



ECT 2019



## Heavy Duty On-road and Non-road After-treatment

Engine Oils Requirement for  
BS VI On-road Vehicles  
&  
BS (CEV/TREM) IV Non-road Vehicles/ Equipment

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Gulf Oil International Group



- About Gulf Oil
  - Environmental regulations
    - Emissions
    - Fuel economy
  - Challenges in migration from BS IV to BS VI
  - Impact of new regulations on lubricants
  - Effect of operating conditions on lubricants
  - Opportunity to move to higher value lubricants
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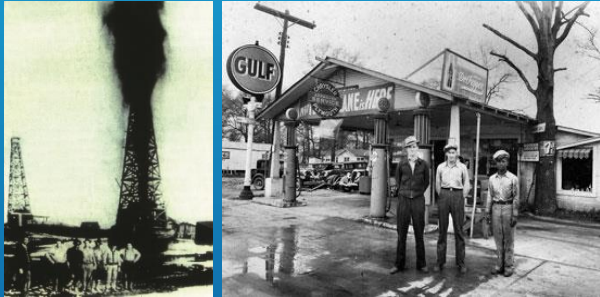


# Gulf Brand : Global Presence since 1901



## World's First

- High Volume oil well – 1901
- Off shore floating drill platform – 1910
- Drive through station – 1913



## The Orange Disc logo

- One of the most widely recognized oil company trademarks
- Integral part of communities & popular culture in many parts of the world



## Hinduja Group

- Acquired by Hinduja Group – post 1984 (Except USA, Spain & Portugal)
- Flagship company Gulf Oil International



## Business Operations

- Operations in more than 100 countries
- Blending Plants in 20 countries

LUBRICANTS

CAR CARE

MARINE

GULF AVIATION

FUEL RETAIL

GULF EXPRESS

Globally TOP 13 Lube

Company as per Kline

## Acquisitions

- Acquired in 2012 -Global Market Leader in Metal Working Fluids, Houghton International
- Merger of Houghton & Quaker Chemicals on 1st Aug 2019 – Gulf Oil 24.5% equity ownership



## Marine

- Gulf Oil Marine, established in 2008, is present in 900 ports across 80 countries



## Core Values

- Quality
- Endurance
- Passion



## Motorsport

- 1968 – First win at Le Mans in famous Blue & Orange
- Gulf is synonymous with racing





