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TALL OIL FATTY ACID

TOFA

Forchem's Tall Oil Fatty Acid (TOFA) reflects our combination of high quality Scandinavian type Crude Tall Oil (CTO) raw material together with Europe's most modern and efficient Tall Oil bio-refinery in Rauma, Finland.

The optimum distillation process produces a very pure fatty acid with a low level of rosin acids and a low level of unsaponifiables, which make it an ideal raw material for many chemical reactions and intermediates.

For those applications where low temperature performance is critical Forchem produces a premium quality grade of TOFA, For 2X. This is produced from specially selected CTO and is subjected to even greater quality control to ensure maximum product performance and stability.

TOFA TALL OIL FATTY ACID

CARBON FOOTPRINT
Forchem TOFA
94 $gCO_2eq./kg$

ANALYSIS SPECIFICATION

PRODUCT	Acid Value	Cloud point, °C	Colour Gardner	Free rosin acids, %	Unsaponifiables, %
FOR 2	min. 193		max. 5	max. 2,1	max. 2
FOR 2X	min. 193	max. -3	max. 5	max. 2,1	max. 2

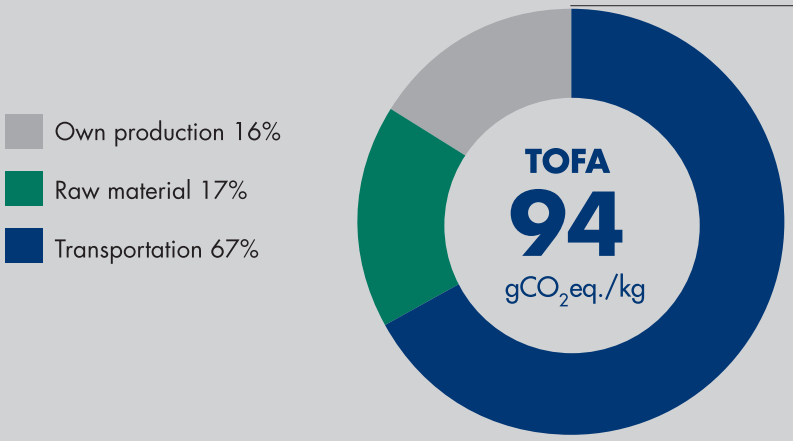
ANALYSIS TYPICAL VALUE

PRODUCT	Acid Value	Cloud point, °C	Colour Gardner	Density at 15 °C, kg/m³	Flash point, closed cup, °C	Free fatty acids, %	Free rosin acids, %	Iodine value, Wijs	Pour point, °C	Refractive index, 20 °C	Saponification value	Unsaponifiables, %	Viscosity at 40 °C mPas
FOR 2	195	-2	4	909	205	96	1,9	154	-12	1.470	198	1,8	16
FOR 2X	196	-8	3.6	908	205	97	1,8	155	-15	1.470	198	1,7	16

FORCHEM TOFA
– At the forefront of low carbon solution

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 co-product derived from the kraft pulping process. There is no additional use of natural resources. 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. The European produced Forchem TOFA is used to satisfy the demands of today's environmentally aware consumers and global markets.



10%

Forchem's TOFA emissions compared to soybean oil.

Forchem TOFA emissions are for year 2016. Soybean oil emission factors are from Ecoinvent v3 database.

METHODOLOGY FOR CARBON FOOTPRINT CALCULATIONS

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- Product carbon footprint is the sum of greenhouse gas emissions of a product system, expressed in CO_2-equivalents.
- Calculations are conducted following the life cycle assessment standards ISO 14040 and ISO 14044.
- Emissions are for year 2016. The presented 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 available databases (mostly Ecoinvent v. 3.0) 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).
- Emissions factors for average Nordic pulp mills is used for CTO originating from Nordic and Global average for CTO produced outside Nordic countries.
- This calculation was conducted in co-operation with Gaia Consuling Ltd. (www.gaia.fi) for business-to-business purposes only.

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