

# **Volvo Trucks North America VNL-680 and the DOE SuperTruck**

Peter Lobner, 2 April 2020

## **Introduction**

With a market share of 9.2% in December 2019, Volvo Trucks North America (<https://www.volvotrucks.us>) is the fifth largest manufacturer of Class 8 tractor-trailers for the North American market. Their flagship Class 8 truck is known as the VNL-series. Volvo led one of the teams that participated in the DOE SuperTruck I program, which was conducted from 2010 to 2016. The Volvo-led team is continuing their participation in SuperTruck II, which runs from 2017 to 2022.

Mack Trucks is owned by Volvo Trucks North America and has a 7.7% share of the North American Class 8 truck market.

## **Volvo VNL-860**

The flagship of Volvo's VNL-series of long-haul trucks is the VNL-860.





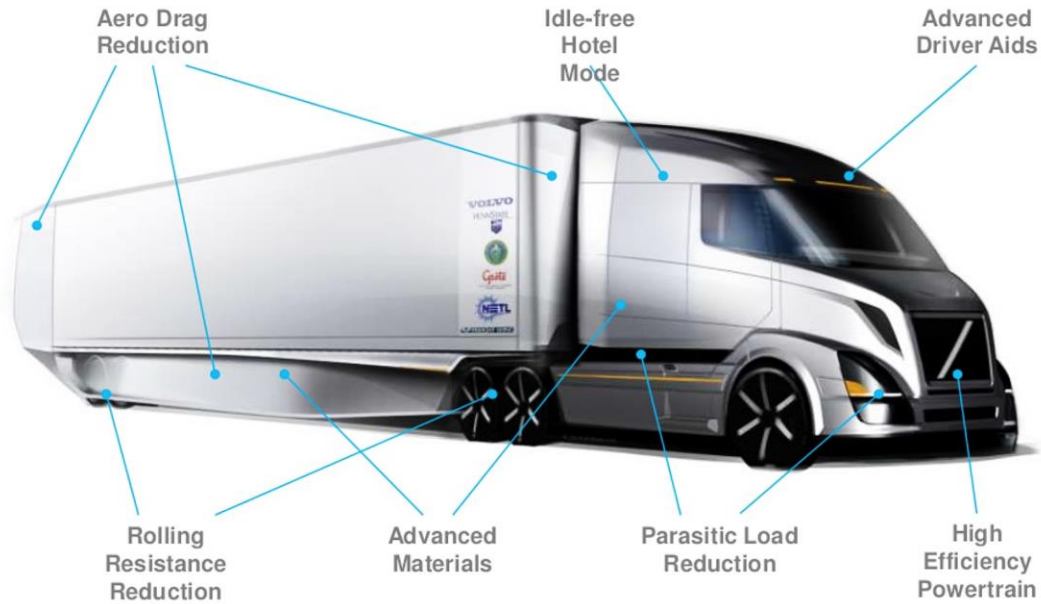
*Volvo VNL 860. Source, both graphics: Volvo*

The latest VNL-series trucks feature Volvo's most aerodynamic and fuel-efficient package, which includes the following features:

- Compared to the previous package, the completely redesigned exterior offers improved airflow, resulting in up to 7.5% fuel savings when paired with an aero trailer.
- New hood, bumper and lower airflow deflector work together to manage airflow and efficiently channel it rearward.
- Redesigned chassis fairings optimize airflow past the drive wheels and the tractor-trailer gap.
- The cab roof air deflector complements the cab fairings, keeping the airflow attached and smoothing out costly turbulence between the cab and trailer.
- Aerodynamic design of the mirror assemblies reduces turbulence by attaching air more quickly to the tractor.
- Side skirts on the tractor and trailer reduce air turbulence in this region.

## Volvo SuperTruck

Volvo is leading one of the teams in the DOE SuperTruck program.



*Volvo concept SuperTruck.*

*Source: Volvo North American presentation, 2014*



*Volvo SuperTruck I test truck. Source: Volvo 2016 press release*



*Volvo SuperTruck I test truck.  
Source: Screenshot from Volvo YouTube video*

A large array of solar panels built into the roof of the trailer charges a large battery that powers the HVAC system and other “hotel” loads. A 10 kW alternator recovers energy from braking to also supply the batteries. Battery capacity is adequate for 14 – 17 hours during a driver’s rest cycle.