# Gulf Oil International : Global Footprint



## Worldwide Presence



## Leading Global OEM Approvals





## Emission Regulations

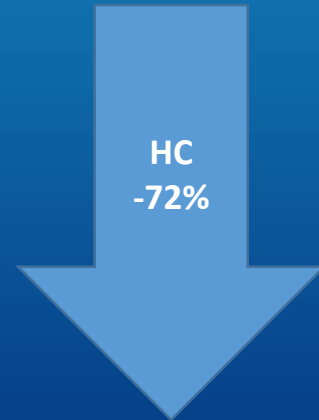
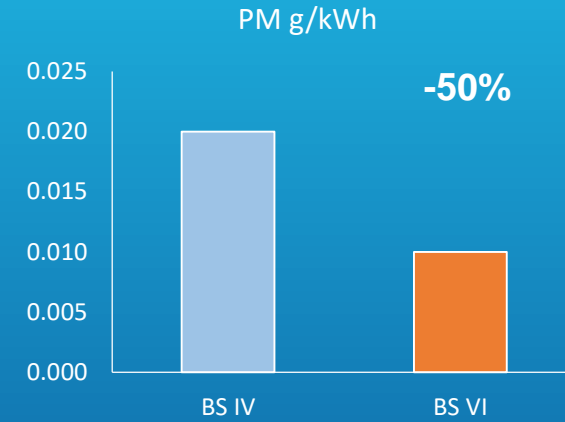
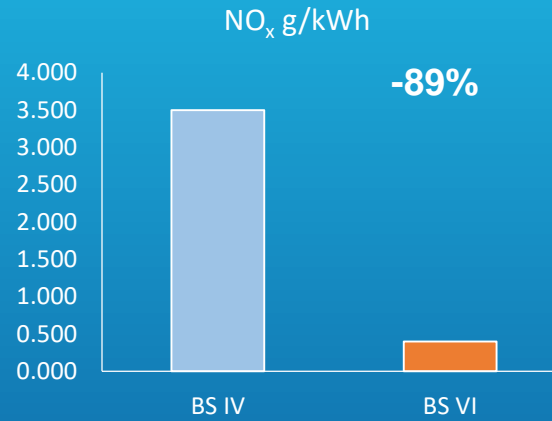
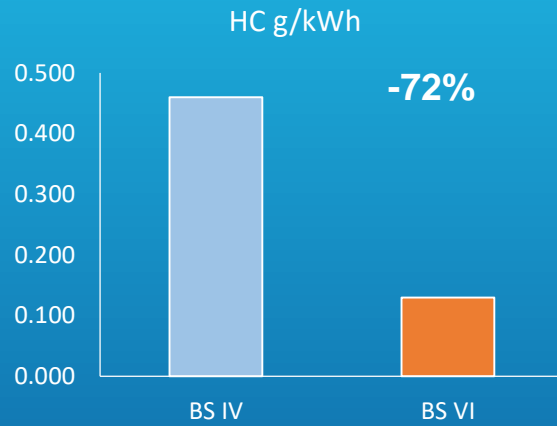
- ▶ BS IV implemented pan India from April 2017 for on-road vehicles
- ▶ Govt. of India decided to leapfrog from BS IV to BS VI emission norms from April 2020
  - Mandatory for all new Commercial vehicles (CV), passenger cars(PC) and 2 &3-wheelers
- ▶ Europe took 9 years to move from Euro IV to Euro VI
  - ▶ OEMs and Oil Companies in India got just 3 years to make it happen
- ▶ Common BS (CEV/ TREM) IV and V emission norms from Oct 2020 and April 2024 respectively for non-road vehicles/ equipment

## Fuel Economy Norms

- ▶ Norms came into existence for
  - ▶ PC in April 2017 and CV in April 2018
- ▶ More stringent norms would be applicable for
  - ▶ CV from April 2021 and PC from April 2022



