

CROPENERGIES

RENEWABLE ETHYL ACETATE

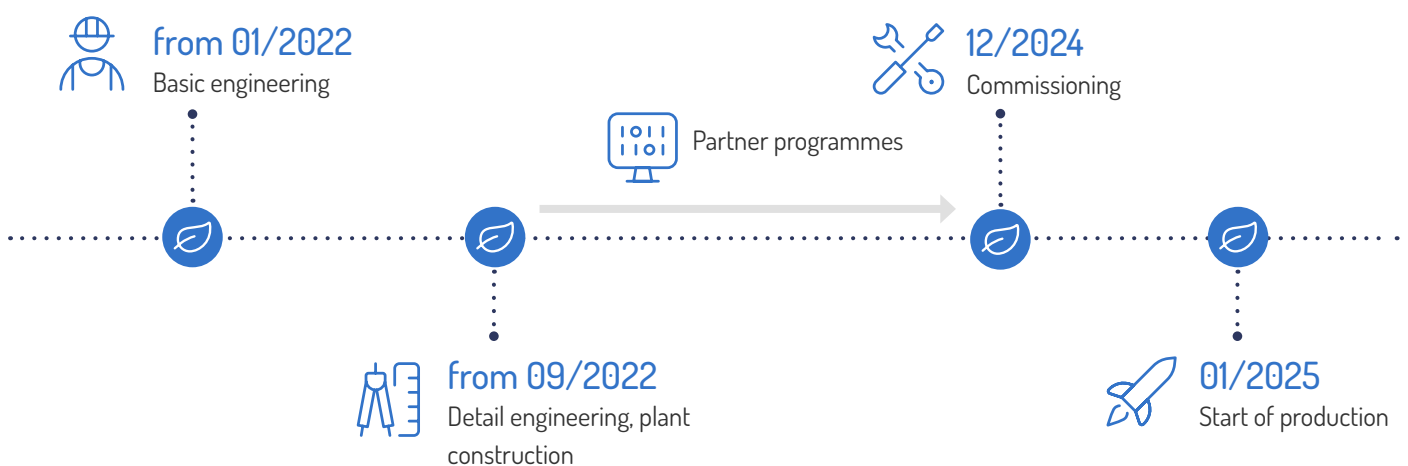
SUSTAINABLE, RENEWABLE PRODUCTS MADE FROM BIOMASS

The exclusive use of **renewable carbon** as raw material is a key prerequisite for the chemical industry to achieve **climate neutrality**.

Sustainable, renewable products made from biomass – that is what CropEnergies stands for. Our products contribute to a climate-friendly world and ensure that fossil carbons remain in the ground permanently and do not continue to drive climate change. Since 2005, we produce protein food, animal feed, ethanol and neutral alcohol for the European market. The first product from our new Biochemicals business area fits in seamlessly here: The planned production process is almost 100 % CO₂-neutral and provides biodegradable ethyl acetate of the highest quality. As promised

