ENERGY TRANSITION IN HEAVY VEHICLE SECTOR

- USE OF RUBBER MATERIALS

Elastomers in Energy Transition

28th March 2025
London

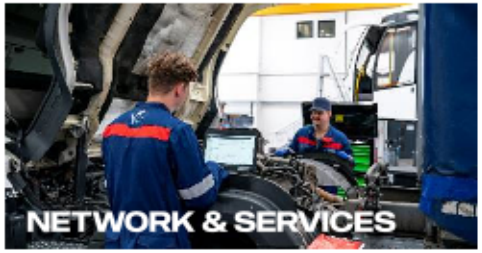
MARTIN BELLANDER

SCANIA


• Introduction
• Energy transition, drivers and where are we today?
• Electric Vehicles – how it works
• Rubber in Electric vs ICE Vehicles
• Some EV examples
• Summary and concluding remarks

INTRODUCTION

SCANIA IN BRIEF



NET SALES **216,129** SEK M.	**59,000** EMPLOYEES
100+ COUNTRIES	R&D SPEND **11,654** SEK M.
1,500 SERVICE POINTS	LAST RED FIGURES **1934**
FOUNDED **1891**	

THE WORLD OF SCANIA

ABOUT THE TRATON GROUP

"Transforming Transportation Together.
For a sustainable world."

SCANIA

MAN

INTERNATIONAL

Truck
Bus

SCANIA'S SCIENCE BASED TARGETS

CURRENT STATUS AND NEXT STEPS

1.5 °C

SCOPE 1 & 2

50%

CO_2 reduction from our **operations** by 2025 (2015)

Tonnes CO_2e

CURRENT STATUS

- 42 % reduction compared to 2015
- In 2024 our key focus areas will include continuing to incorporate renewables (particularly green electricity) in both our industrial operations and commercial facilities. We will also continue to install heat pumps at our facilities and continue our transition to electric vehicles for our company transport needs.

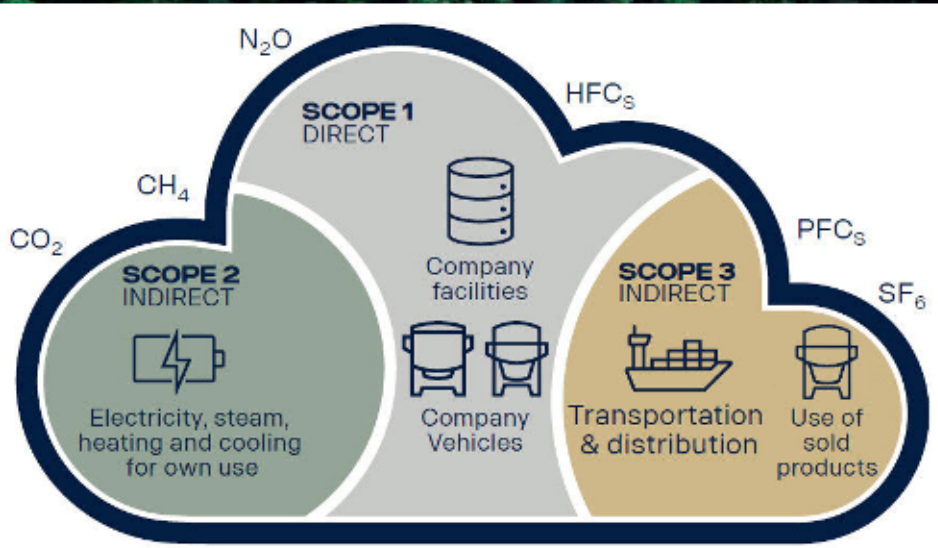
SCOPE 3

20%

CO_2 reduction from our **products** by 2025 (2015)

CO_2e/km WTW

- 3 % reduction compared to 2015
- The target is measured against 2022 sales, and as a result does not yet reflect the full impact of initiatives such as our Super drivetrain. We expect a significant improvement in our 2024 reporting, when the target will include 2023 sales.
  In 2024, our Scope 3 reduction efforts will focus on areas such as driver efficiency, optimising vehicle specifications, promoting renewable fuels and expanding electrified solutions



ENERGY TRANSITION, DRIVERS AND WHERE ARE WE TODAY?

POSSIBLE CO_2 REDUCTION HERE AND NOW

CBG[1]
80%
(50-90%)

LBG[1]
70%
(50-90%)

HVO[1]
83%
(50-90%)

BEV[2]
55%
(53-99%)

Biodiesel/FAME[3]
60%
(50-80%)

ED95[4]
80%
(75-85%)

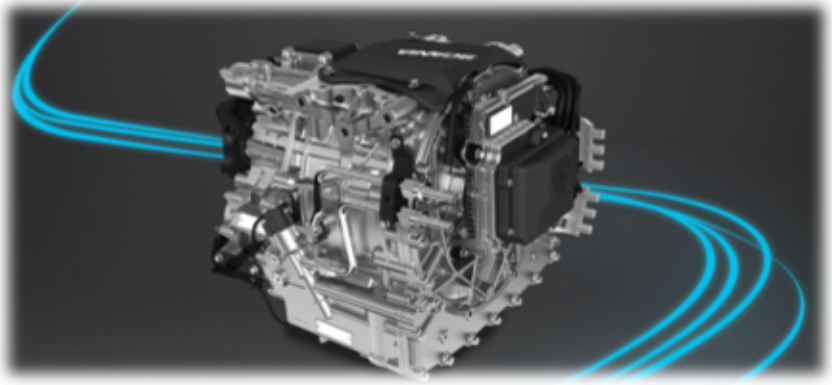
Typical Well-to-wheel CO_2e reduction

1. From Waste-based feedstock
2. From Current EU electricity mix
3. With most common usage
4. Average from ED95 suppliers

