

Increased need of reproducing confident geometric representation of sealings assembled onto surrounding structures

For more accurate and realistic simulation prediction in
Aerodynamics, Soiling and Aero-acoustics

Volvo Trucks

CAB Analysis | 9th BEFORE REALITY CONFERENCE | Mattias Hejdesten, Senior Expert Aerodynamics | Proprietary

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Agenda

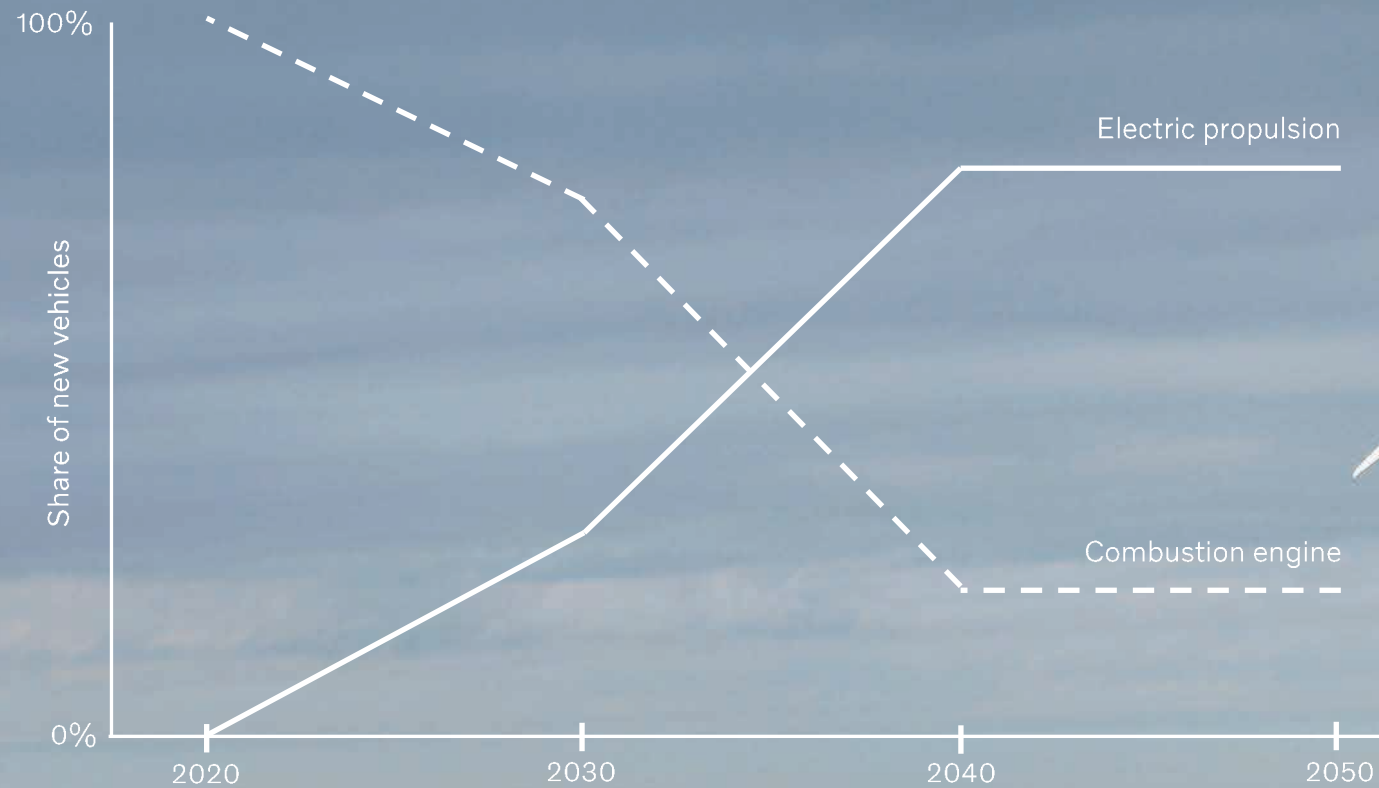
- Introduction
- Background
- GTT challenge
- Joint investigation

Driving prosperity

Every day, across the globe, our trucks, buses, engines, construction equipment, and financial services and solutions make modern life possible. We are driving the transition to sustainable and safe transport, mobility, and infrastructure solutions.

That way, we will meet the growing demand for transportation, while making the journey to become a net-zero society. Together.