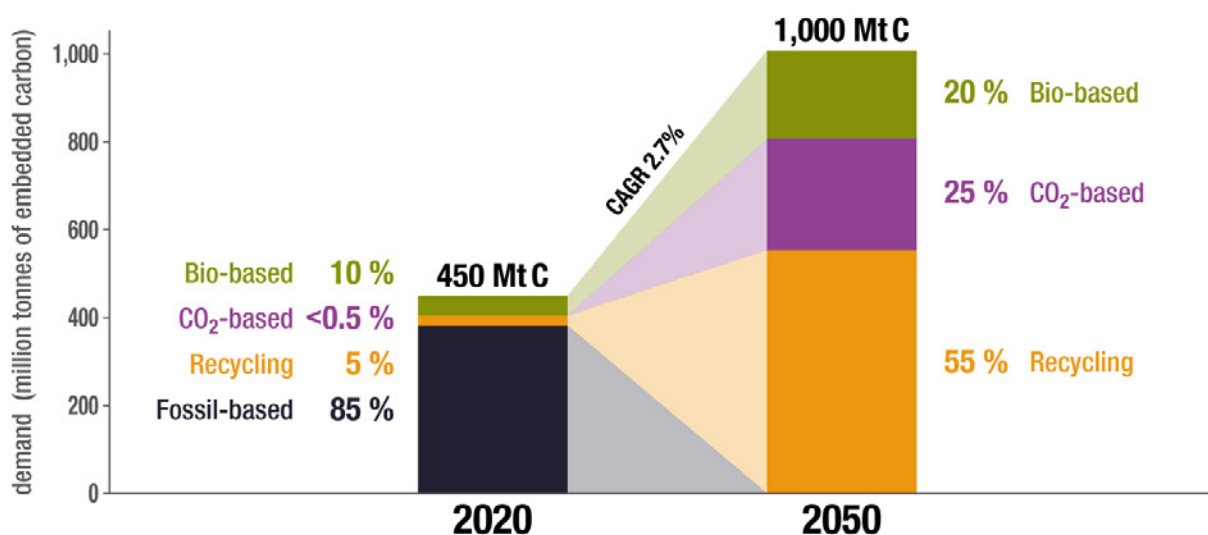
some time ago, we now want to provide you with some initial information about our new product.

CropEnergies AG, Mannheim, and Johnson Matthey, London, a leader in sustainable technologies, have entered into an engineering, license and technical services agreement for a plant to allow us to produce renewable ethyl acetate from sustainable ethanol near our production site in Zeitz, Germany.



GLOBAL CARBON DEMAND FOR CHEMICALS AND DERIVED MATERIALS

FOSSIL CARBONS MUST BE REPLACED IN THE FUTURE



In 2020 and Scenario for 2050 (in million tonnes of embedded carbon)
 (www.renewable-carbon.eu/graphics)

The exclusive use of renewable carbon as raw material is a key prerequisite for the chemical industry to achieve climate neutrality. The use of renewable carbon is to the chemical and derived material industries