Road transports
- Driving forces for Energy Transition

- Climate - CO_2 reduction
- ETS2 – including transport sector. 2027
  - Emissions Trading System for Buildings, Road Transport and additional Sectors
- Emission regulations, Euro 7 (EU 2024/1257)
  - Lower air pollutant emissions from exhaust fumes and brakes.
  - Tyre wear particles
  - Stricter lifetime requirements.

Safety regulations (EU 2019/2144)



Energy transition

Much more than just electric propulsion:

Safety - In vehicle information

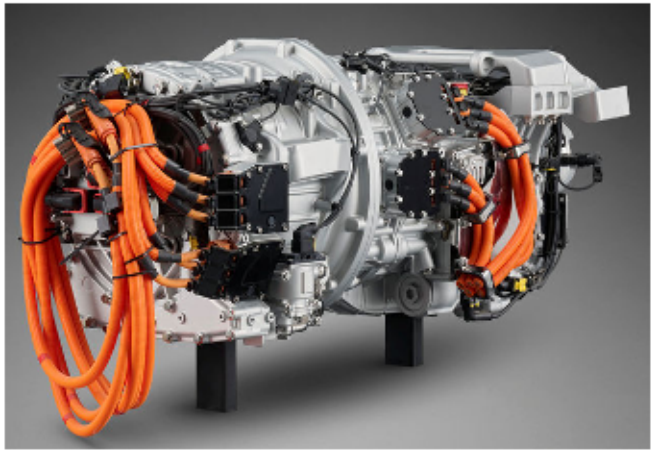
Mandatory from July 2024:

1. Emergency stop signal
2. Tyre pressure monitoring system
3. Blind spot information system
4. Reversing information system
5. Moving off information system
6. Alcohol Interlock Facilitation Installation
7. Driver drowsiness and inattention warning
8. Intelligent speed assistance

Connectivity

- Communication system
- Real time data of fleets
  - Fuel consumption
  - Vehicle uptime
  - Vehicle performance
  - Driving time and planning
  - Service planning
  - Geofencing/speed limiting
  - Real-time positioning
  - Charging infrastructure

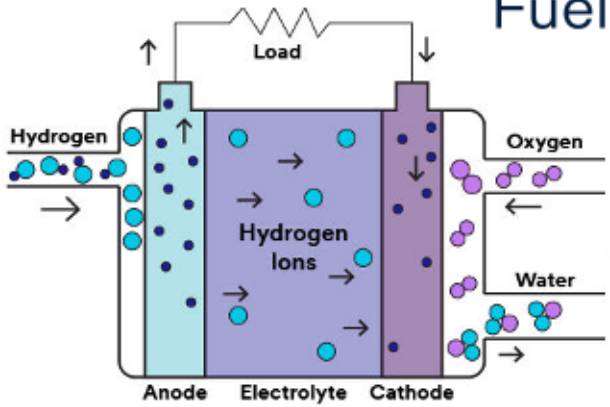
Electric Propulsion

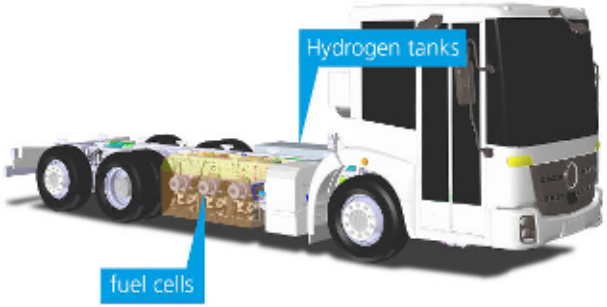


Battery Electric

Electrified Roads

Fuel Cell Electric





Hydrogen Combustion Engines

https://www.avl.com/en/expert-article/commercial-hydrogen-engine-50-bte

Press release

Volvo to launch hydrogen-powered trucks

2024-05-23

Volvo Trucks is developing trucks with combustion engines that run on hydrogen. On-road tests with trucks using hydrogen in combustion engines will begin in 2026, and the commercial launch is planned towards the end of this decade. Trucks that run on green hydrogen provide a significant step for Volvo to achieve its net zero goal and support customers to reach their decarbonization targets.

