EASTMAN

Building a better circle with less impact

Environmental footprint of methanolysis (North America)

Did you know?

There are many types of molecular recycling technologies. Eastman uses methanolysis as part of our polyester renewal technology platform.

Eastman's **methanolysis** is a type of material-to-materials molecular recycling technology that will help solve the world's plastic waste crisis while also resulting in **significant reduction in carbon emissions** and improvements across a **wide spectrum of environmental issues**. How is this evaluated? With a methodology called life cycle analysis (LCA).

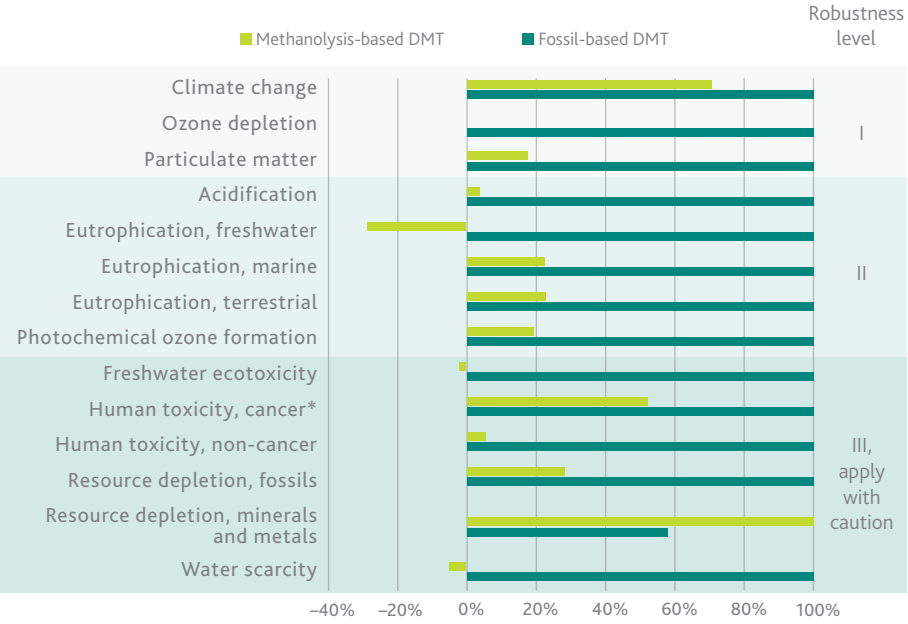
LCA is a standardized tool for assessing potential environmental impacts for a process or product throughout its life cycle. Eastman commissioned Quantis, an esteemed international LCA consultant, to complete an LCA for methanolysis (including a critical review by a panel of third-party LCA experts) to confirm that the study is in conformance with international LCA standards (ISO 14040 and 14044). The study concludes that the intermediate material **DMT produced by methanolysis from recycled waste polyester results in 29% lower greenhouse gas emissions** than DMT produced from conventional fossil material. DMT is a precursor material that Eastman uses to manufacture a wide variety of specialty products such as copolyester plastics.

In addition, **DMT from methanolysis ranks better than fossil-based DMT on 13 out of 14 environmental impact categories** assessed in the study using methodologies recommended by the European Commission. A scenario analysis shows that the climate change benefits of methanolysis would be further improved if the scope was expanded to include avoided disposal of plastic waste inputs.

For more complete details, see Eastman's methanolysis LCA technical report at **eastman.com/LCA**.

Methanolysis environmental footprint is better than virgin processing in almost **every category**.

Relative life cycle impact assessment of DMT made by methanolysis compared to conventional



Goal of study: Complete LCA of recycled dimethyl terephthalate (DMT) produced by methanolysis from polyester waste and compare to conventional DMT produced by Eastman at the same site from fossil-based paraxylene.

Scope: Cradle-to-gate production of DMT, including all relevant processing at Eastman, raw material acquisition, upstream operations, energy supply, natural resource extraction, and transportation. Methanolysis data is based on actual, final engineering designs and permits for Eastman's 110,000 metric-tons-per-year (250 million pounds) plant that is under construction in Tennessee with planned completion by end of 2024. Scope conservatively excludes any credit for avoided disposal of waste plastic inputs.

Functional unit: One kilogram of DMT that meets Eastman's internal specification for use in copolyester production

**This assessment was completed following the USEtox consensus model, which is not intended to predict any specific impacts to human or ecological health, such as cases of cancer. This model simply estimates the transport and fate of emissions and their exposure to people or aquatic organisms (cumulative toxicity units) using a generalized framework. While this methodology is currently recognized as the best practice by the Environmental Footprint Method, its generalized nature creates significant gaps in precision of the data, including lack of characterization factors for substances, data quality issues and lack of regionalization.*

Impact assessment methodology: JRC Environmental Footprint 2017**

Acidification: indicator of the potential acidification of soils and water (i.e., acid rain) due to emissions of gases such as sulfur oxides and nitrogen oxides

Eutrophication: overenrichment of oxygen-depleting nutrients in water and soil

Photochemical ozone formation: ground-level smog formation

Eco- and human toxicity*: potential adverse impacts on freshwater aquatic life and humans due to toxic emissions

Resource depletion: nonrenewable depletion of fossil, minerals, and metals from natural resources

***The JRC classifies each impact category according to the maturity and reliability of its underlying model with levels of robustness:*

-Level I: Satisfactory
-Level II: In need of some improvements
-Level III: To be applied with caution

LCA impact assessment results are relative expressions and do not predict impacts on category end points, the exceeding of thresholds, safety margins, or risks.

Reference:
European Commission (2017). PEFCR document—Guidance for the Development of Product Environmental Footprint Category Rules (PEFCRs), version 6.3

https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html

Read the summary report here.

Quantis