Accelerating the sustainable transformation to 100% fossil-free fuel



→ Our ambition is for 100% of our products to be driven by fossil-free fuels by 2040.

→ To contribute to an emissions-free future, there will be a **steady shift into electric propulsion**, and combustion engines will run on biofuel.

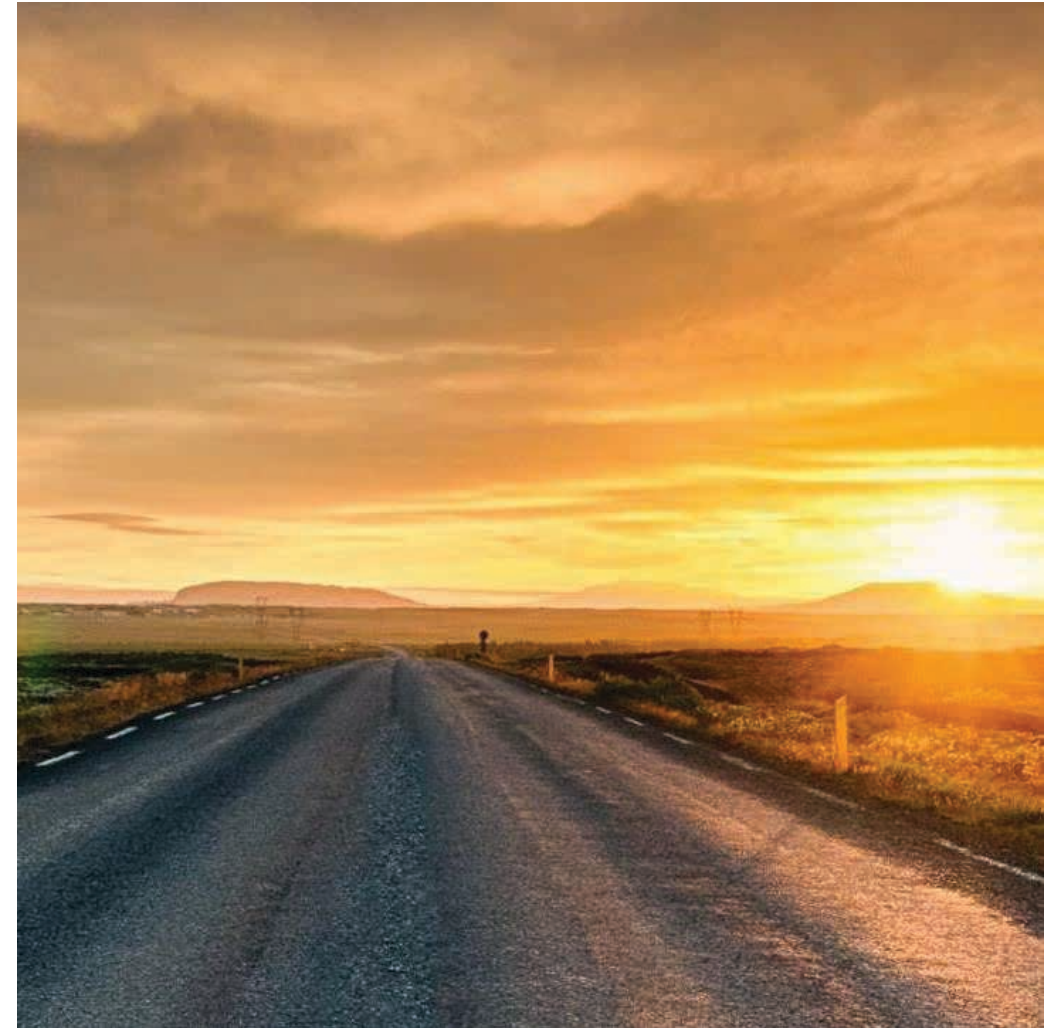
Volvo Trucks

One of the largest premium truck brands in the world.

- Medium and heavy-duty trucks.
- Main production in Sweden, Belgium, Brazil and the USA.

Group Trucks Technology

- We maximize the output from the Volvo Group R&D investment. We do this by balancing common and brand unique solutions and by mastering both well-known and new technologies.
- We provide state-of-the-art research, engineering, product planning and project execution to final delivery of complete products and support the products in the aftermarket.
- We assure product leadership for all Volvo Group brands. By offering technologies for different brands, we address many different customer and market segments in mature as well as growth markets.
- Empowerment, accountability and simplicity are key principles guiding us in our daily work.



