



# FORCHEM FORTOP600

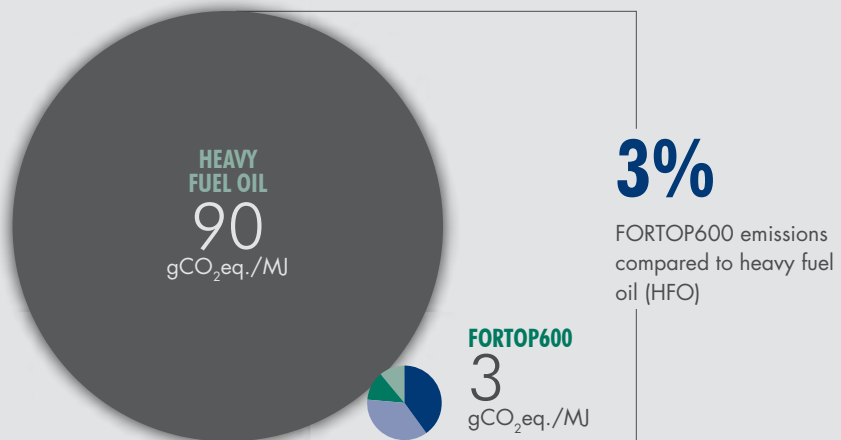
At the forefront of low carbon solutions

## FORTOP600 Liquid Biofuel for combustion

The limited availability of the earth's resources and growing consumer demand has turned the availability of natural resources and the state of the environment into a globally important question. Forchem tall oil products have a low carbon footprint, generating minimal volumes of greenhouse gases compared to alternative materials.

Our raw material, crude tall oil (CTO) is an industrial by-product derived from the kraft pulping process. There is no additional use of natural resources. Forchem's modern bio refinery is powered by 99% bioenergy.

### FORTOP600 vs HFO



- OWN PRODUCTION
- PRODUCT LOGISTICS (estimated distance 500 km)
- RAW MATERIAL PRODUCTION
- RAW MATERIAL LOGISTICS

Fortop600 is a liquid biofuel, which replaces heavy fuel oil (HFO) in customer applications. Carbon footprint of Fortop600 is 3 gCO<sub>2</sub>eq./MJ\*, whereas heavy fuel oil (HFO) causes emissions of 90 gCO<sub>2</sub>eq./MJ\*\*. **FORTOP600 has only 3% of emissions compared to its substitute heavy fuel oil (HFO).**

\* Biofuels are classified to be carbon-free in the EU emissions trading scheme as well as in carbon footprint calculations. Heat value (effective) of Fortop600 is 38 MJ/kg. Fortop600 carbon footprint is 72 gCO<sub>2</sub>eq./kg.

\*\* Heavy fuel oil (HFO) emission factor is from Ecoinvent v2.1 database. Heavy fuel oil (HFO) emissions include all cradle-to-gate emissions, transport to customer as well as combustion. Heat value of heavy fuel oil (HFO) is 40,5 MJ/kg.

## THE GREENER CHOICE

Carbon footprint is the total set of carbon dioxide emissions caused directly and indirectly by an individual, organization, event or a product. Carbon footprint for Fortop600 liquid biofuel produced by Forchem in Rauma refinery is 72 gCO<sub>2</sub>eq./kg\*.

These results include emissions from raw material production and transportation, and operations in Rauma refinery (cradle-to-gate). Emissions are for year 2012.

Forchem utilizes almost entirely bioenergy, which enables climate-friendly operations. The production facility is located next to a pulp mill, minimizing the emissions from raw material logistics.



## METHODOLOGY FOR CARBON FOOTPRINT CALCULATIONS

*gaia*  This calculation was conducted by Gaia Consulting Ltd. 2013

- Calculations are conducted following life cycle assessment standards ISO 14040 and ISO 14044.
- The results include emissions from raw material production, transportation and operations in Rauma refinery (cradle-to-gate).
- Primary data was collected and used for all processes under the control of Forchem.
- Secondary data was collected from reliable databases and used to estimate the emissions of raw material production and transportation.
- Emissions of crude tall oil production (CTO) were assumed to be 3.5% of the emissions of sulfate pulp production. This is based on the average amount of CTO produced as side-product in sulfate pulp processes in Finland (mass basis).
- Emission factor for average Nordic pulp mill is utilized as most of the CTO originates from Nordic pulp mills.
- Calculations were conducted by Gaia Consulting Ltd. (www.gaia.fi) for business-to-business purposes only.

Forchem assumes no responsibility or liability for the completeness and correctness of this analysis and this document including the data and information collected from raw material suppliers