# BS VI – Steep reduction in emissions (CV)



New requirement

Particulate Number  
 $8.0 \times 10^{11}$  /kWh



# Challenges in migrating from BS IV to BS VI



# Challenges in Migrating from BS IV to BS VI

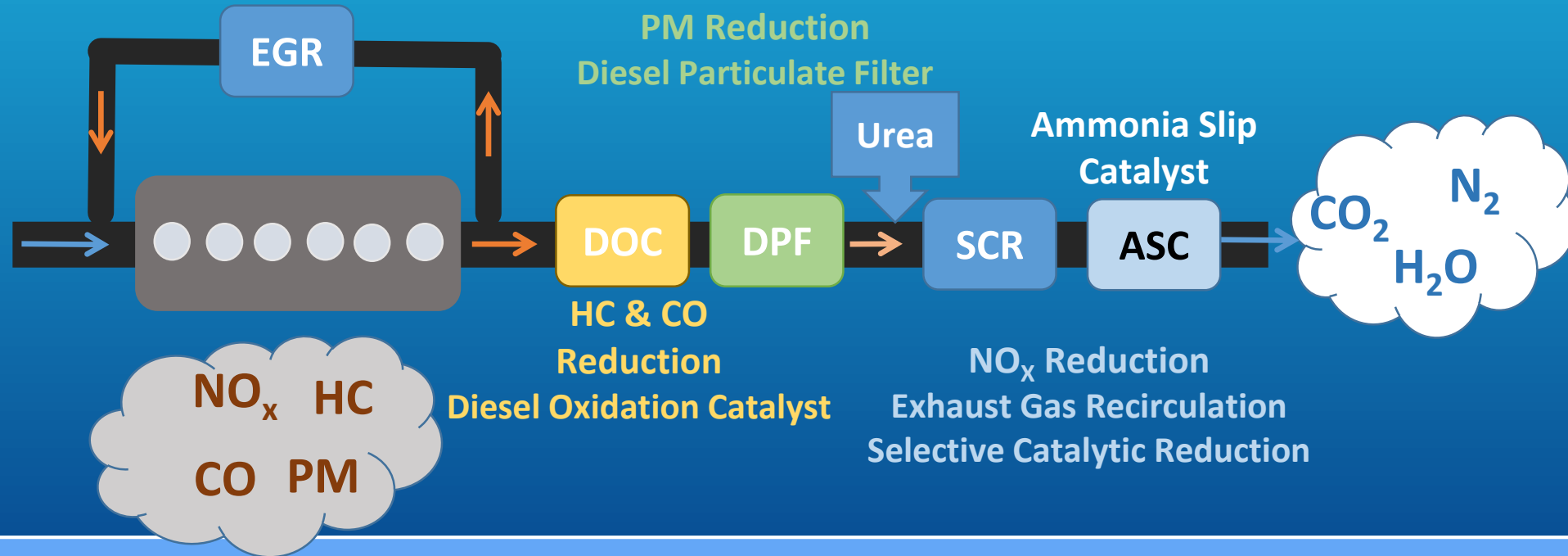


- ▶ Initially there was lot of apprehension in migration to BS VI
- ▶ It appeared auto industry will face major challenges
  - ▶ Product development and localization
  - ▶ Lot of import content and associated unaffordable costs
- ▶ Also felt migration to BS VI may lead to various issues
  - ▶ Deterioration in performance & drivability
  - ▶ NVH levels
  - ▶ Fuel economy penalty etc.
- ▶ Good news – Automobile industry passed through the uncertain phase
  - ▶ With India specific solutions as European technologies are sub-optimal in local geographic and driving conditions
  - ▶ Found cost effective solutions vs. European model
  - ▶ Indigenisation of most of the componentry
- ▶ Challenges still remain in respect of
  - ▶ Ability of suppliers to ramp up when entire industry volume moves to BS VI
  - ▶ Validation of different engine/vehicle platforms given the complexity



# Impact of new regulations on lubricants

**Engine-out exhaust gases need to be treated to meet BS VI emission norms**



- Engine oils have been shown to impact after-treatment devices
  - Phosphorous and sulphur from engine oil can reduce the conversion efficiency of catalysts used in the after-treatment systems;
  - Build-up of ash from engine oil can impair DPF performance
- Reduced SAPS engine oils required for BS VI