23rd May 2024

https://www.volvotrucks.vn/en-vn/news/press-releases/2024/may/Volvo-to-launch-hydrogen-powered-trucks.html

Hydrogen production globally

- 2023 97 Mton actual
  - <1% “Green”, low emissions
- 2030 49 Mton possible

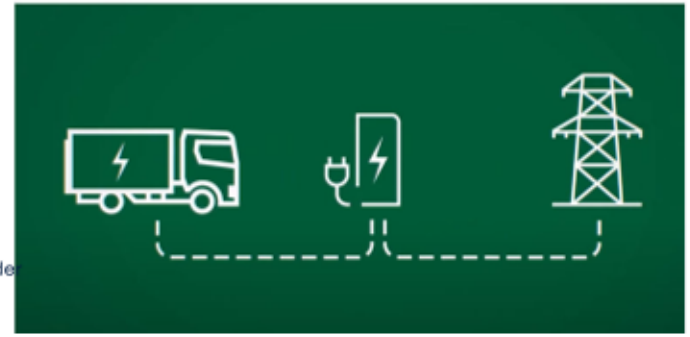
* IEA Global Hydrogen Review 2024

Cummins H2-ICE concept truck - Cummins

https://www.cummins.com/news/releases/2022/09/13/cummins-reveal-zero-carbon-h2-ice-concept-truck-iaa-expo-powered-b67h

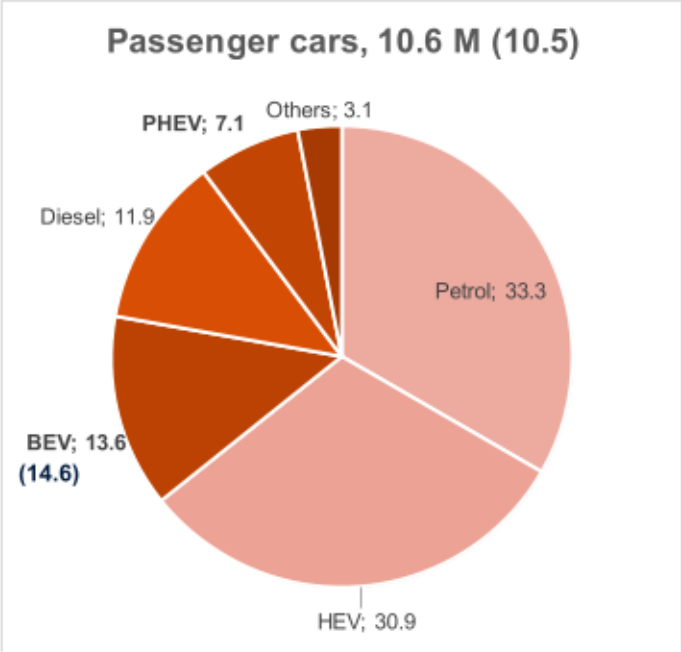
Charging systems

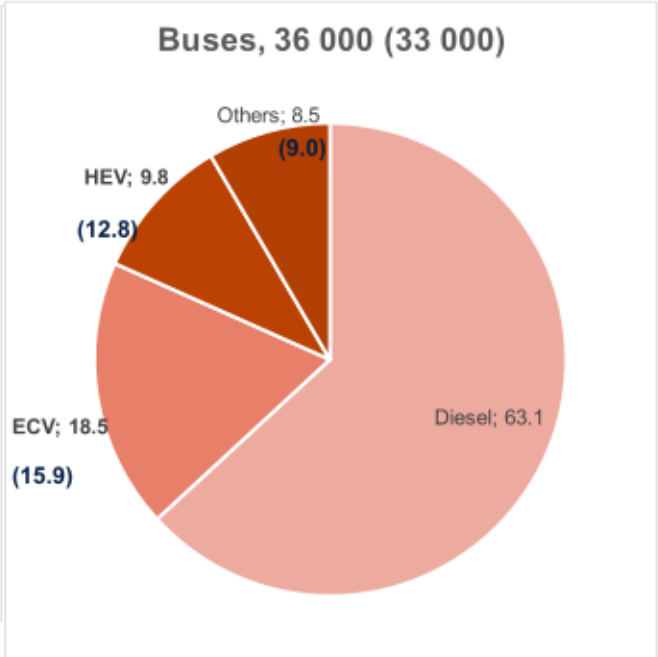
- How will it work???
  700 kWh in 45 min => 1 MW
- Smart Charging, turn-key solutions
  - Secure uptime by scheduling charging
  - Secure peak energy capacity to optimize usage
  - Charge when prices are low to reduce costs
  - Share data with other systems
  - Optimise energy consumption

