



atiel

DRIVING STANDARDS  
IN LUBRICANT TECHNOLOGY

The logo features the word "atiel" in a grey, lowercase, sans-serif font. A yellow swoosh starts from the top right, loops around the letters, and ends at the bottom left. A small yellow dot is positioned above the letter 'i'. Below the swoosh, the tagline "DRIVING STANDARDS IN LUBRICANT TECHNOLOGY" is written in white, uppercase, sans-serif font. The background is a dark gradient with abstract orange and yellow light patterns on the left side.



# Lubricants and Exhaust Aftertreatment an ATIEL Perspective

Robert Mainwaring & Peter Brett

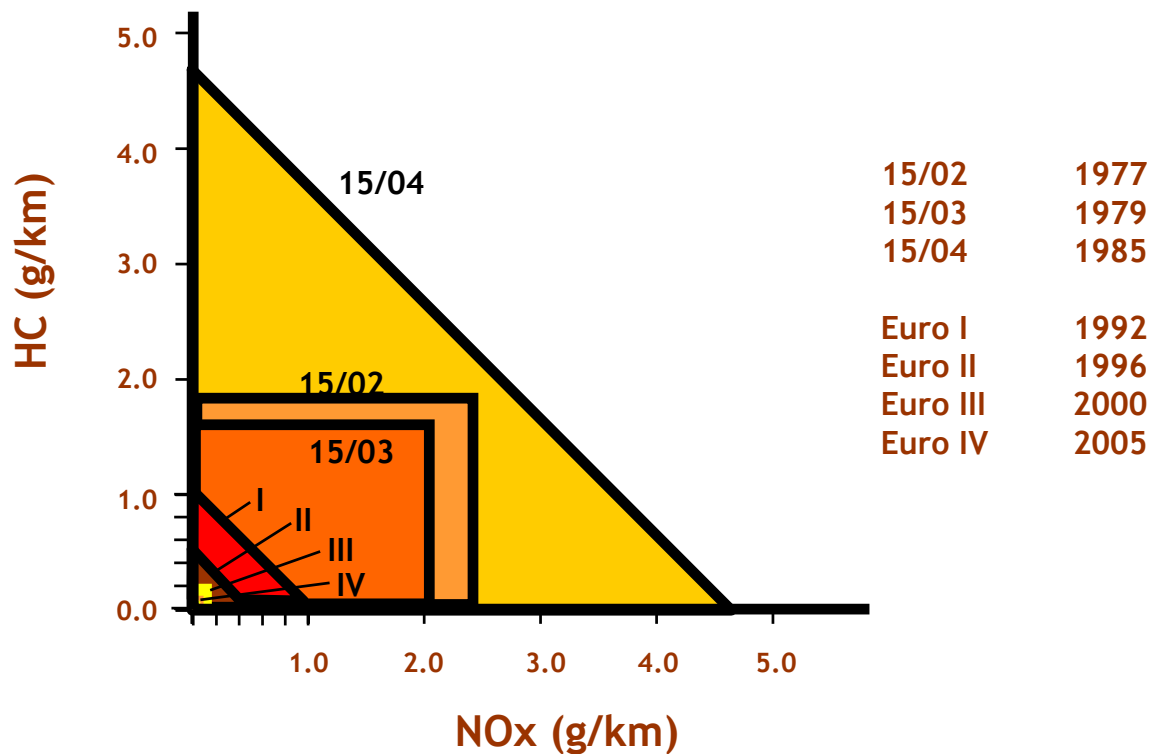
# ATIEL

- is a European economic interest group
- is Registered in Belgium
- represents the common technical interests of European lubricant manufacturing and marketing companies
- promotes dialogue between our members and associated industries on regulations, specifications and Codes of Practice
- focuses on automotive lubricants and the specifications which describe them
- **Supports fit for purpose tests against a demonstrated field need**

# This Presentation

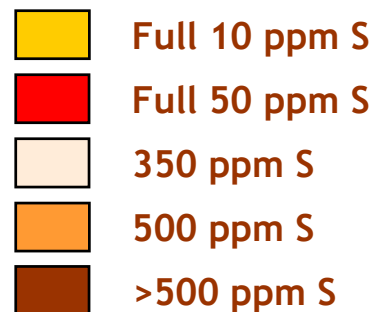
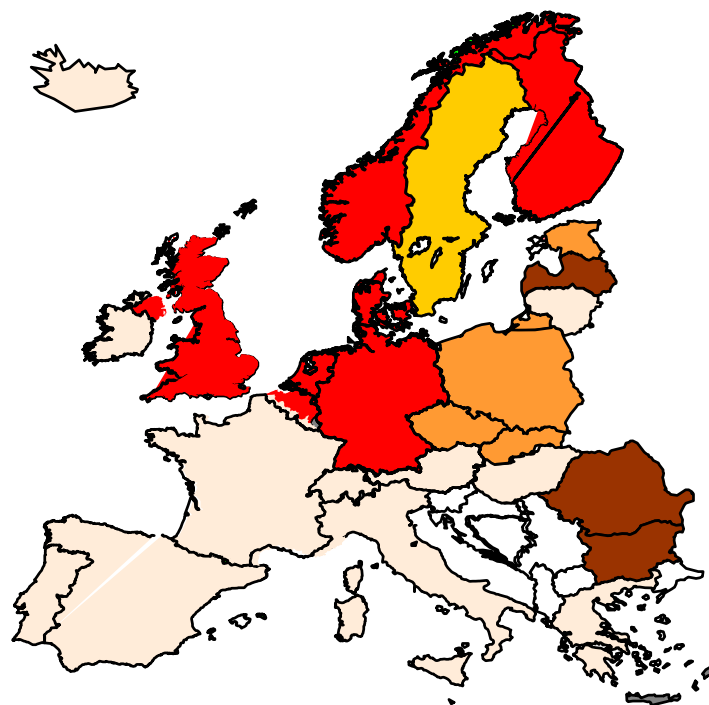
- Scene setting
- Engine and aftertreatment options for Euro IV and beyond
- Lubricant formulation
- Linkage between formulation and system performance
- Conclusions and recommendations