# Effect of operating conditions on lubricants

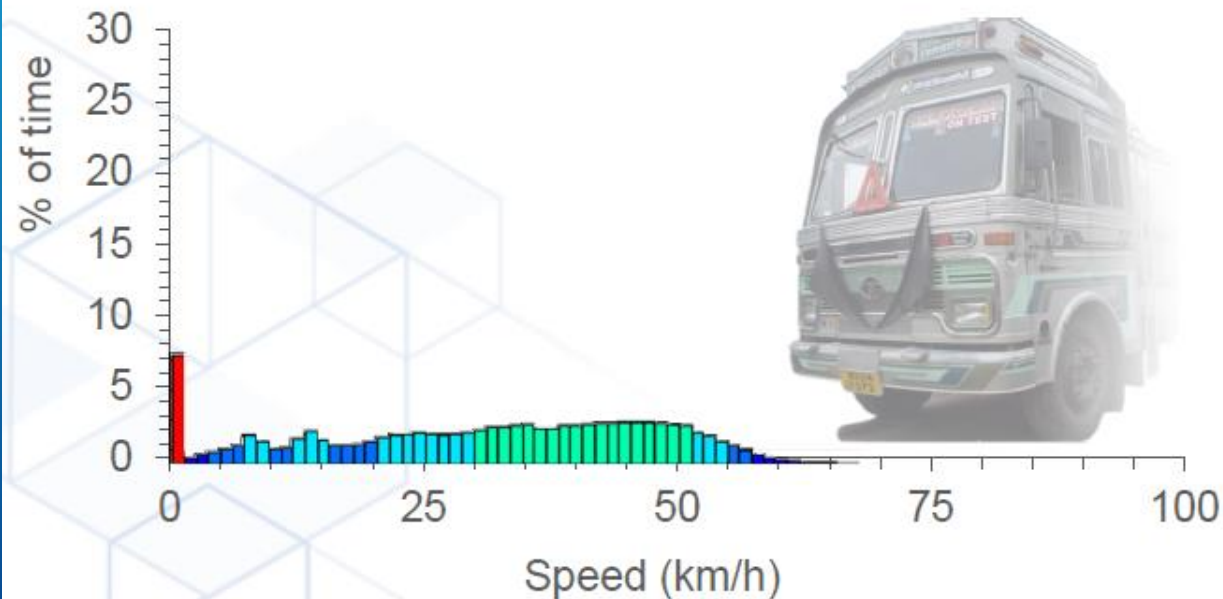


# Effect of operating conditions on lubricants



## Typical Indian truck duty cycle

Capacity 5.8 litres    Power 180 hp    Load up to 25t



## Typical European truck duty cycle

Capacity 13.0 litres    Power 440 hp    Load up to 44t

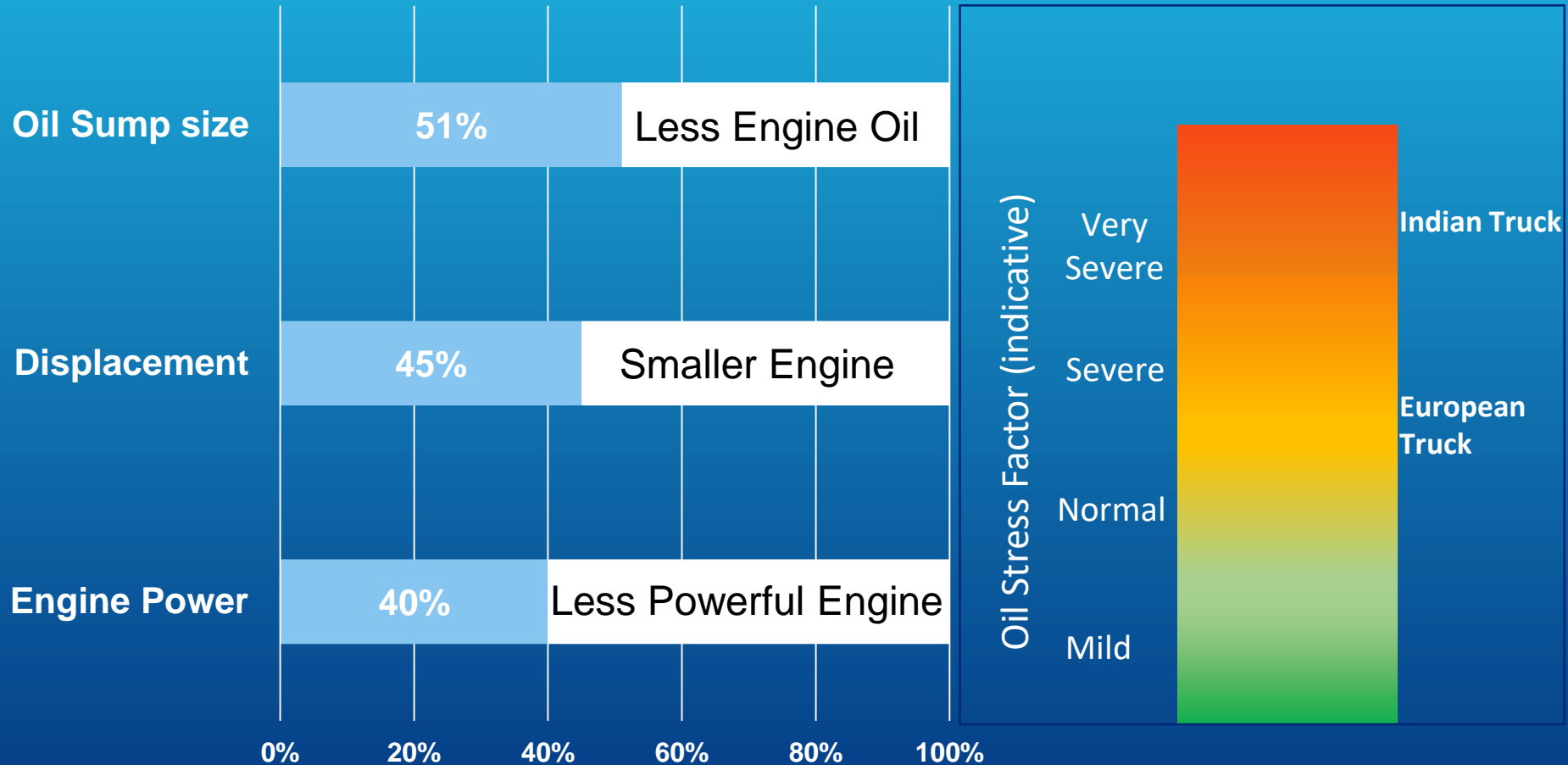