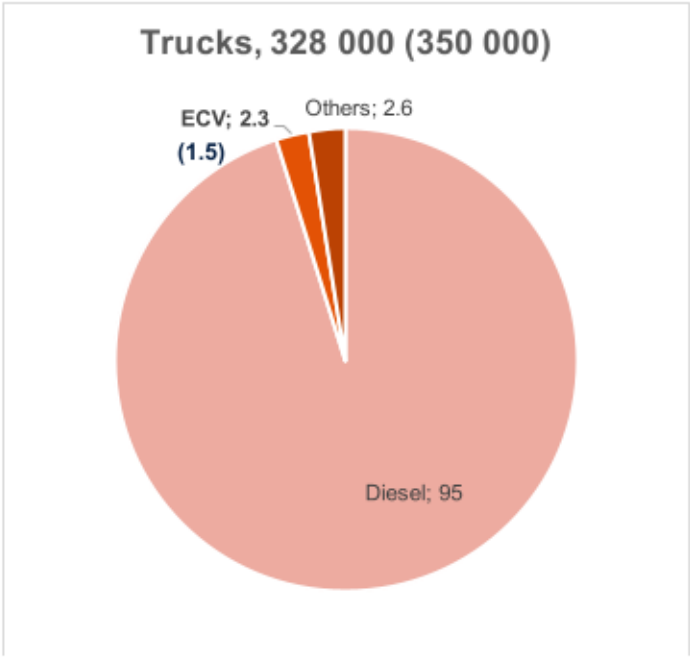


Electrification today, EU 2024

New registered vehicles





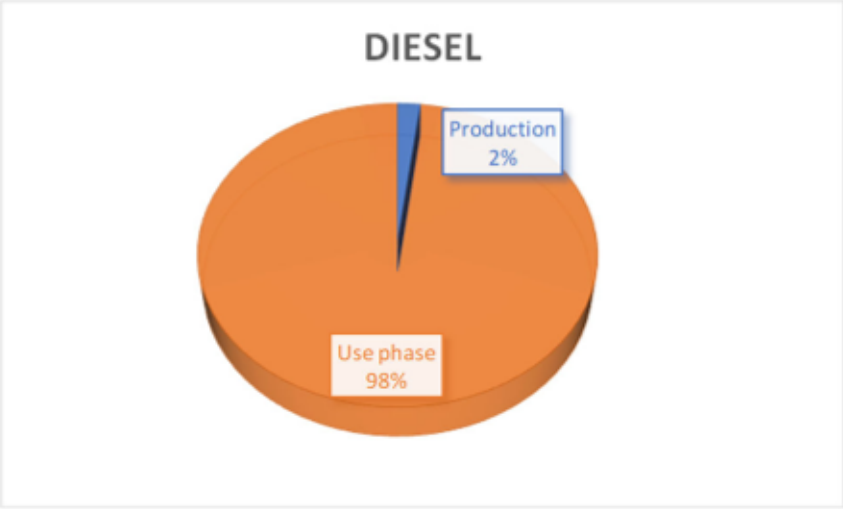


Source: www.acea.auto

CO_2 from Trucks, use phase vs production

CO_2 emissions from: (ton CO_2e)	Diesel Truck	BEV Truck
Use phase, full lifetime	1 200	60 *
Production	25	52

* Average European energy mix



Typical figures

ELECTRIC VEHICLES – HOW IT WORKS

Electric vs ICE*

- Electric machine, incl. gearbox
- Battery pack +cables
- Power inverter/converter