# Emissions : European Gasoline



Target emission levels are so low that anything which may impact performance is under scrutiny

# Fuel Sulphur Legislation



## EU Directive :

- 50 ppm max from 2005
- 10 ppm 'balanced' from 2005
- 10 ppm everywhere from 2008-9

Gasoline and diesel sulphur levels are decreasing towards 10ppm  
Supply not guaranteed across Europe until ~2009

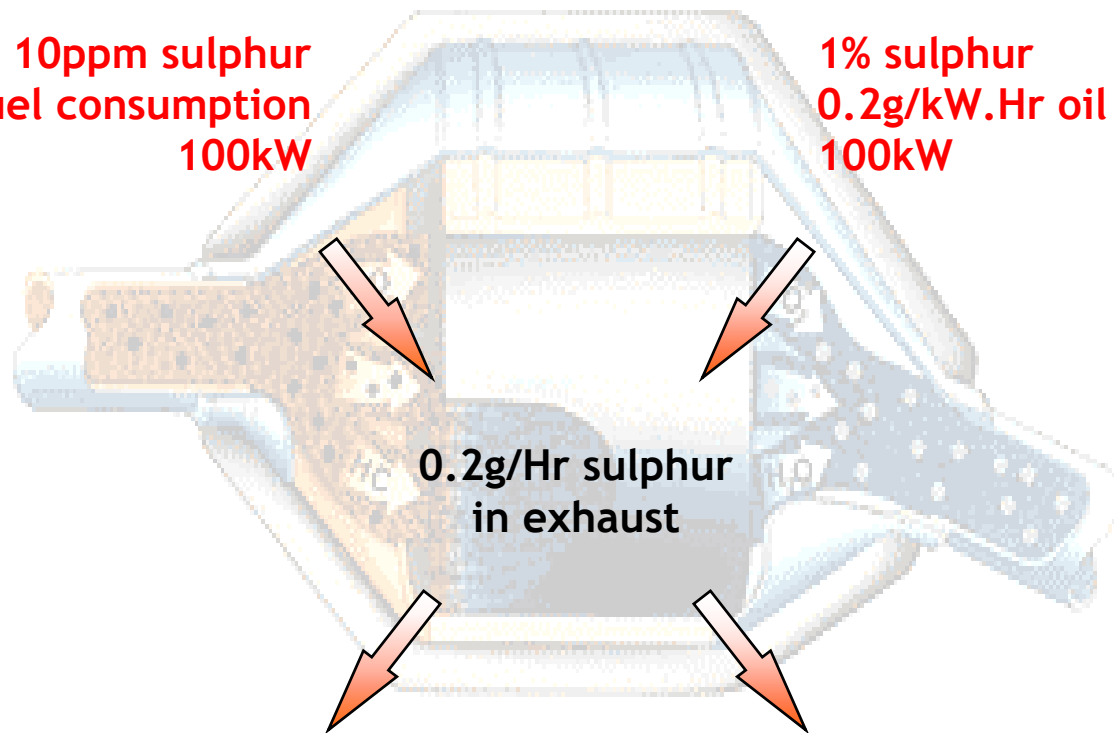
# Fuel & Lube Sulphur

## FUEL

10ppm sulphur  
200g/kW.Hr fuel consumption  
100kW

## LUBE

1% sulphur  
0.2g/kW.Hr oil consumption  
100kW



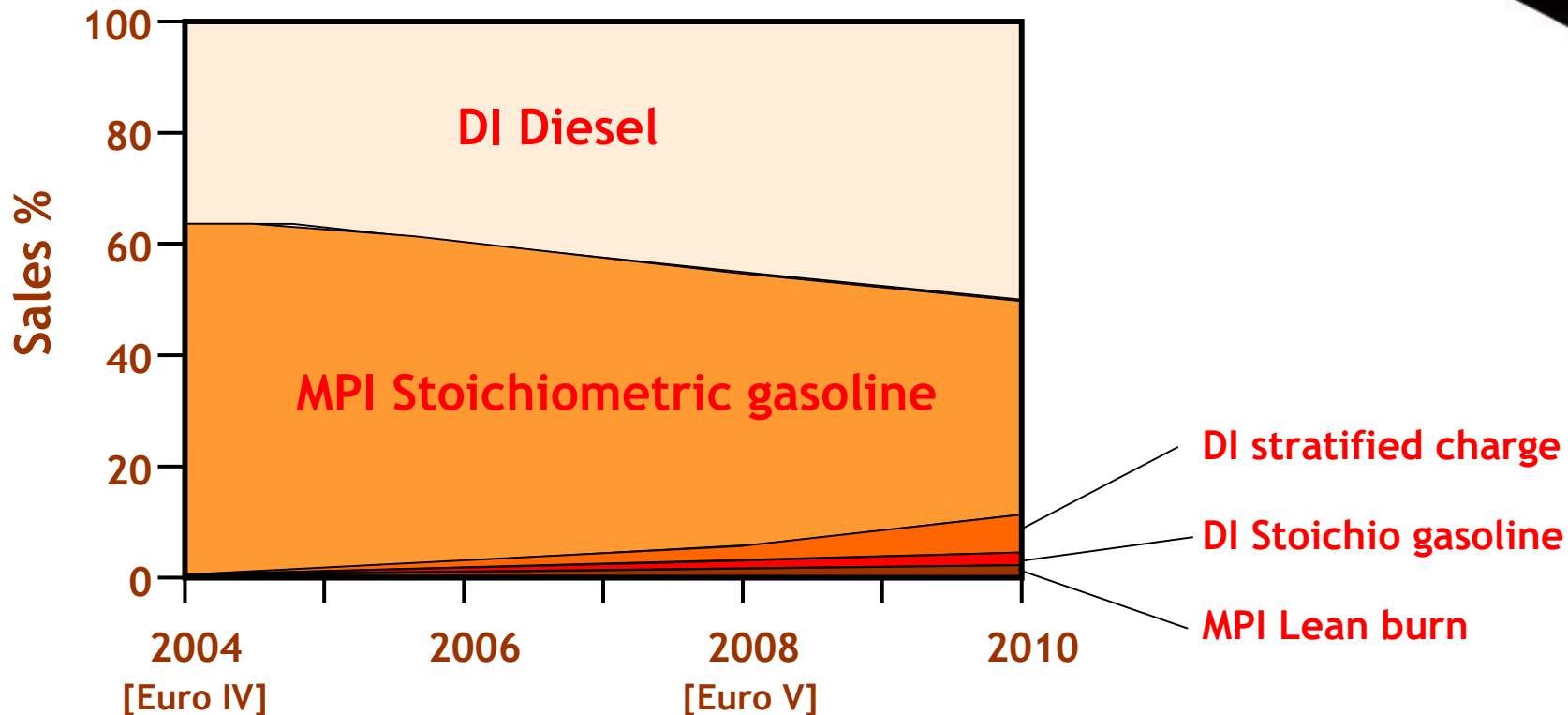
0.2g/Hr sulphur  
in exhaust

Fate largely understood

Fate largely unknown

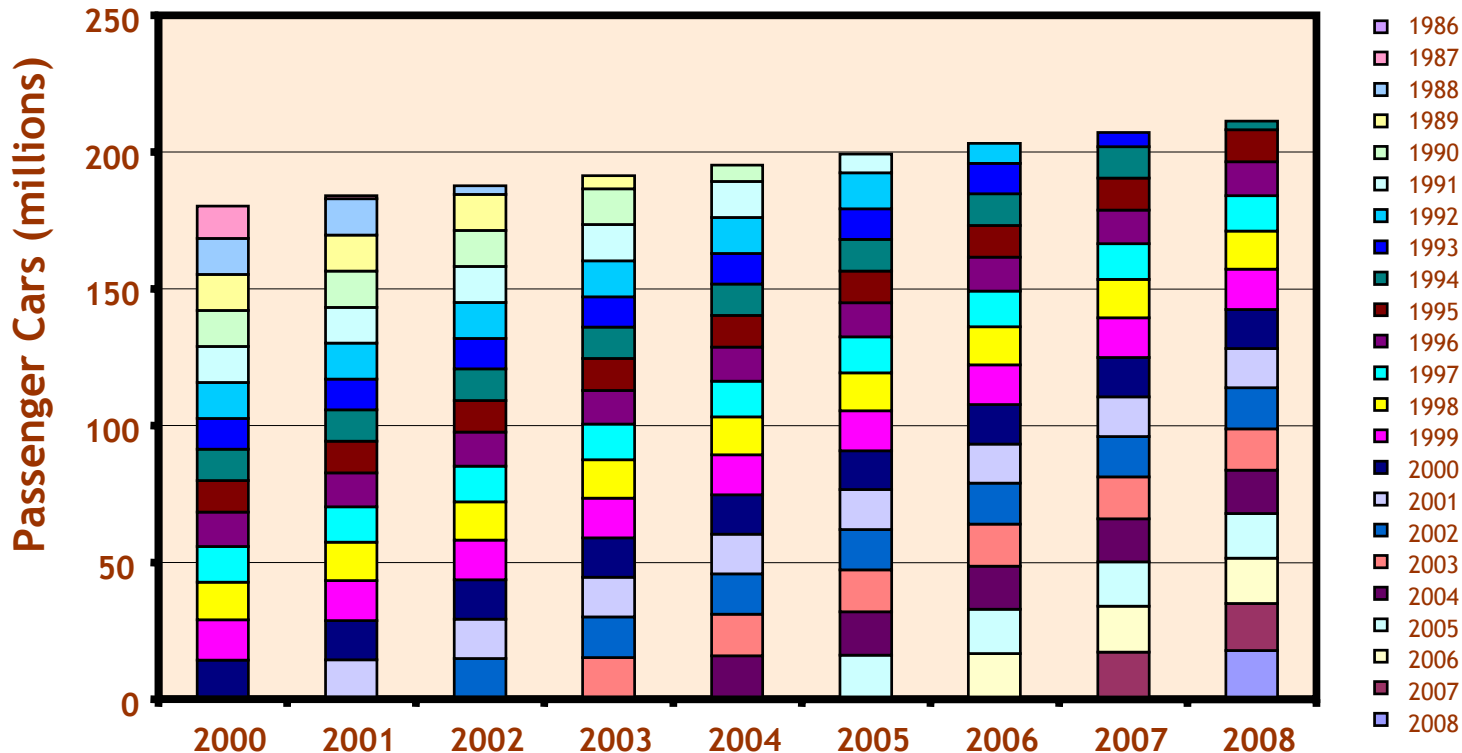
Cannot assume that base oil, additive & fuel sulphur effects are equivalent

