



FLUID TECHNOLOGY FOR ELECTRIFICATION

LUBRICANT EXPO - SEPTEMBER 2022

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FLUID TECHNOLOGY FOR ELECTRIFICATION

1. The transition to hybrid and battery electric vehicles in Europe
2. Challenges for engine lubricants and thermal management fluids
3. Summary



THE EUROPEAN LIGHT-DUTY VEHICLE PARC

348 million Light-duty vehicles in operation across 34 European countries

Diesel + DPF

90 million

Diesel fuelled light-duty vehicles with a Diesel Particulate Filter (DPF)

Hybrid Vehicle

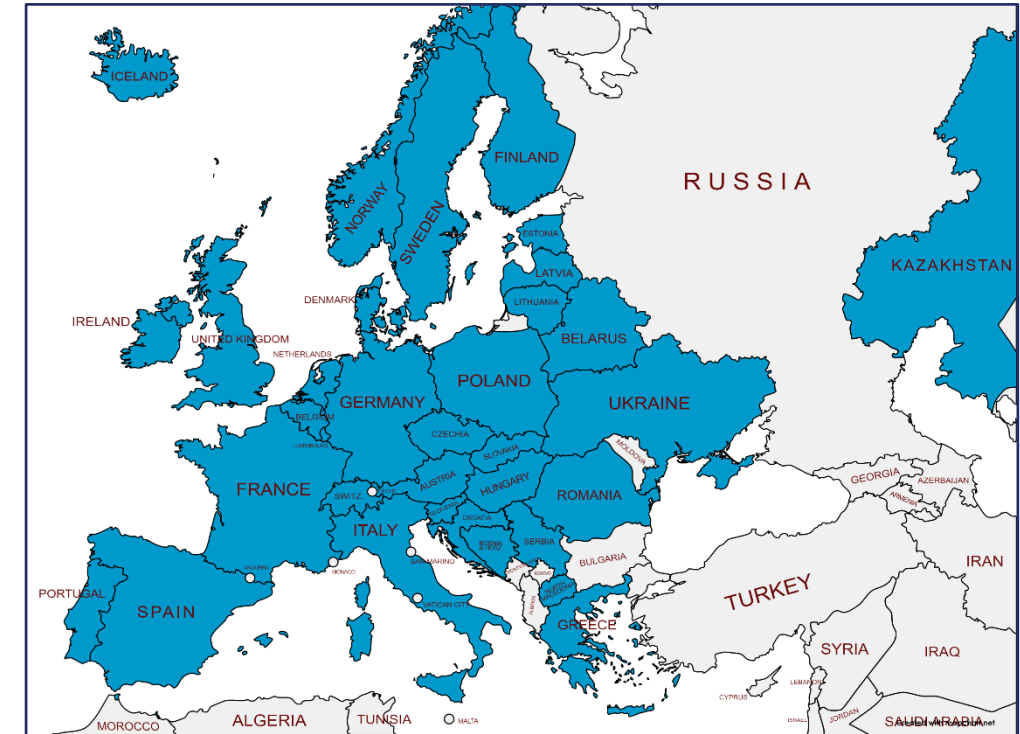
6.5 million

Light-duty mild (MHEV) and plug-in (PHEV) hybrid electric vehicles

Electric Vehicle

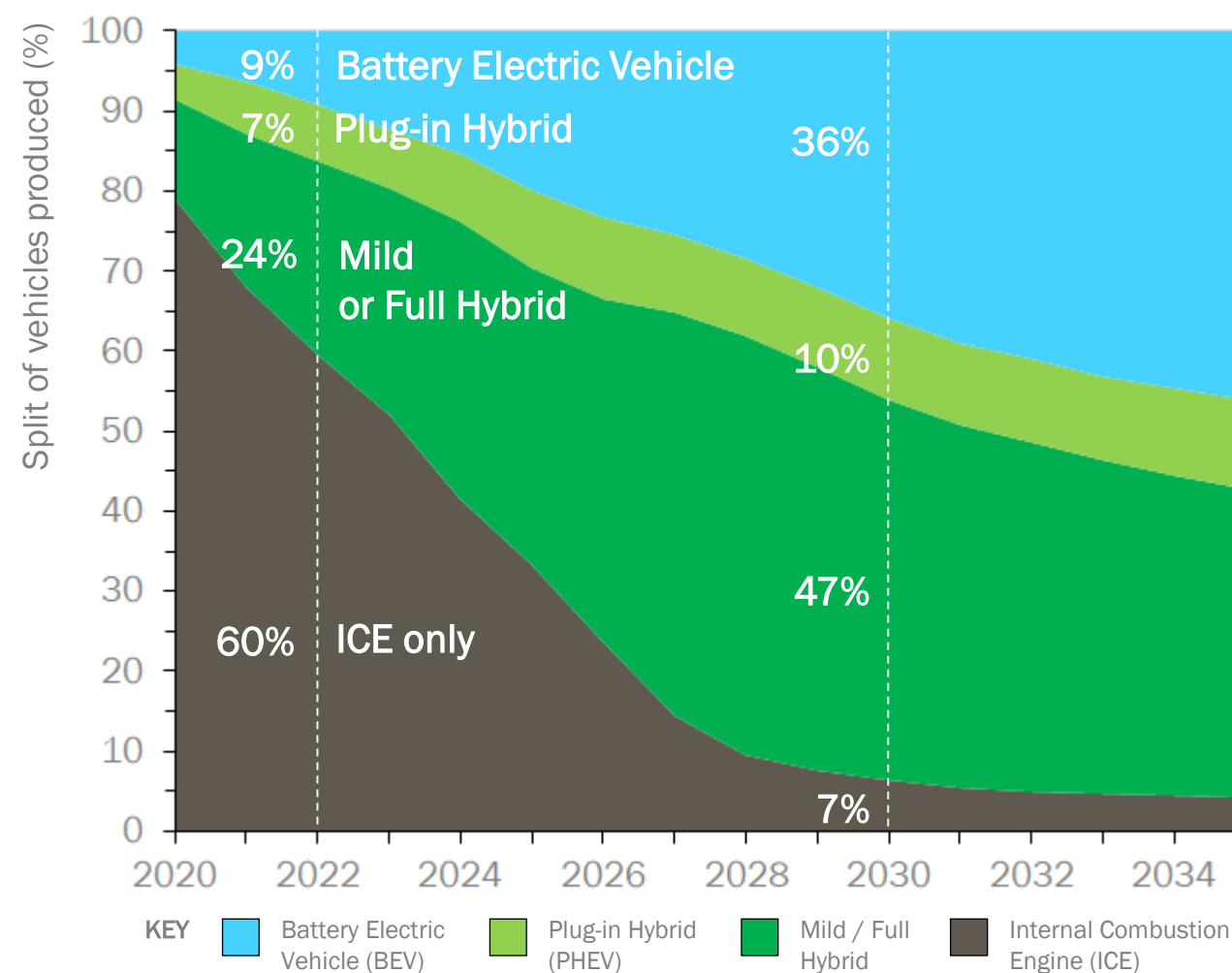
2.8 million

Battery electric vehicles (BEV)



- Two thirds of vehicles in operation were designed to meet Euro 4 or later emission standards
- Over a quarter of all vehicles in use are fitted with a DPF aftertreatment system
- The transition to electrified powertrains with hybrid and battery electric vehicles is underway

THE TRANSITION TO HYBRID AND BEV



- **Vehicle production is shifting from ICE only to Hybrid & BEVs**
- Hybrid vehicle production is forecast to nearly double by 2030
- Battery electric vehicle production is forecast to quadruple by 2030
- By 2030 over 90% of vehicles produced are forecast to be hybrid or BEV
- All new vehicles sold today can be expected to be in the market for the next 12 years

CHALLENGING DUTY CYCLES FOR HYBRIDS



No progressive warm up,
engine does not always run