- Combustion engine + gearbox
- Fuel tanks + fuel lines

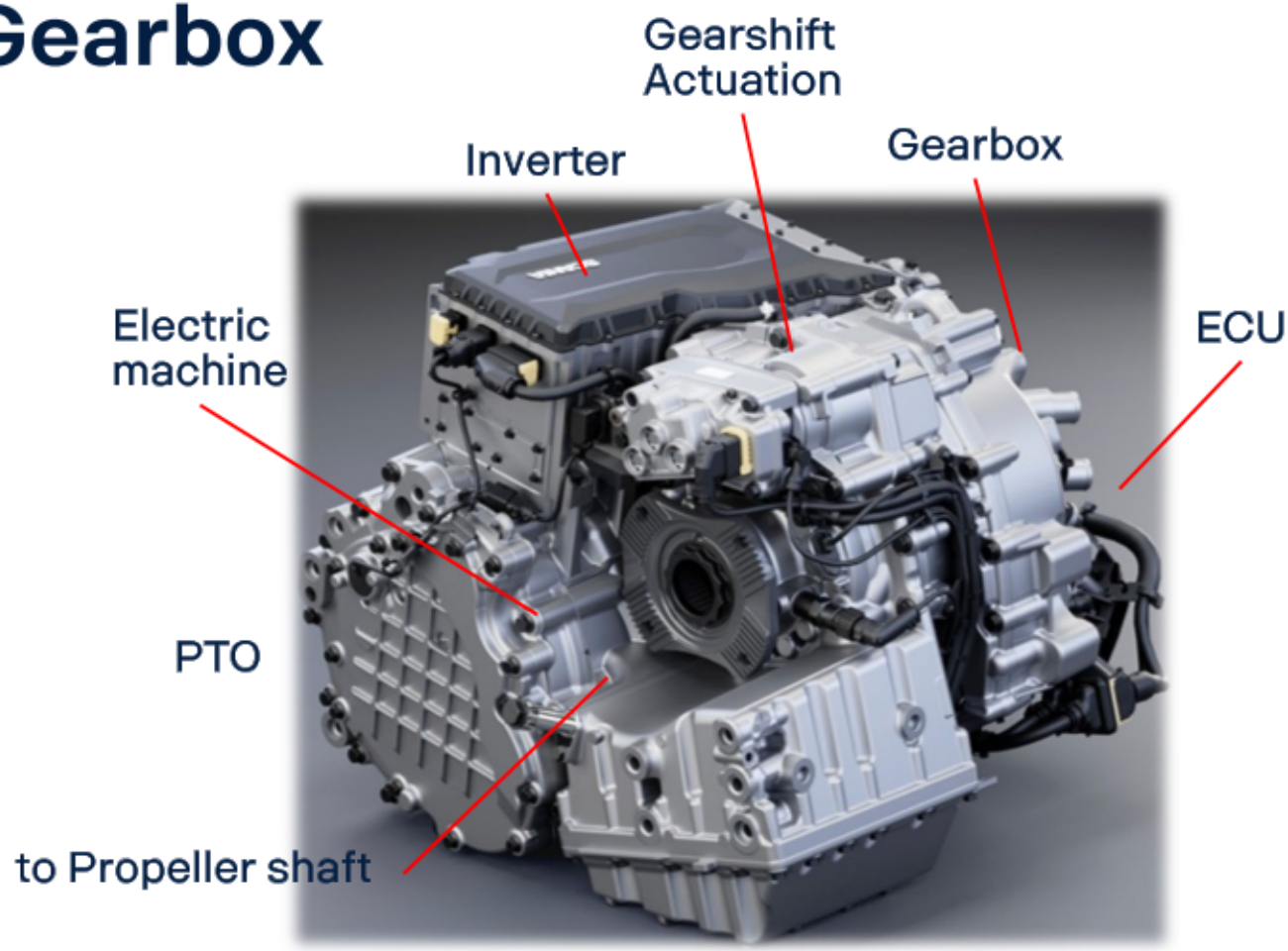
*ICE – Internal Combustion Engine

Under/behind the cab

- Battery pack
- Electric machine + gearbox
- Power inverter/converter
- Management and control

Electric machine/Gearbox

- 270/300/330/360/400 kW (360/410/440/490/540 hp)
- PTO* 30, 60 och 260 kW
- AC, synchronous
- Permanent magnets rotor
- Oil cooled



* PTO – Power Take off

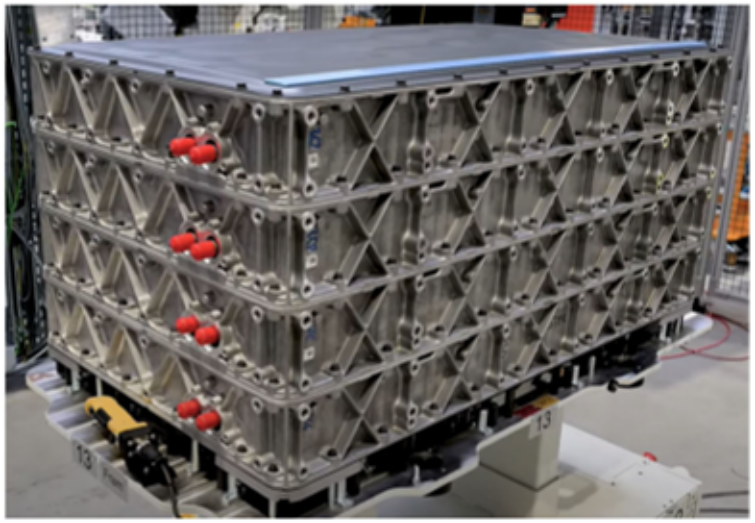
Battery pack

- Cell => Module => Pack
- Busbars, cooling system, compression pads, gap fillers, cooling plates
- **Capacity**
  - 416 kWh/624 kWh (3-4 ton)
  - 75/83% SoC-window
    - 520 km range at 29 t GTW
    - 440 km range at 40 t GTW
    - 320 km range at 64 t GTW
- **Charging**, CCS2
  375 kW/500 A DC
  85 min at 375 kW

Battery cells

Battery module

Battery pack



ICE vs Electric vehicle

– Combustion engine	=> Electric machine (or e-axles)
– Fuel lines	=> VCB cables*
– Fuel tanks	=> Battery pack
– Filler hose/cap/pickup	=> Charging device
	=> Inverter/Power electronics

HIGH Temperature

LOW Temperature

*VCB – Voltage Class B:
DC: 60 V -1500 V
AC: 30 V – 1000 V

Similarities:

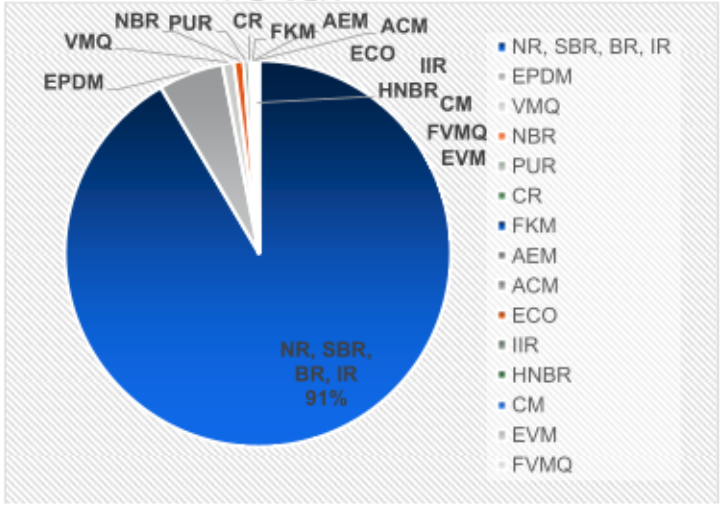
- Gearbox/oil
- Power take off (PTO)
- Propeller shaft
- Axle gear (still)
- Wheels
- Chassis
- Cab
- Cooling system, glycol based
- Steering (hydraulic =>electric)
- Compressed air
- ECU:s (electronic control units)
- Auxillary systems, low voltage