# PC Engine Evolution



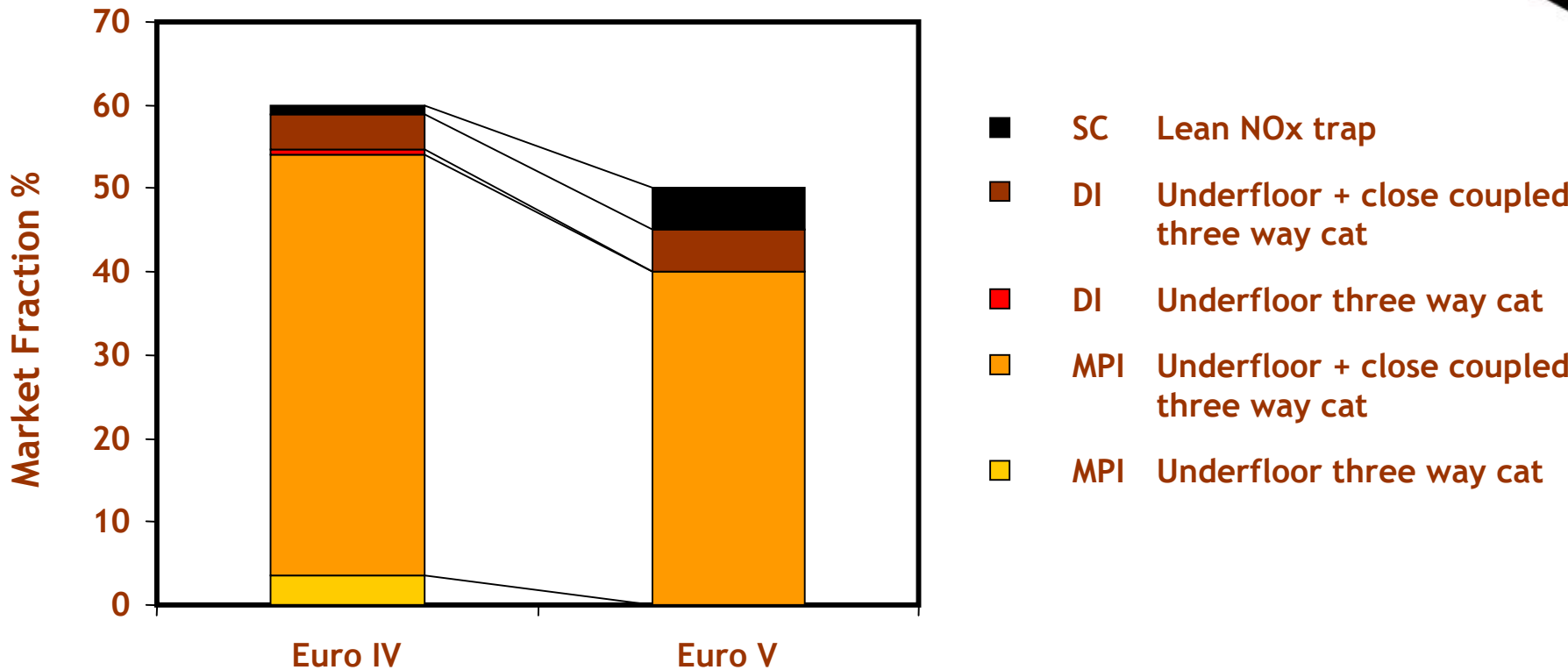
Conventional DI diesel and MPI gasoline engines dominate - even in 2010

