The new high efficient AWD-system

- now introduced as part of the mild hybrid electrification
Content

- The Volvo electrification strategy
- The mild hybrid 48V system
- The new all wheel drive system
  - Background
  - PTU and RDU design
  - Coupling
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COMMITTED TO ELECTRIFICATION

FIVE FULLY ELECTRIC CARS 2019-2021

ALL NEW MODELS AFTER 2019 WITH AN ELECTRIC MOTOR

Mild Hybrid
(48V)

Plug-in Hybrid
Twin Engine

Pure Electric
Electrification plan

Plug-in Hybrid (Twin Engine)

- V60 D5, D6 TwE
- S60 T6 TwE
- XC90, XC60, S90, V90, S60, V60, T8, T6 TwE
- XC40 T5 TwE
- Polestar 1

Mild Hybrid (48V)

- all VED4 gen 3
- all VEP4 gen 3

Pure Electric

- today


Graz/Spielberg, May 9 to 10, 2019
Electrification & All-Wheel Drive Congress
The mild hybrid powertrain

- Engine
  - Details will be presented at Aachen Colloquium

- KERS1 48V mild HEV

- All new 8-speed automatic gearbox

- High efficiency AWD-system
48V Mild hev content

TECHNICAL OVERVIEW

48 V Mild Hybrid benefits:

- Fuel consumption reduction by recovering kinetic energy
- NVH and refinement improvement for start/stop system
- Performance and response improvement
- Electric support for propulsion and auxiliary loads
- The new brake by wire system interacts with the hybrid system and recovers energy at braking through the BISG
Awd system - background

- AWD-system contribution to mild hybrid powertrain evaluated
  - Disconnect system vs Efficiency improvement of current concept

- Current system losses ≈ 3 % / 5 g (considering mechanical losses)
- Disconnect improvement ≈ 2 % / 3 g (based on a 70% disconnect usage)

- Conclusion that more than half the improvement of a disconnect system could be achieved by efficiency improvements to current concept

- Need of improved torque and road load data capability due to new engine performance
Efficiency - Awd system

40°C Average all speeds and torques

- Hypoid: 25%
- Oil Churning: 24%
- Head Bearing: 15%
- Tail Bearing: 5%
- Pinion Seal: 6%
- Diff Left Seal Drag: 2%
- Diff Right Bearing: 9%
- Diff Left Bearing: 5%

Drag losses:

- Baseline
- Pinion Bearings
- Diff Bearings
- Oil Splash
- Seals
- Remainder

Source: GKN 2016
Awd system – PTU & RDU

• 1450 Nm road load collective
• Reduction of oil splash losses by means of passive oil management
• Angular contact ball bearings for PTU tubular shaft and RDU differential
• Fuel efficient taper roller bearings for pinion arrangement
• Optimized standard seals
Awd system – RDU oil system

Source: GKN 2016
AWD System - AOC

Increased torque capacity with less amount of discs
- improved package and weight reduction

Eco mode
- shut down of motor in controlled driving situations with reduced current consumption and reduced base torque

GenVI Actuators based on
- Brushless DC-motor (BLDC)
- Integrated Plug-On ECU
- GenV Pump Concept

Physical Improvements
- Weight and size reduction ~0.5kg reduced

Source: BorgWarner 2019
Efficiency results

- Total gain up to 15%, 15 – 20g
- The verification has confirmed that approximately half the improvement of a disconnect system could be achieved by efficiency improvements to the current concept