RUBBER
- ELECTRIC VS ICE VEHICLES

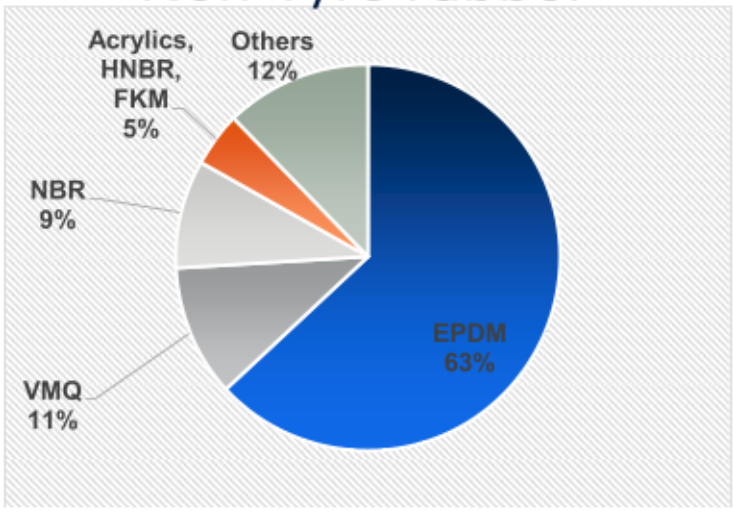
Rubber in an ICE* truck, an example

- 3 axles (=>8 tyres)
- 9 500 kg truck weight
- ~560 kg rubber (polymer weight) in total

Total



Non-Tyre rubber

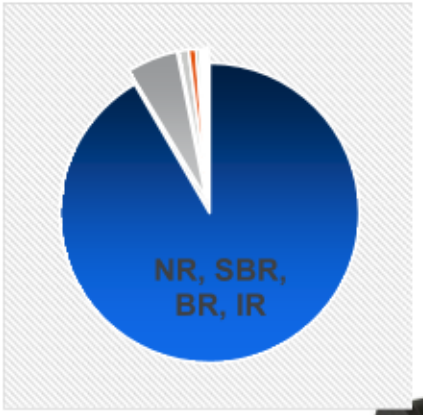


*ICE – Internal Combustion Engine

Natural and SBR rubber

EV
ICE

- Tyres
- Engine mounts
- Propulsion Battery dampers
- Dampers
- Anti-rollbar bush
- Floor mats
- Air bellows

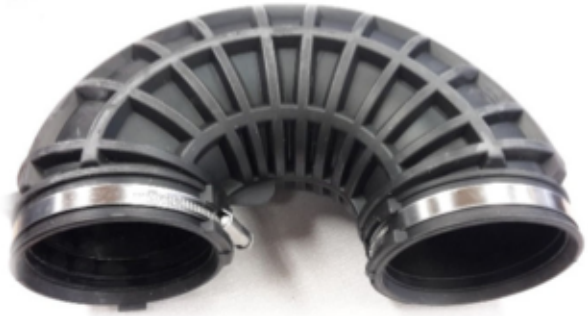


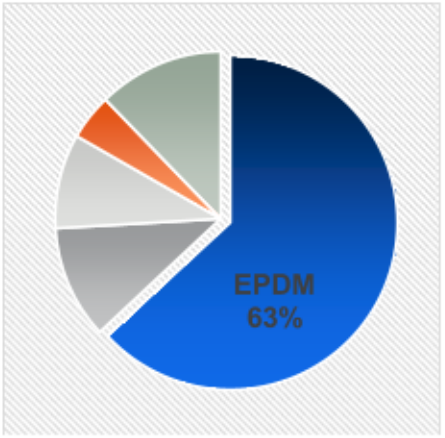
EV

ICE

EPDM

- Air hoses, ducts
- Coolant hoses
- Seals/gaskets
- Door seals
- Sealing strips
- Isolators



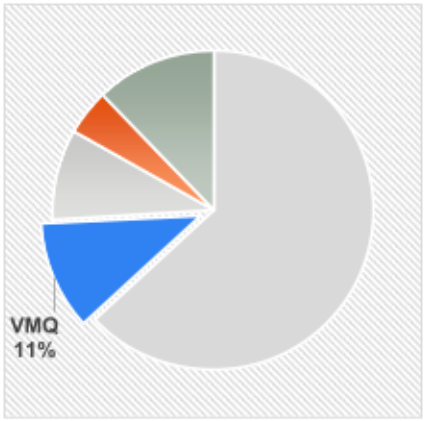


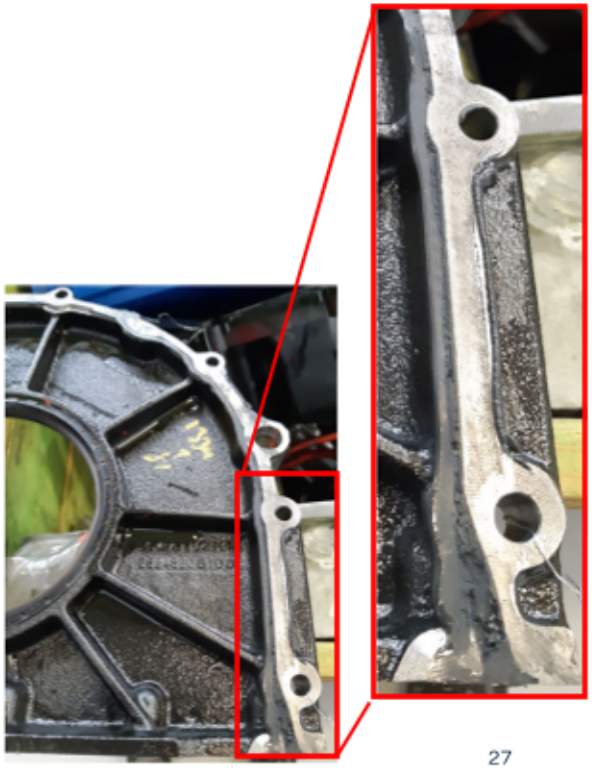
Increased use of TPE in e.g.
coolant lines and exterior seals