Volvo Group's 7 strategic priorities

1

Transform the Volvo Group to become a leading end-to-end integrator as well as offering easy to integrate products and services through strong brands.

2

Grow the service business and target selected industry verticals offering a portfolio of tailor-made solutions.

3

Secure a desirable sustainable product and service portfolio with the right quality, leveraging new and well-known technologies, CAST, partnerships and digital innovation - accelerating electromobility solutions.

4

Grow in Asia and the US: In Asia through JVs, alliances and by strengthening the Volvo Group footprint in China. In the US by significantly improving the Group's market position.

5

Develop robust profitability throughout the decentralized regional value chains by leveraging global scale, digitalization, a purpose-fit footprint and continuous improvement using Volvo Production System.

6

Selectively capture, accelerate and scale-up new businesses and develop competencies and capabilities needed.

7

Reinforce value-based leadership and ways of working where all colleagues are empowered to take action and are accountable for the results.

Background

Disruptive industry trends

- Legal demands on reducing CO₂ emissions of the HD vehicle sector
- Rise of quiet electric drivelines
- Changed focus on other sources of vehicle emitted noise
- Increased need for higher transport solution safety and efficiency



Background

General aerodynamic optimization approaches

- Shape optimization
 - Maximizing the performance of a given low-drag body by permitting significant deviations from the original styling concept.
- Detail optimization
 - Maximizing the performance of a given styling design and modifications must be within the styling concept.



Background

Aerodynamic optimization at Group Trucks Technology

- Shape optimization
 - Maintain attached flow on vehicle sides by shaping front end corners in sensible ways
- Detail optimization
 - Mitigate leakage flows through front body panels to BiW (leakage drag) by sealing split lines and gaps
 - Mitigate evacuating flows from BiW through front body panels causing (interference drag) by sealing split lines and gaps



Background

Detail optimization by means of sealing split lines

- Adding seals in split lines between panels
- Seals must be optimized in shape at assembled position
- Seals must guarantee sealing function and shape quality despite build tolerances of panels

Background

Virtual V&V at Group Trucks Technology

- Virtual development and verification in all project phases
- Semi-automated CFD simulation process
- Unsteady and Steady State simulation methods in Siemens Star-CCM+
- Increased demand on simulation accuracy and product robustness
 - Highly resolved case models including detailed surface representation e.g., split lines and gaps

GTT challenge

Reproduce real life assembly of lip sealings

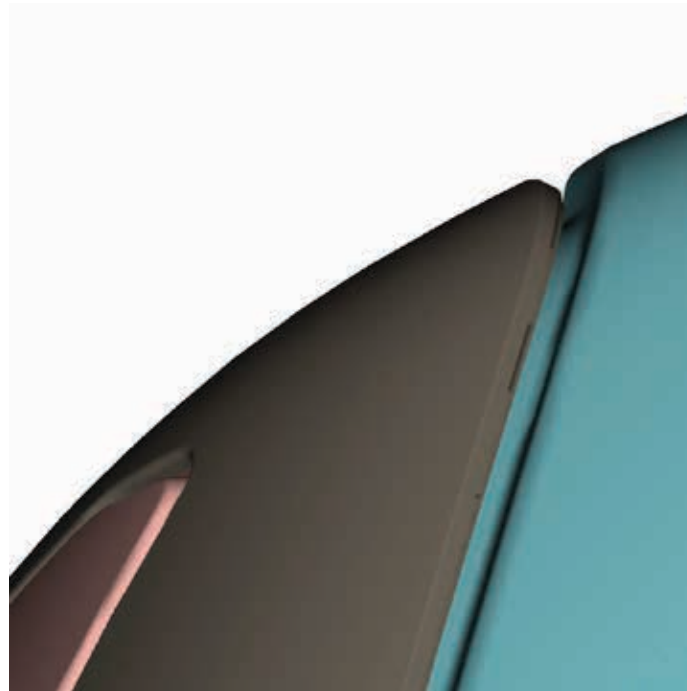
- Obtain wanted position of seal
 - Direct morphing of GEOMETRY
 - Mesh morphing on MESH
 - Re-model CAD by Design Engineer
- Need of material behavior
 - Need of material properties
 - Understand surrounding constraints applied