what decarbonisation is in the energy sector. With decreasing carbon demand from the energy sector and increasing demand from the chemical & materials sector, the structure of carbon demand changes fundamentally between energy and chemicals & materials: While today the embedded carbon demand of chemicals &

materials virtually disappears compared to the energy sector, both sectors will be almost equal in 2050.

Source
 Renewable Carbon as a Guiding Principle for Sustainable Carbon Cycles, a paper of the Renewable Carbon Initiative, February 2022

SUSTAINABILITY

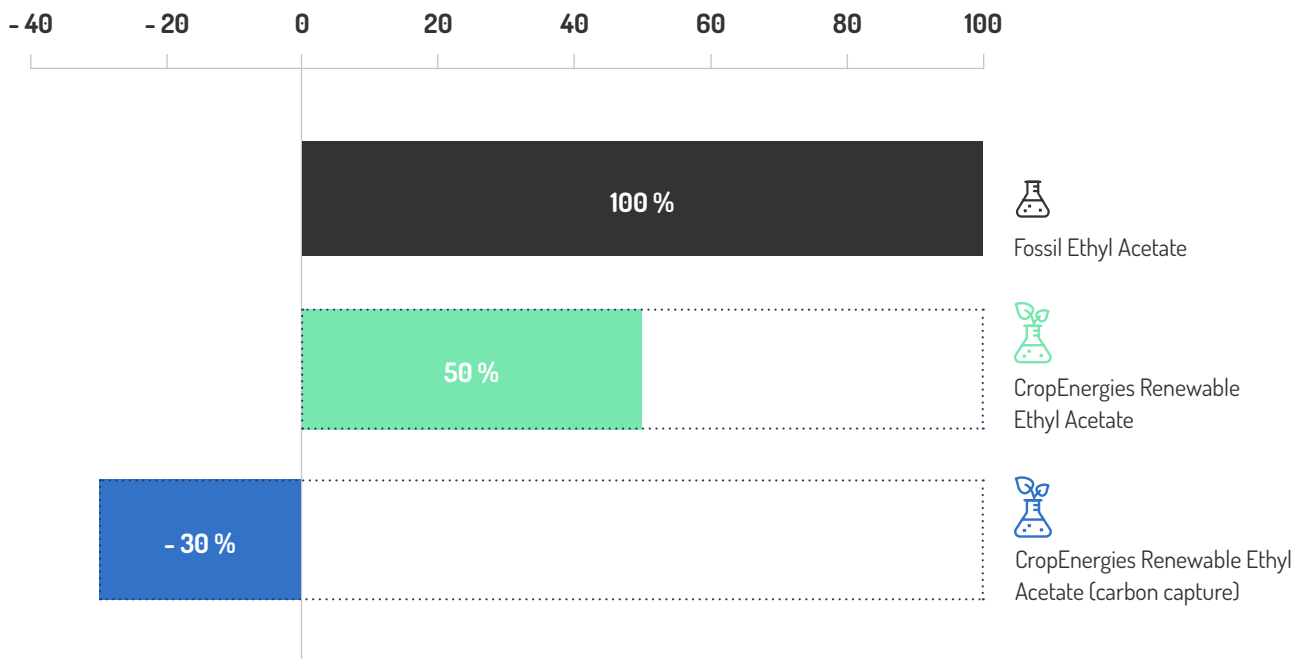
Our renewable ethyl acetate is the raw material for bio-based products that contribute sustainably to reducing your carbon footprint. At the same time, you benefit from the security of supply and short supply routes of a European production.