**Indian duty cycle puts more stress on lubricant**



# Impact of truck type and usage on the engine oil

## Comparison of typical Indian and European trucks



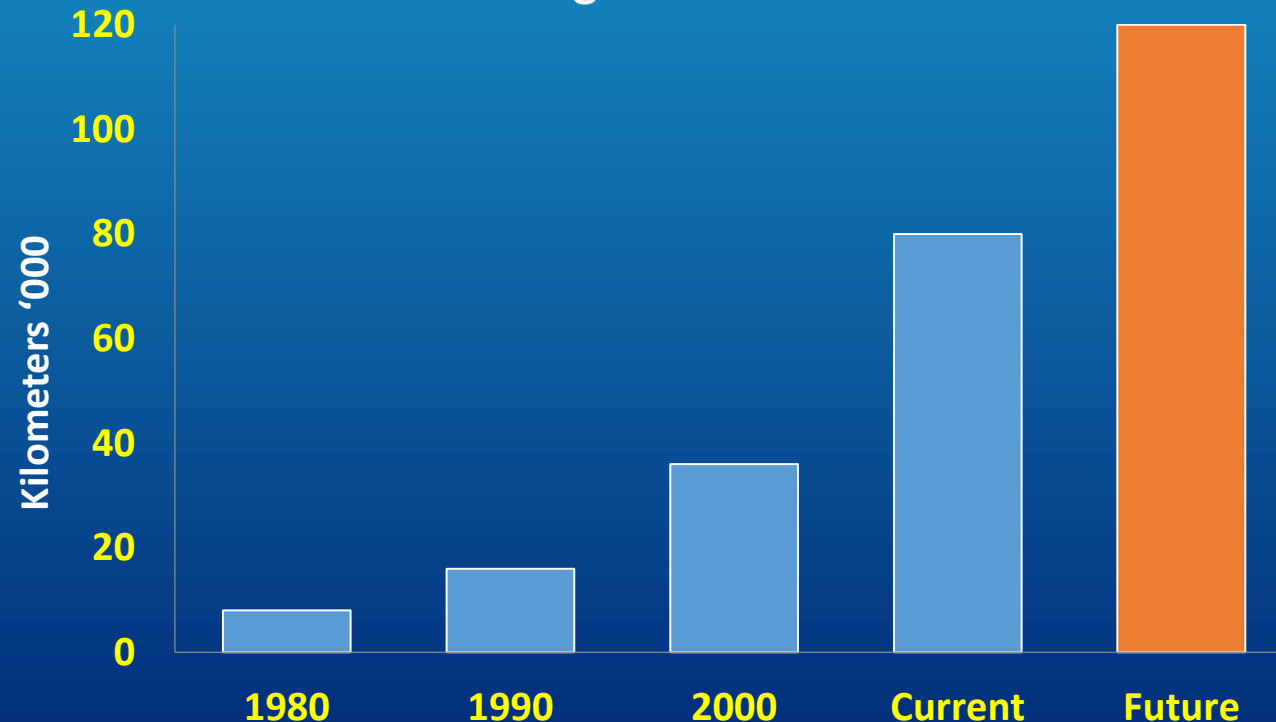
Engine oil is subjected to more stress in Indian trucks  
Hence validation in local operating conditions extremely important