# Fleet Roll Over



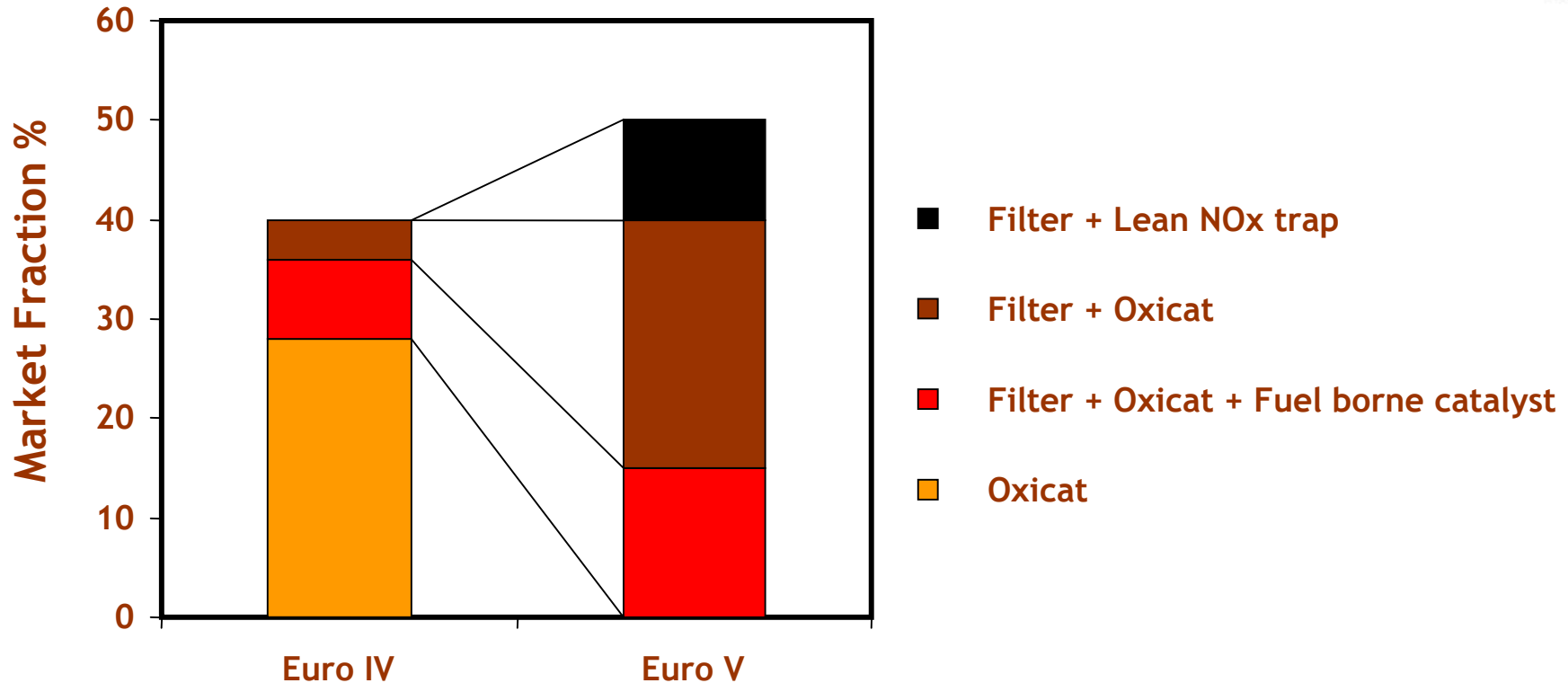
Just 7% of the vehicle fleet is replaced each year  
so new models represent a very small fraction of the total pool