A study by the Nova Institute concludes that the CropEnergies ethyl acetate reduces CO₂ emissions by approx. 50 % compared to the fossil product. Since it is a plant-based product, even a net positive climate balance (carbon capture)

can be achieved, taking into account the temporarily stored biogenic carbon.

Production reduces the input of fossil resources by approx. 80 % compared to the fossil counterpart (14 MJ/kg instead of 64 MJ/kg).

GHG SAVINGS IN PRODUCTION PROCESS

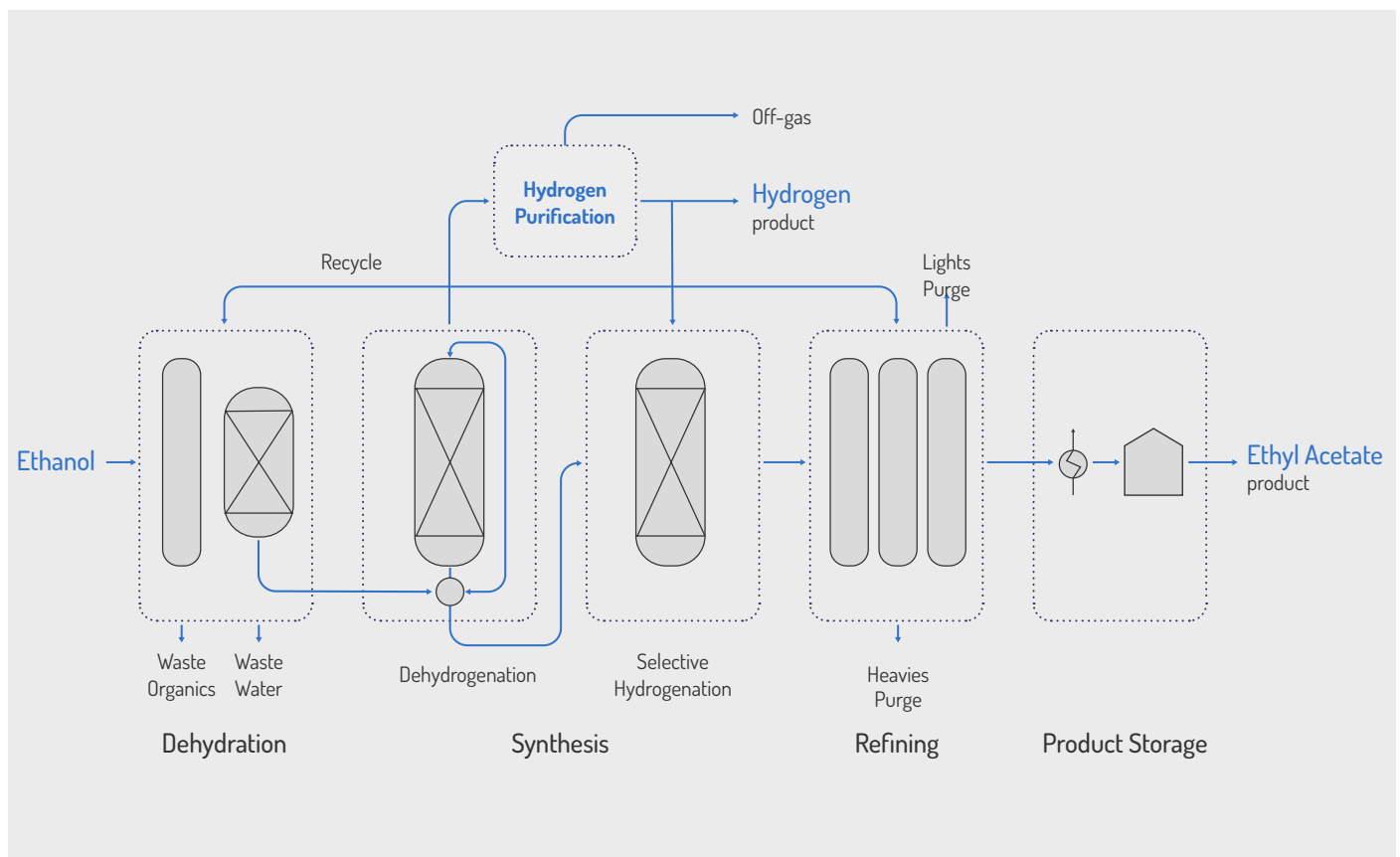


TECHNOLOGY

The **Davy ethyl acetate process** uses ethanol only as a raw material. The process is atomic efficient; the main end products are high-purity ethyl acetate and hydrogen. The actual dehydrogenation reaction takes place in the vapor phase. The product leaving the reactor is 'polished' in a second reaction step. Hydrogen produced in the dehydrogenation step is purified and a small fraction used in selective catalytic hydrogenation, which removes carbonyl compounds that are difficult to separate by distillation.

The stream leaving the **polishing reactor** contains mainly ethyl acetate and un-reacted ethanol together with small quantities of water and other co-products. This stream is fed to a series of columns where a ternary azeotrope

is broken, un-reacted ethanol is separated and recycled to the reaction section. Ethyl acetate is refined to meet specification and the light and heavy components are removed. These can be used as fuel or for other applications, as necessary.



DATA SHEET

ETHYL ACETATE FROM RENEWABLE ETHANOL

Ethyl acetate is produced from ethanol which is of agricultural origin and made by fermentation of carbohydrate containing syrups and cereals.

Ethyl acetate is a clear, colourless liquid.

Specification

Parameter	Unit	Limit	Method
Purity	% (w/w)	Min. 99.5	Gas Chromatography
Water content	% (w/w)	Max. 0.05	ASTM E 1064
Ethanol	% (w/w)	Max. 0.02	Gas Chromatography
Acidity	% (w/w)	Max. 0.005	ASTM D 1613
Non-Volatile components	% (w/w)	Max. 0.02	ASTM D 1353

Parameter	Unit	Typical	Method
Density (20°C)	g/mL	0.899 – 0.901	ASTM D 4052
Boiling Point	°C	76 – 78	ASTM D 1078
Water Solubility	g/100 mL	8.3	ASTM D 1722
Refractive Index (20 °C)	-	1.370 – 1.376	DIN 51423

Additional Information

CAS No. 141-78-6

EC No. 205-500-4

Disclaimer

All information given in this product data sheet is based on our current knowledge and experience. Due to the different possible applications beyond our control we do not assume any liability for suitability of our products. This information does not relieve the user of own examination and tests.