# OEMs desire to extend oil drain-intervals



- ▶ CV Engine oil drain interval has seen substantial jump in the past
  - ▶ 5 times jump in last 15 years and 10 times in last 30 years
- ▶ Fleet operators want reduction in TCO
- ▶ OEMs are keen to move to longer drain intervals





- ▶ Mix of truck types and engine platforms being used in India
  - ▶ Indian OEMs
  - ▶ European OEMs
  - ▶ North American OEMs
- ▶ Duty cycles and operating conditions in India are severe
- ▶ None of the normal SAPS engine oils used in BS IV CVs are suitable for BS VI CVs
- ▶ BS VI CVs need controlled SAPS engine oils
  - ▶ European experience with Euro VI engine oils useful
  - ▶ But need to be optimised for local geographical and operating conditions
  - ▶ OEMs want to retain/extend the current drain intervals
- ▶ BS VI PVs and 2&3 Wheelers require SAPS optimised engine oils



Are the BS VI challenges provide opportunities to enhance value of lubricants?

- ▶ BS VI lubricant challenges also provide opportunity to enhance value
  - ▶ Gulf Oil has been the trend setter in India since 2006 in developing & marketing long-drain lubricants for CVs and Motorcycles
  - ▶ Gulf Oil is in the distinctive position to design bespoke engine oils for BS VI vehicles
    - ▶ Extensive field validation database in India with various global & local OEMs
    - ▶ Benefit of European experience on engine oils for Euro VI vehicles
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# Opportunity to move to higher value lubricants



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HDDEOs in Europe	Approvals and Specifications
<b>Gulf Superfleet Synth ULE 5W-30</b>	ACEA E6, E9, E7, <b>MAN M3677, M 3477, API CJ-4, MB-Approval 228.51, 228.31, DQC IV-10 LA, MTU Oil Cat 3.1, Volvo VDS-4, Mack EO-O PP, Renault VI RLD-3, Cummins CES 20081, DDC 93K218, JASO DH-2, CAT ECF-3</b>
<b>Gulf Supreme Duty ULE 15W-40&amp;10W-30</b>	ACEA E9, <b>API CK-4, Volvo VDS-4.5; Mack EOS-4.5; Renault VI RLD-4</b> , MB 228.31, CES 20086, DQC III-10-LA, DDC 93K222
<b>Gulf Superfleet ULE 10W-30 &amp; 10W-40</b>	ACEA E6, E9, <b>API CK-4, Volvo VDS-4.5/ Mack EOS-4.5/ Renault VI RLD-4, MB-Approval 228.51, MAN M 3271-1, M 3477, M 3677, 3775 (10W-30) and MAN M 3477 (10W-40)</b> , MTU Cat 3.1, CES 20081, Deutz DQC III-10LA & DQC-IV LA, CAT ECF 3, ECF 2 & ECF1a
<b>Gulf Superfleet Synth XLE 10W-40</b>	ACEA E6, E7, API CI-4, <b>MB-Approval 228.51, Volvo VDS-3; Renault VI RLD-2; Mack EO-N, MAN M 3477; MAN M 3271-1, MTU Oil Category 3.1, Deutz DQC III-10 LA</b>
<b>Gulf Superfleet Universal 5W-30</b>	ACEA E6/E9/E4/E7, API CJ-4, <b>Scania LDF-4, MB-Approval 228.51, Volvo VDS-4, Mack EO-O Premium Plus, Renault VI RLD-3, MAN M 3575/ M 3677/M 3477/ M 3271-1/ M 3691</b> , MTU Oil Category 3.1, Deutz DQC IV-10 LA