# Gasoline Engine A/T Options



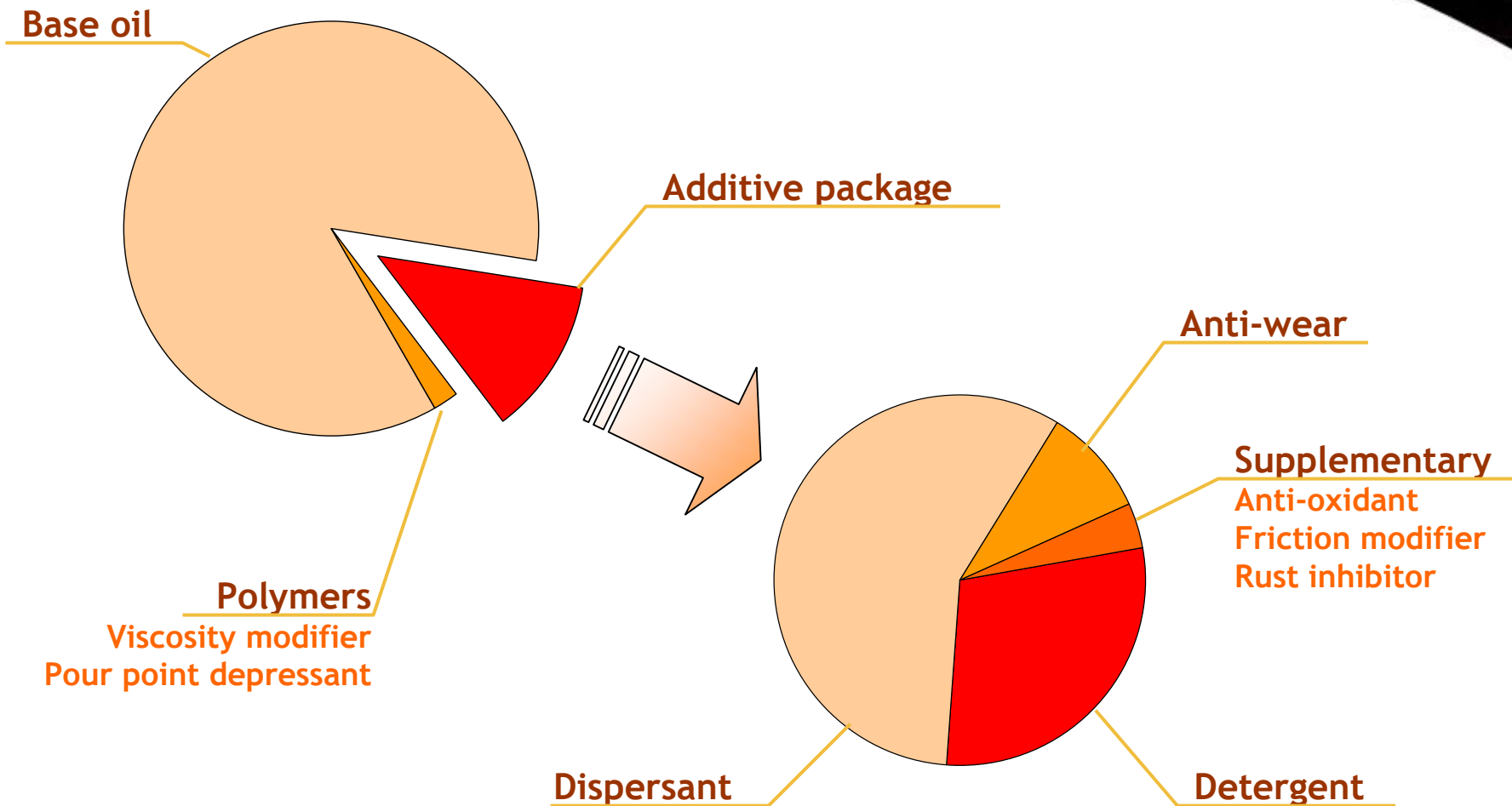
Three way underfloor + close coupled systems dominate  
 Stratified charge Lean NOx option remains small