The optimized Volvo SuperTruck met or beat all of DOE’s SuperTruck I objectives and delivered the following performance compared with a baseline 2009 model Volvo VNL 670:

- 3,200 pounds lighter
- 40% less aero drag
- 69% better fuel economy ( achieved > 12 mpg)
- 50% BTE powertrain
- 88% increase in freight efficiency (achieved about 188 ton-mpg) vs. 50% DOE target

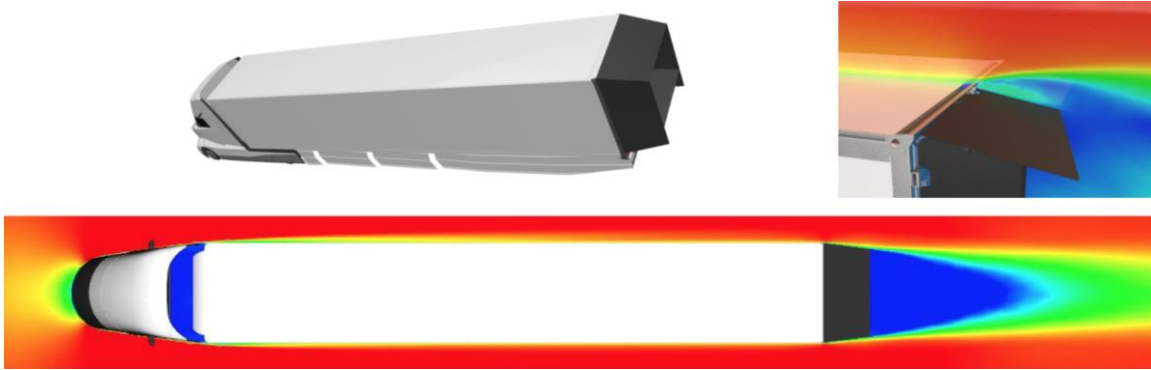
Volvo reported that many features of their SuperTruck I already are being implemented in current model tractor-trailers.

- Improved trailer aero devices - 2015
- Tractor aero improvements - 2016 on highway tractors
- Powertrain improvements - 2017 on 11L & 13L engines



*Volvo 2017 tractor comparison with SuperTruck. Source: Volvo*

Volvo is leading one of the DOE SuperTruck II teams. As of June 2019, the tractor and trailer aero design were frozen and CFD simulation indicates that the design exceeds the target of 50% drag reduction vs. baseline and is about 15% better than the Volvo SuperTruck I test truck. Work on the 55% BTE powertrain is proceeding with development of a turbo-compound diesel with waste heat recovery. The Volvo SuperTruck II test truck is expected to be ready for its first road test in early 2021.



*Volvo SuperTruck II general arrangement & CFD results showing boat tail details. Source: Volvo, June 2019*

You'll find more information on the Volvo North America SuperTruck at the following links:

- On the Volvo website here:  
<https://www.volvotrucks.us/innovation/supertruck/>
- Volvo press release, "Volvo's High-Tech SuperTruck Exceeds Program's Freight Efficiency Goals," 13 September 2016:  
<https://www.volvogroup.com/en-en/news/2016/sep/volvo-high-tech-super-truck-exceeds.html>
- SuperTruck I presentation: "Volvo SuperTruck," 2016, on the DOE website here:  
[https://www.energy.gov/sites/prod/files/2016/06/f33/vs081\\_amar\\_2016\\_o\\_web.pdf](https://www.energy.gov/sites/prod/files/2016/06/f33/vs081_amar_2016_o_web.pdf)
- SuperTruck I presentation: "SuperTruck Powertrain Technologies for Efficiency Improvement," 2016, on the DOE website here:  
[https://www.energy.gov/sites/prod/files/2016/06/f32/ace060\\_amar\\_2016\\_o\\_web.pdf](https://www.energy.gov/sites/prod/files/2016/06/f32/ace060_amar_2016_o_web.pdf)
- Jason Cannon, "Volvo's SuperTruck is part evolution, part revolution," ccjdigital.com, 22 February 2017:  
<https://www.ccjdigital.com/volvos-supertruck-is-part-evolution-part-revolution/>
- SuperTruck II presentation: "Volvo SuperTruck 2 - Pathway to Cost-Effective Commercialized Freight Efficiency, 12 June 2019, on the DOE website here:  
[https://www.energy.gov/sites/prod/files/2019/06/f63/ace101\\_amar\\_2019\\_o\\_5.6\\_11.20am\\_jl.pdf](https://www.energy.gov/sites/prod/files/2019/06/f63/ace101_amar_2019_o_5.6_11.20am_jl.pdf)

The following YouTube videos provide a good overview of the Volvo North America SuperTruck:

- “Volvo Trucks - Introducing the SuperTruck Concept Vehicle” (4:23 minutes): <https://www.youtube.com/watch?v=KndAcoPLZQY>
- “On the Spot with... Revealing Volvo's SuperTruck” (5:14 minutes): <https://www.youtube.com/watch?v=dm5CfkuNrg4>