# Opportunity to move to higher value lubricants



- ▶ BS VI lubricant challenges also provide opportunity to enhance value
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  - ▶ Extensive field validation database in India with various global & local OEMs
  - ▶ Benefit of European experience on engine oils for Euro VI vehicles

PCMOs in Europe	Approvals and Specifications
Gulf Formula GVX 5W-30	ACEA C3, <b>Approved according to VW Standard 507 00 and 504 00, Porsche oil category C30, MB-Approval 229.51, BMW Longlife-04</b>
Gulf Formula LV 0W-20	ACEA C5, <b>MB-Approval 229.71</b> , Jaguar Land Rover STJLR.51.5122
Gulf Formula EFE 5W-20	ACEA C5, <b>Ford WSS-M2C948-B</b>
Gulf Formula EFE 0W-20	ACEA C5, <b>VCC RBS0-2AE</b>
Gulf Formula LEF 0W-30	ACEA C2, Ford WSS-M2C950-A, Fiat specification 9.55535.GS-1 & 9.55535.DS-1
Gulf Ultrasynth X Plus 0W-20, 5W-20, 5W-30, 10W-30,	<b>API SN Plus, API SN (Resource Conserving), ILSAC GF-5</b>



# Non-Road Emission norms and impact on engine oils



	Non-Road					On-Road	
	BS (TREM / CEV) IV		BS (TREM/CEV) V			BS IV	BS VI
P in kW	37 ≤ P < 56	56 ≤ P < 130 130 ≤ P < 560	37 ≤ P < 56	56 ≤ P < 130 130 ≤ P < 560	P ≥ 560		
CO (g/kWh)	5	5 (3.5)*	5	5 (3.5)*	3.5	1.5	1.5 (WHSC) 4.0 (WHTC)
HC (g/kWh)		0.19		0.19	0.19	0.46	0.16
NOx (g/kWh)		0.4		0.4	3.5	3.5	0.4
HC + NOx	4.7		4.7				
PM (g/kWh)	0.025	0.025	0.015	0.015	0.045	0.02 (ESC) 0.03 (ETC)	0.01
PN (no /kWh)	NR	NR	1x10 <sup>12</sup>	1x10 <sup>12</sup>	NR		0.8x10 <sup>12</sup>

- BS (TREM / CEV) IV Non-road vehicles/equipment in the category of 56 ≤ P < 560 kW require SCR due to stringent NOx requirement, which is in line with on-road BS VI vehicles
- BS (TREM / CEV) V Non-road vehicles/equipment in the category of 37 ≤ P < 560 kW require additionally DPF due to stringent PM/PN requirement, which are in line with on-road BS VI vehicles
- While normal SAPS engine oils will suffice the requirement for BS (TREM / CEV) IV, SAPS controlled oils are required for BS V

\* Applies to 130 ≤ P < 560 category  
NR = No Requirement

- ▶ Gulf Oil is ready with customised lubricant solutions for all segments of BS VI vehicles in various SAE grades (including FE grades)
  - ▶ Established the backward compatibility of BS VI engine oils in BS IV CVs
    - ▶ Potential for extension of current drain intervals
  - ▶ Validation in BS VI vehicles is in advanced stage and expect to retain/extend the current drain intervals
  - ▶ PV and 2 & 3-wheelers engine oils upgraded with optimised SAPS meeting latest Global and Indian OEM requirements
- Ready with lubricant & fluid solutions for all aggregates of BS VI vehicles
  - Opportunity for OEMs to extend service intervals