# Diesel Engine A/T Options

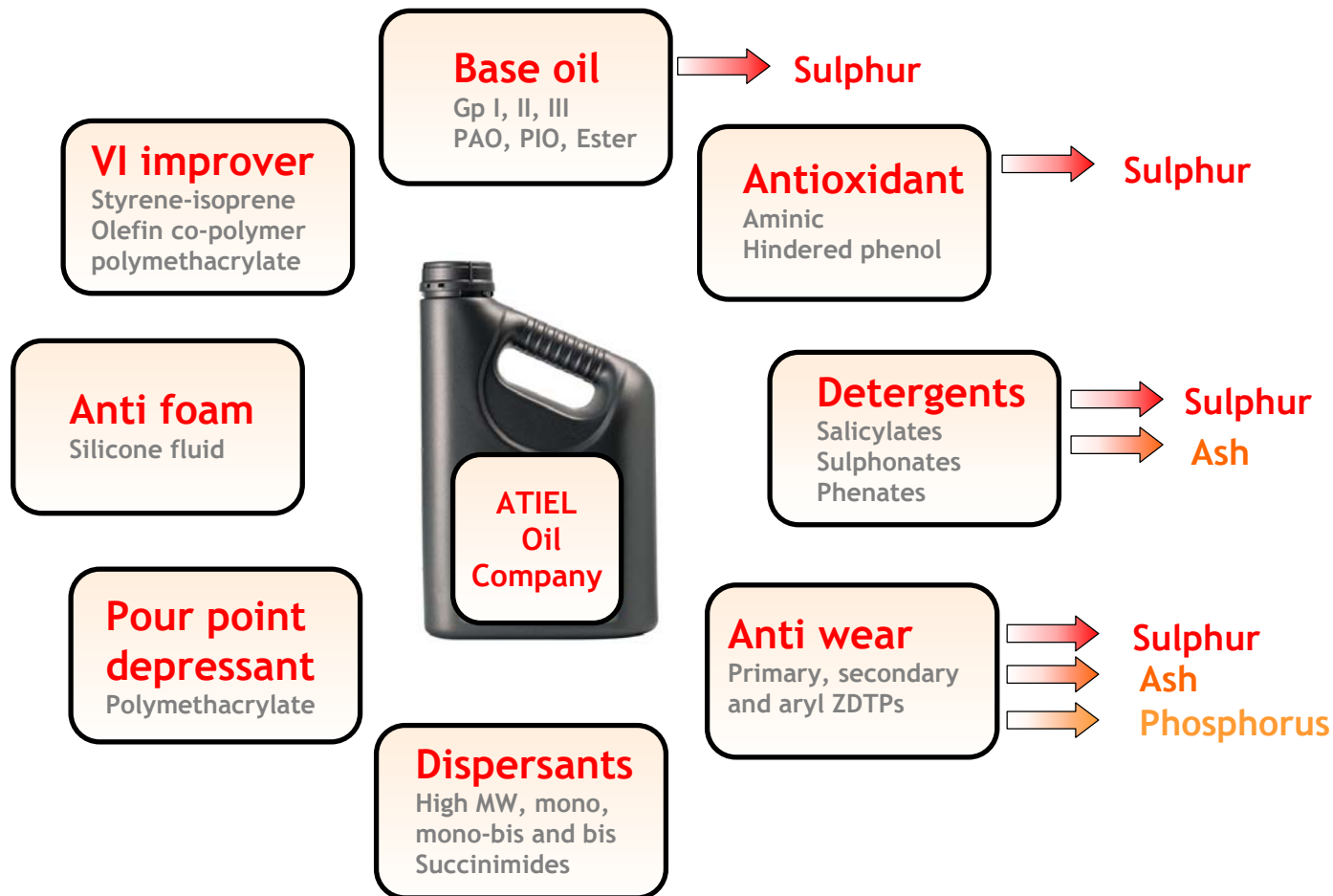


Simple oxicat insufficient for Euro V  
 Lean NOx trap required for larger vehicles

