Different Diesel Fuels



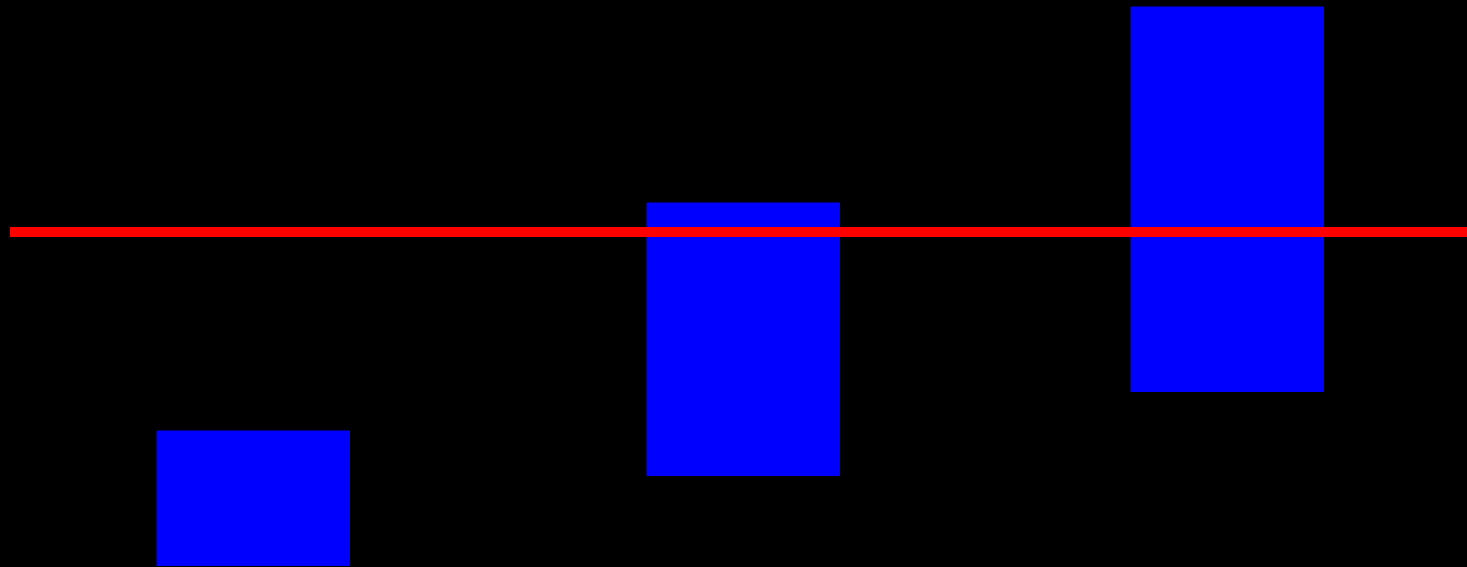
# Oil Dilution During Particulate Trap Regeneration



Volkswagen Group of America, EEO,  
February 4, 2008



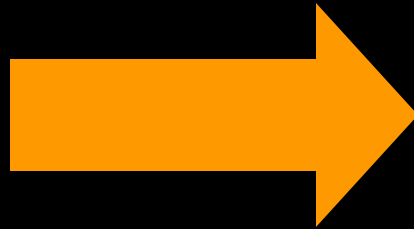
# Crankcase Oil Dilution Versus Fuel Blend Rate