Silicone

EV
ICE

- Battery frame gaskets
- Gap filler, gels, potting
- Cable grommets, sensors
- Cable isolation, outer
- Fuel hoses, outer layer
- RTV sealants, flange sealing
- Charge air (CAC) hoses
- Air hoses
  - Charge air (CAC)
  - Compressor
  - Diff pressure
  - Waste gate and dump valve
- AdBlue dosing hoses
- Coolant hoses



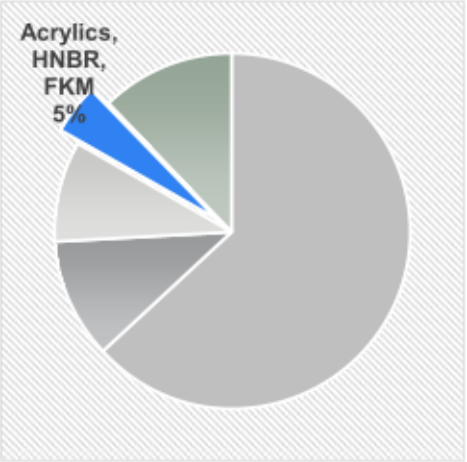


Oil and Fuel Resistant

EV

ICE

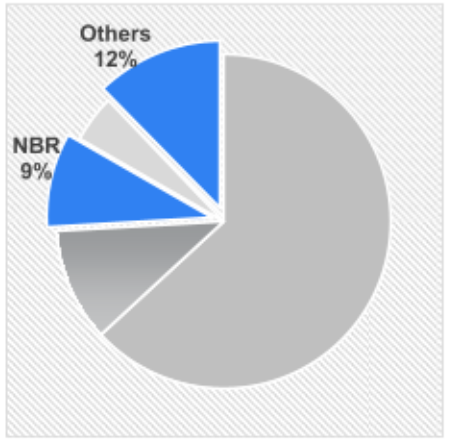
- ACM
  - oil seals/gaskets,
  - air hoses
- AEM
  - oil seals/gaskets
  - piston seals
  - hoses (brake, oil, air)
- HNBR
  - oil gaskets
- FKM
  - fuel, coolant gaskets
  - fuel hose layers
  - rotary shaft seals



*ICE – Internal Combustion Engine

NBR + Others

- NBR
  - seals, hydraulic hoses (steering)
- IIR
  - tyre liners
- CR
  - hose layers
  - dampers/isolators
  - membranes
  - air bellows
- ECO
  - hose layers
- CM/CSM
  - hose layers (steering hydraulic)
  - cable insulation
- PUR
  - floor mats
  - bushings
  - seats
  - cable insulation
  - bellows



SOME EV EXAMPLES

Coolant hoses

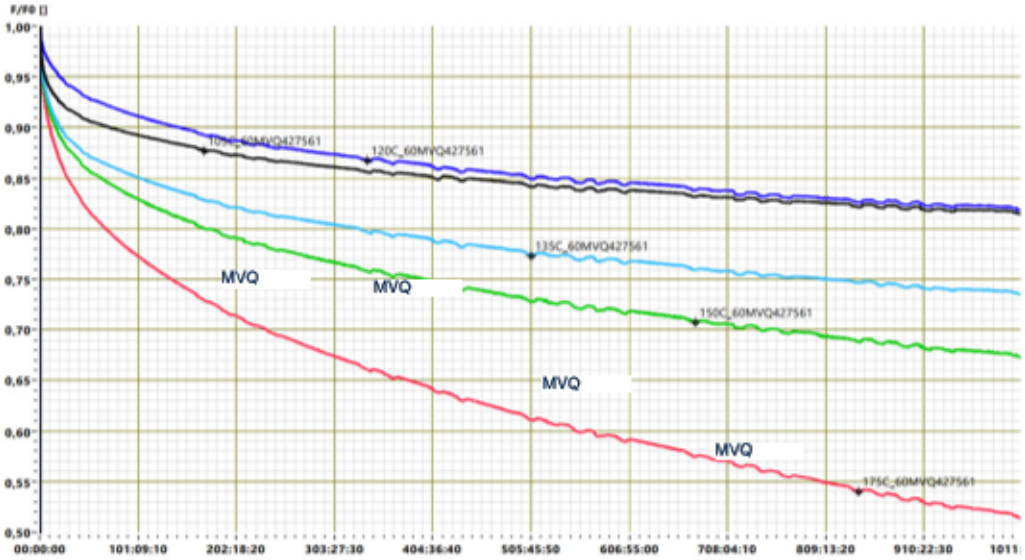
- Today EPDM
  - Temperature, +135°C
  - Long lifetime
  - Compression set
- Electric Vehicles
  - Temperature lower
  - Still long lifetime
  - Compression set
  - Many connectors
  - TPV, thermoplastic, hybride solutions?

https://cooperstandard.com/products/TPV

https://cooperstandard.com/products/TPV

Battery frame gaskets

- Silicone rubber
  - 60 IRHD
  - TS 7,5 MPa
  - UL94-V0
- Life time estimation, ISO 11346
  - Stress relaxation in compression, ISO 3384-1
  - 25% compression, sealing profile
  - 105°C, 120°C, 135°C, 150°C, 175°C
  - 50% remaining force