# Oil Composition

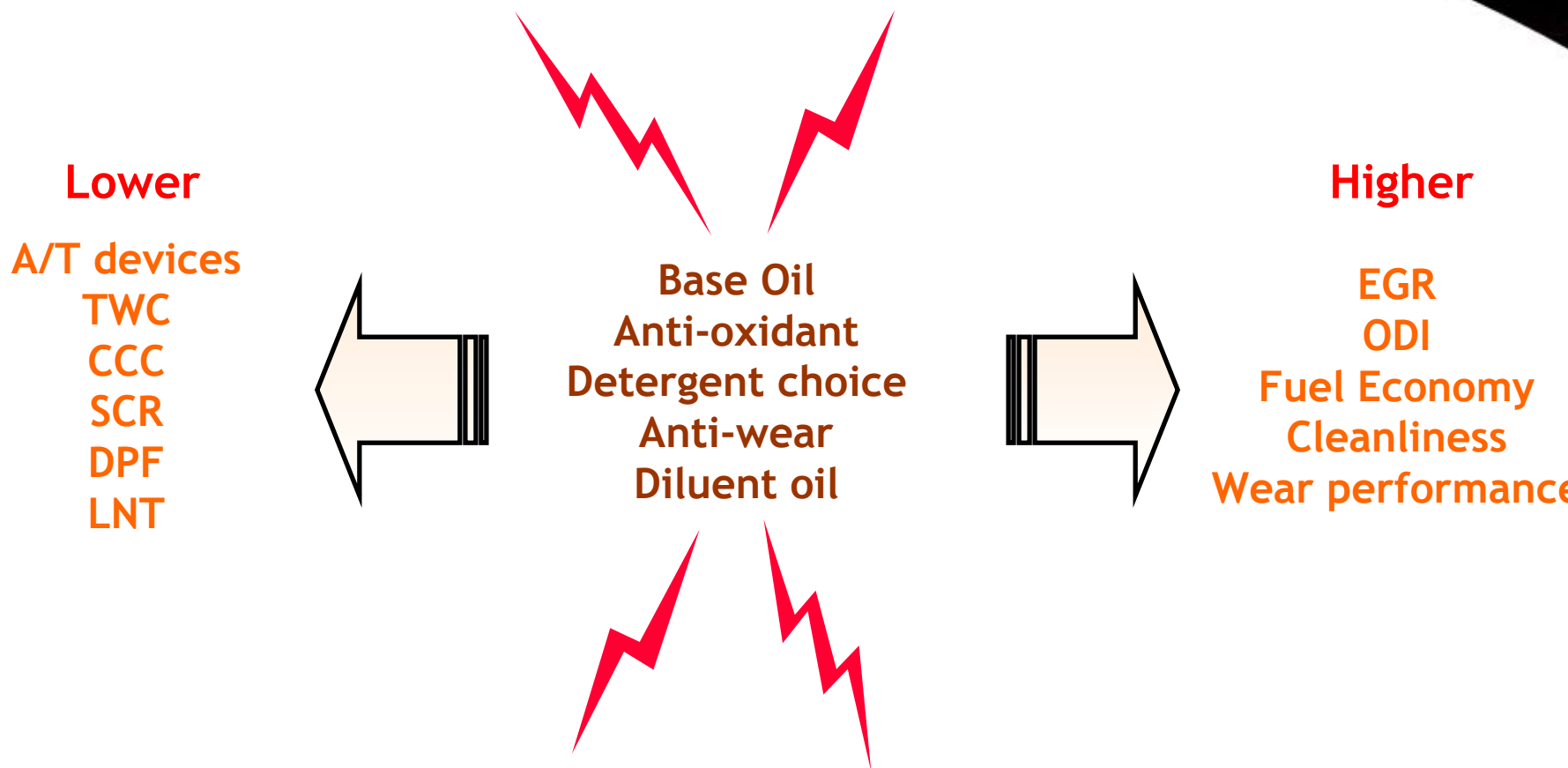


# SAPs : Sulphur, Ash, Phosphorus



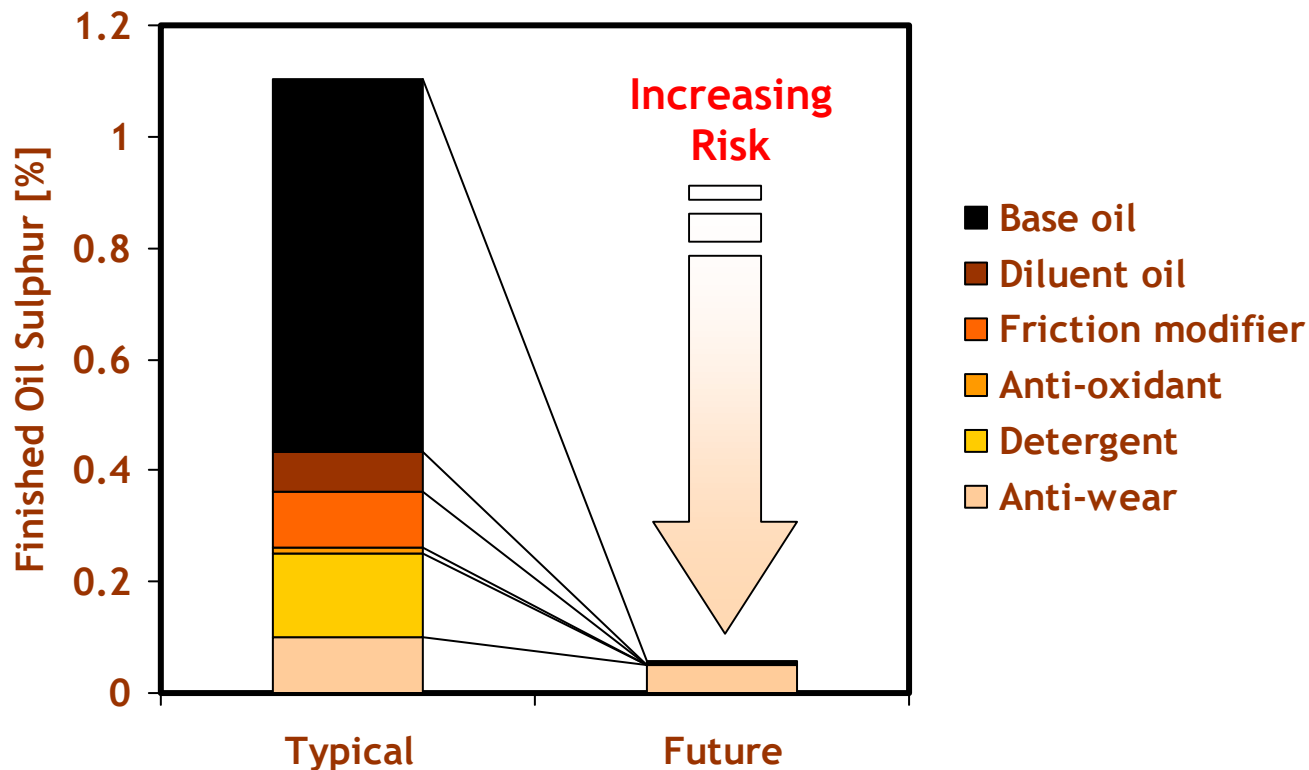
SAPs are added to enhance the performance of the lubricant

# Formulation Tensions



SAPs have been associated with decreased A/T system performance

# Typical SAPs Levels



Reducing SAPs constrains formulation options, presents a risk to engine integrity and may close out desirable additive and base oil options

# Aftertreatment Experiments

- Several public domain experiments have been completed and reported in the last 2-3 years

OPEST 1  
OPEST 2  
CRC  
DECSE  
Lubrizol  
ACEA HD



- None of these have been able to demonstrate a causal link between the lubricant and A/T system performance

# Linking Options and Evidence

Engine	Device	S	A	P	2005 %	2008 %
MPI	TWC	N	N	?	3.6	0
	TWC + CCC	N	N	?	50.4	40
DI	TWC	N	N	?	0.6	0
	TWC + CCC	N	N	?	4.2	5
GDI	LNT	<u>Y [rev]</u>	N	?	1.2	5
LDD	Oxicat	N	N	?	28	0
	DPF + oxicat + DPF	N	<u>Y</u>	N	8	15
	DPF + oxicat	N	<u>Y</u>	N	4	25
	DPF + LNT	<u>Y [rev]</u>	<u>Y</u>	N	0	10

[rev = reversible]

Percentages refer to NEW vehicles

# Conclusions

- Lubricants are now on the radar screen
- A wide range of aftertreatment options are emerging
- Each option has its own potential sensitivities to lubricant components
- Evidence linking deterioration in A/T system performance to lubricant composition is weak
- Need for change to lubricant formulation is not strongly justified
- There is a risk that engines will suffer a deterioration in wear and cleanliness performance

# Recommendations

- Constrain formulations only if the need has been demonstrated
- Use performance tests rather than chemical limits
- Apply these only to affected engine and aftertreatment types

Thanks for your attention  
Any Questions?