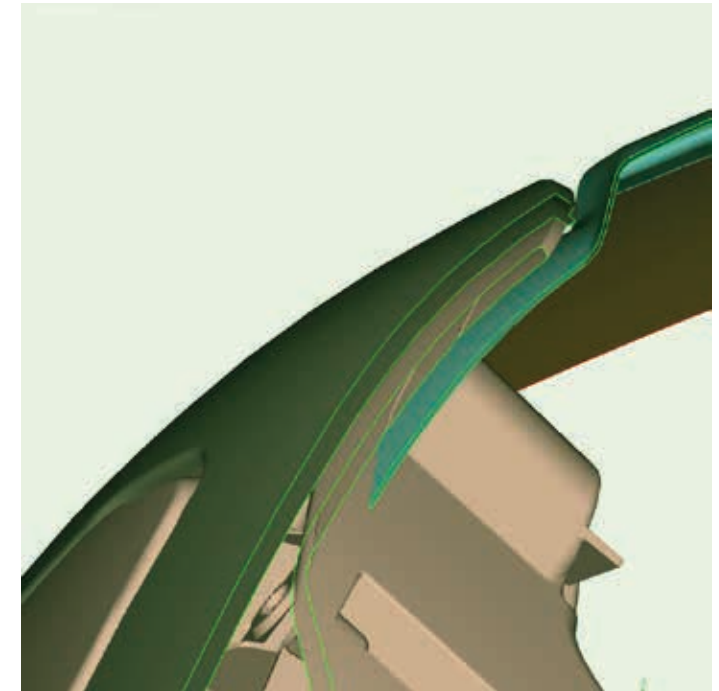
GTT challenge

Reproduce real life assembly of lip sealings

No seal



Exterior view

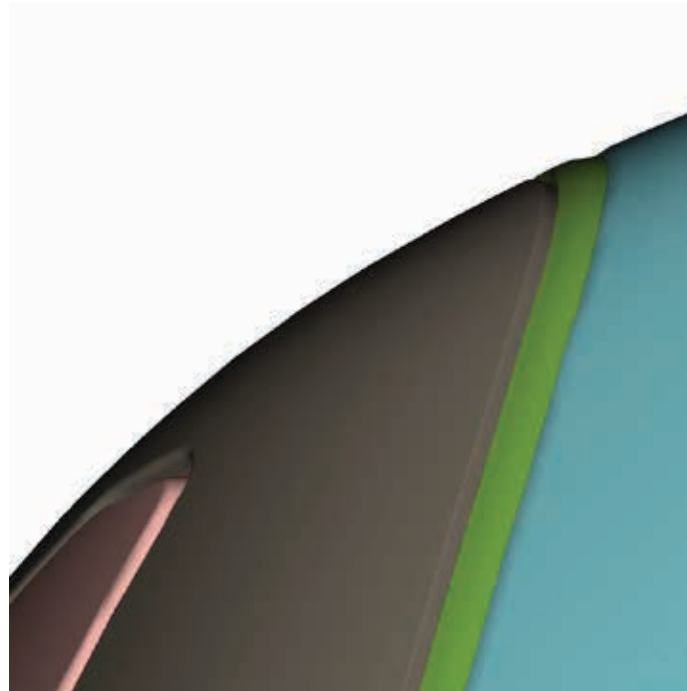


Cross section view

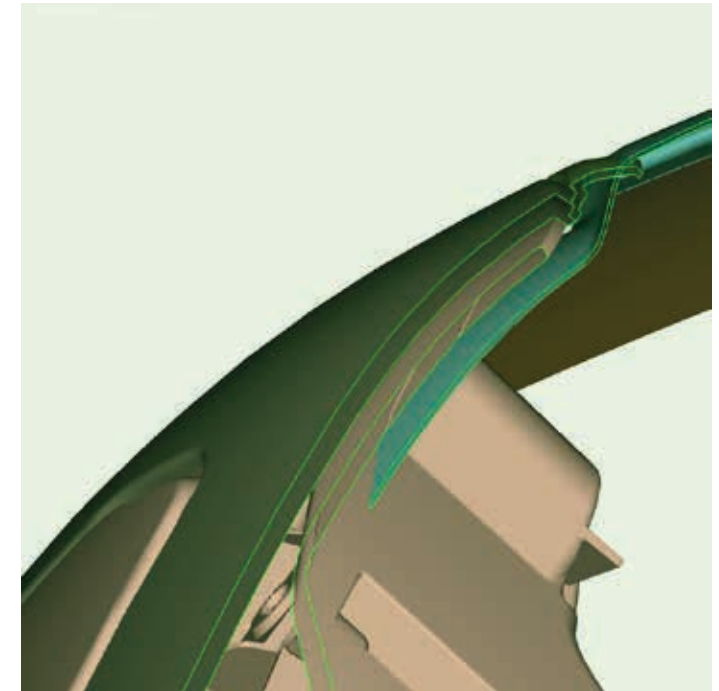
GTT challenge

Reproduce real life assembly of lip sealings

Seal in nominal CAD position



Exterior view

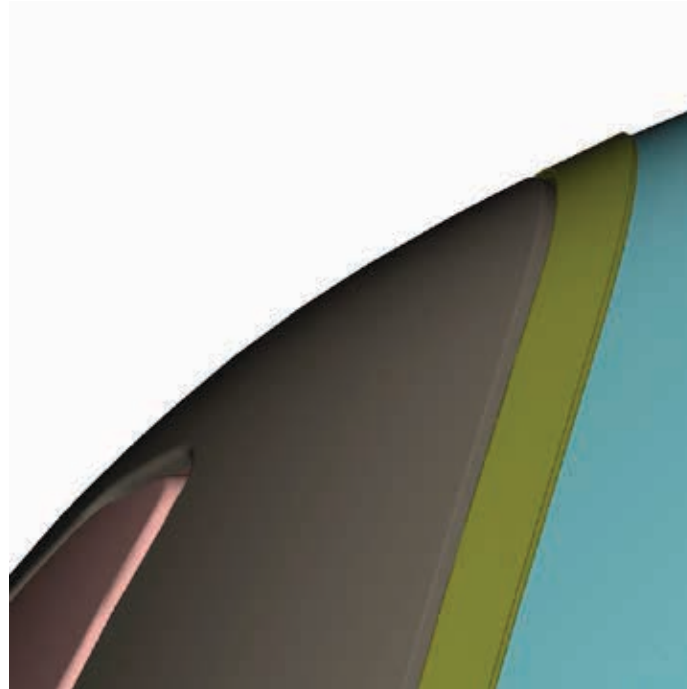


Cross section view

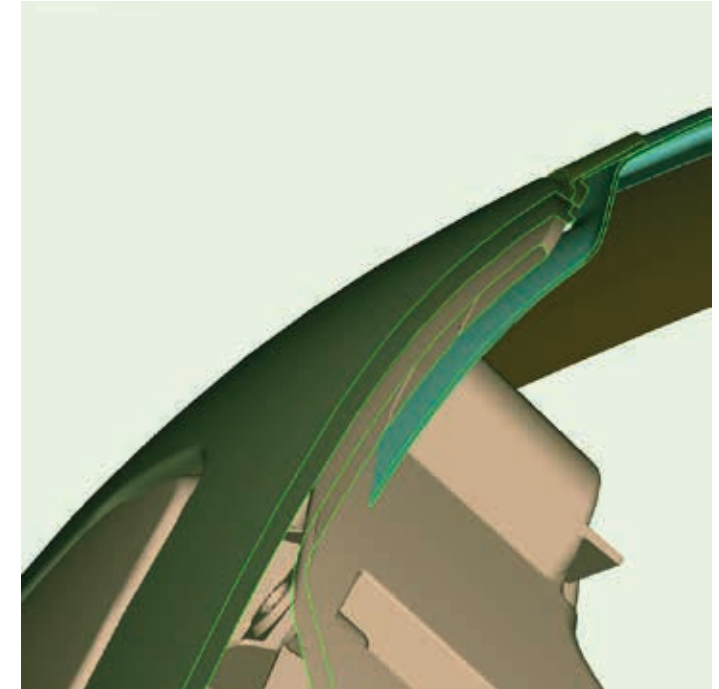
GTT challenge

Reproduce real life assembly of lip sealings

Seal in assembled position (re-modelled by Design Engineer)



Exterior view



Cross section view

Joint investigation

GTT & BETA Simulation Solutions

- GTT in contact with BETA Simulation Solutions
- GTT has provided
 - Relevant geometries
 - Material properties
 - Validation results by GTT (morphed and scanned data)
- Investigation ongoing at BETA
 - Status report

Together

WE SHAPE THE WORLD

we want to live in

V O L V O