Volkswagen Group of America, EEO,  
February 4, 2008



# Consequences of Oil Dilution From Biodiesel



Volkswagen Group of America, EEO,  
February 4, 2008



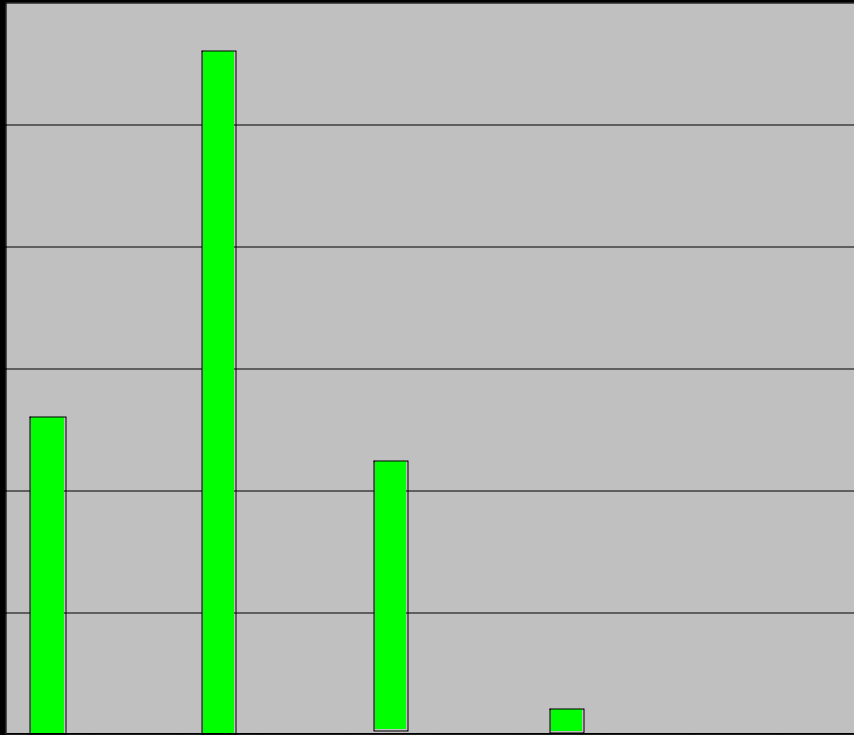
# Pre – Results of DGMK – Study 686



Volkswagen Group of America, EEO,  
February 4, 2008



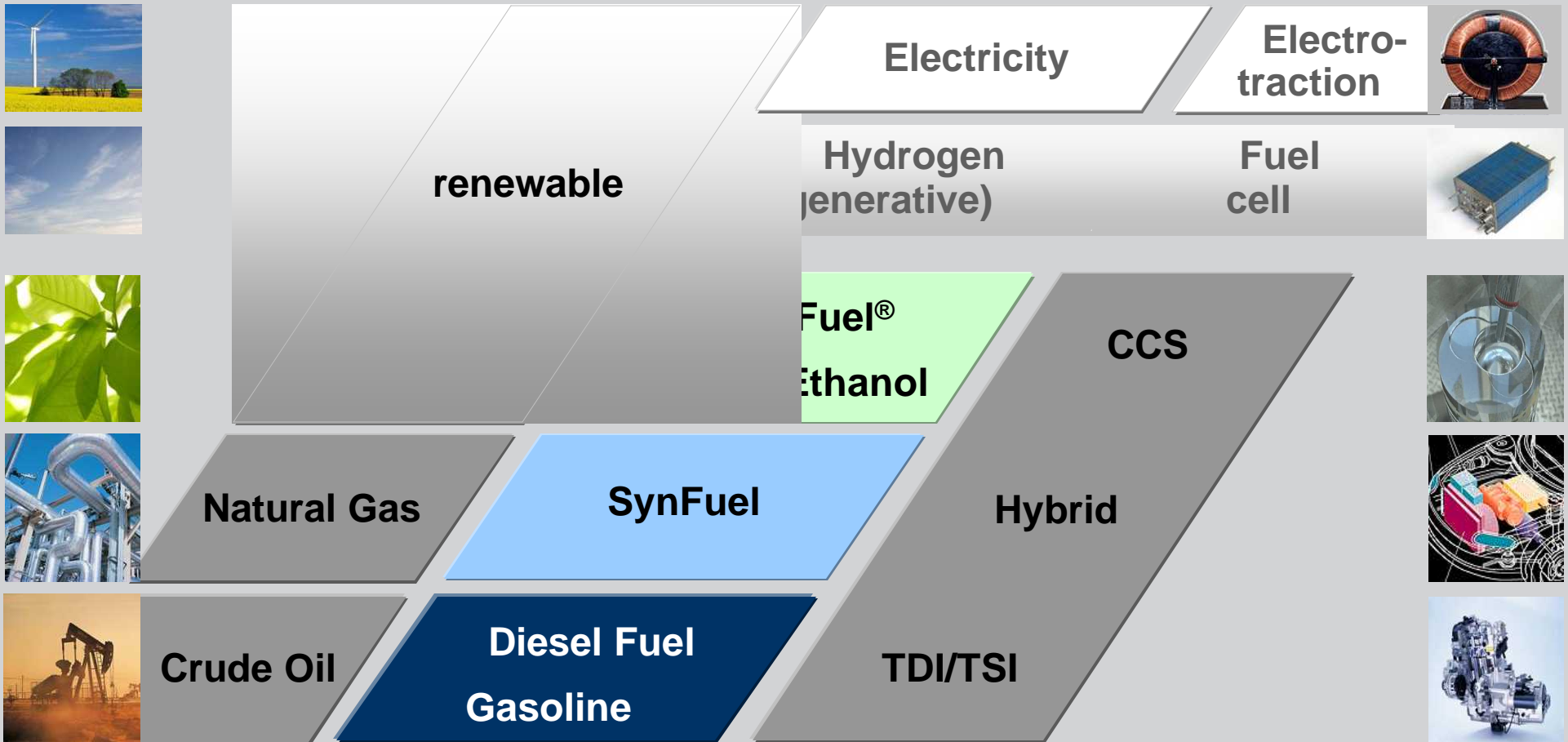
# DGMK 686: Concentrations of the end of the run



Volkswagen Group of America, EEO,  
February 4, 2008



# Long Term Strategy of Volkswagen



Volkswagen Group of America, EEO,  
February 4, 2008



# Thank you



## Questions?

Volkswagen Group of America, EEO,  
February 4, 2008