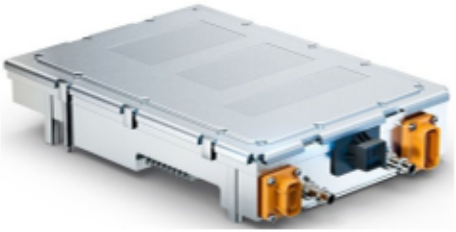


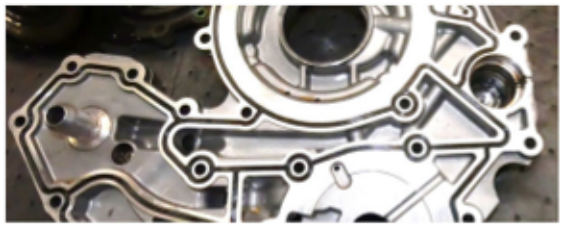
Charging device, seals and protection

SUMMARY

Summary ICE => EV

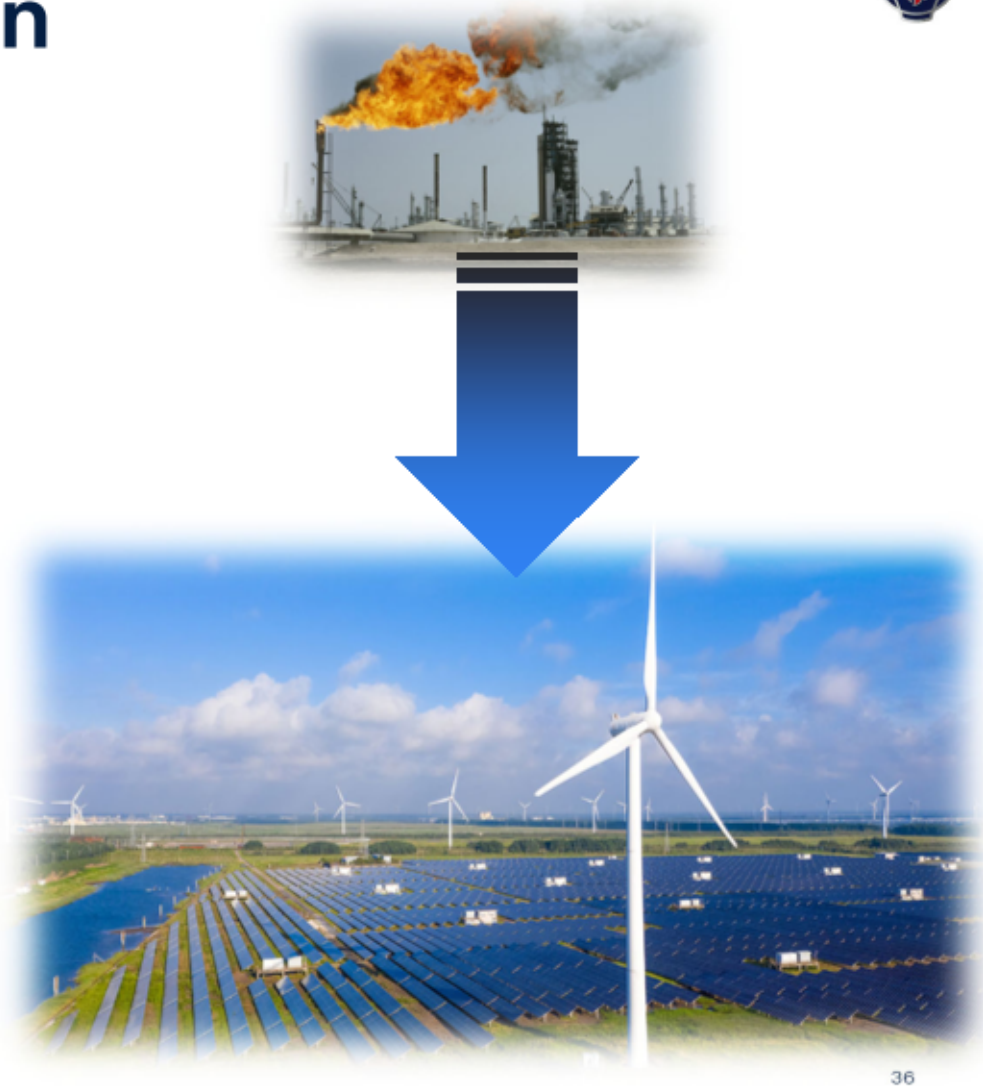
- Cab/chassis parts, coolant hoses - EPDM
- FKM rubber (fuel/coolant, high temp)
- Hoses in silicone (charge air)
- Battery isolators – NR/SBR
- Small parts in silicone rubber
- Silicone potting/gap fillers
- Oil gaskets (AEM/ACM/HNBR)





Summary Energy Transition

- Electric machines
  - Oil resistance (today)
- Battery applications
  - Gap fillers, potting, isolators/dampers
- Hydrogen technology
  - Permeability
  - Conductivity of coolants in fuel cells
- Tyre rolling resistance
  - Major contributor to energy losses in electric vehicles
- Sustainable materials
  - CO_2, abrasion particles




THANKS FOR LISTENING
QUESTIONS?
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