at an optimum temperature

FORMULATING CONSIDERATIONS

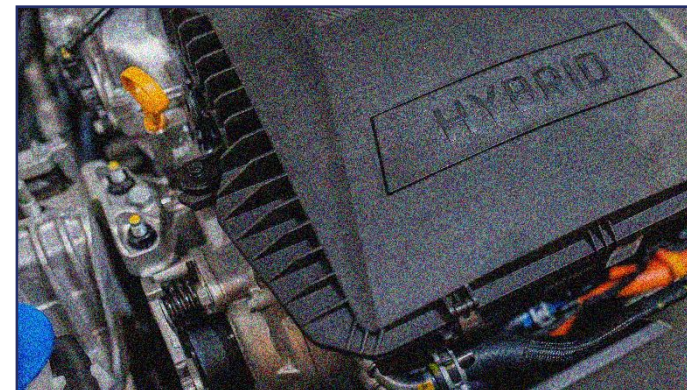
Wear protection
Activation temperatures
Flow at low temperatures



Vehicle cycles between battery
and engine usage, switching to
engine operation at high speed

FORMULATING CONSIDERATIONS

Wear protection
Corrosion inhibition
Emulsion formation protection

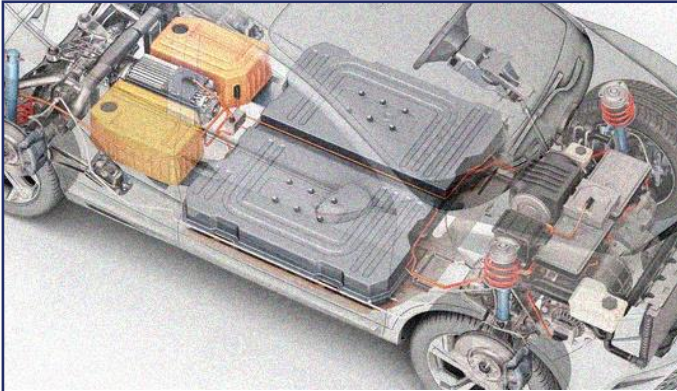


Once running, the small, high
power density, engine operates
at high temperatures and loads

FORMULATING CONSIDERATIONS

Oxidation resistance
Wear protection
Deposit and sludge formation

MANAGING HEAT AND POWER IN BEVS



Multiple cooling systems for the battery, electric motor, interior, electronics (and ICE in a PHEV)

FORMULATING CONSIDERATIONS

Thermal management

Corrosion protection

Pumpability & freeze protection



Rapid charging generates high levels of heat, preconditioning required for optimum charging

FORMULATING CONSIDERATIONS

Thermal management

Corrosion protection

Materials compatibility



Multi-stage transmissions and electric motors to manage power delivery and efficiency

FORMULATING CONSIDERATIONS

Corrosion protection

Churning loss reduction

Low conductivity

SUMMARY

- The transition to hybrid and battery electric vehicles is already underway
- These bring many new challenges for engine lubricant and heat transfer fluid technology
- There will still be many combustion engines in use which we need to keep running efficiently and reliably





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