# AdBlue<sup>®</sup> (Diesel Exhaust Fluid - DEF)

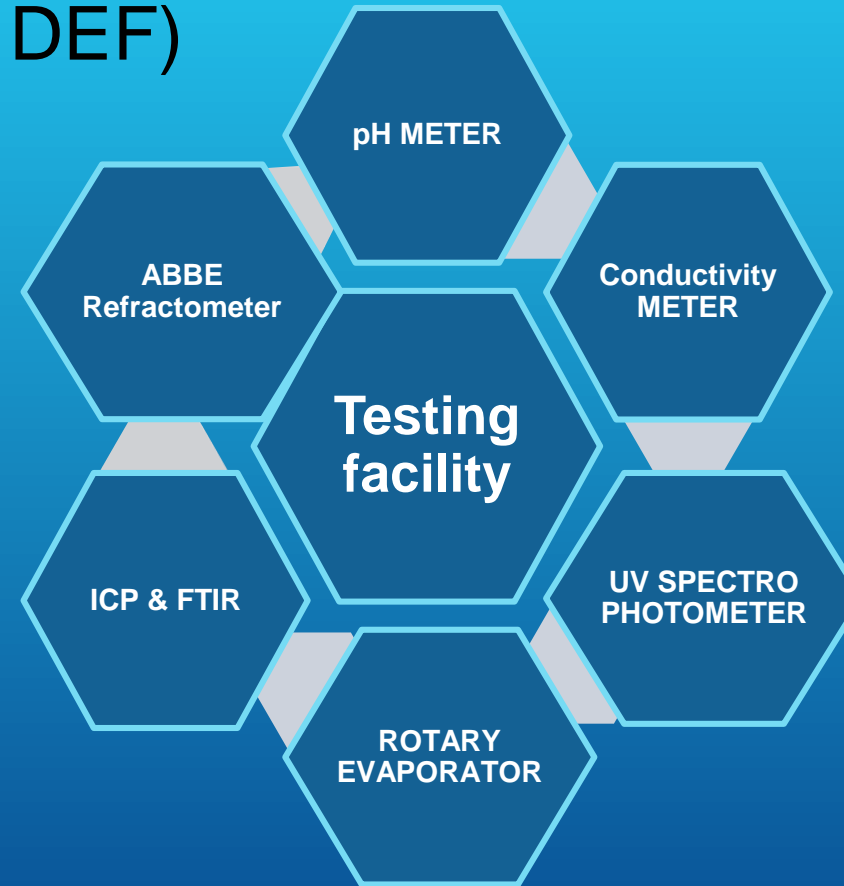


Among the First in the country to market AdBlue<sup>®</sup> in 2010

Manufacturing AdBlue<sup>®</sup> to the exacting standards of ISO 22241

Quality AdBlue<sup>®</sup> is critical for SCR performance and durability

Approved supplier to many OEMs



26L



10L



210L



26L



# Summary



- ▶ Govt. of India decided to leapfrog from BS IV to BS VI by closing the gap with developed world to improve air quality
- ▶ Indian auto and oil industry have overcome the initial apprehensions by optimising the Euro VI technology to local needs
- ▶ Indian duty cycle puts more severity on CV lubricants
- ▶ None of the existing normal SAPS engine oils are suitable for BS VI vehicles
- ▶ While European experience with Euro VI engine oils is useful, need to be customised for BS VI vehicles
- ▶ Indian lubricant industry capable of meeting challenges of lubricants for BS VI vehicles
- ▶ Stringent BS (CEV/ TREM) IV and V norms will come into effect from Oct '20 and Apr '24 respectively
  - ▶ Conventional SAPS engine oils will suffice BS (CEV/ TREM) IV
  - ▶ Controlled SAPS engine oils will be required for  $37 \leq P < 560$  kW category meeting BS (CEV/ TREM) V
- ▶ Gulf Oil has been setting the trend in India since 2006 for long drain oils for CV and MCO segments
  - ▶ Ready with customised lubricant and fluid solutions for BS VI CVs, PVs and 2&3-wheelers with backward compatibility
  - ▶ Potential for extension of service intervals by OEMs

# Thank you



Winning then..... Winning now ..... Winning in the future