FACTSHEET

Jet Fuels Made From Municipal Waste

What's the issue?

In a world where climate and waste crises are worsening at a staggering rate, the idea of turning waste into fuels might sound like a great solution. Companies like Fulcrum Bioenergy and Velocys have been catching media attention by claiming that they have developed a technology that can produce jet fuels from waste.

Can it actually work?

Unfortunately not, as little evidence exists to prove the feasibility of such technologies. Fuels derived from municipal solid waste or plastic are not currently permitted by the International Civil Aviation Organization. As little as 0.3% of jet fuel currently comes from non-crude oil, namely vegetable oils and animal fats. Considering that the very same technologies, waste gasification and pyrolysis, have failed for over three decades due to low-quality end products, high energy demands and low financial viability, it is highly unlikely that the attempts to produce waste-derived jet fuels will suddenly succeed.

Will it improve in the near future though?

Waste-derived fuels have long failed to materialize, and the bar is raised even higher for jet fuels; they must perform consistently and safely in extreme conditions, adapting to varying altitudes and pressures. Jet fuels must meet the highest and the latest standards in order to avoid problems associated with jets handling multiple fuel types, especially because of the long working life of commercial jet engines. However, meeting such rigid specifications is nowhere in sight for waste-derived fuel production.

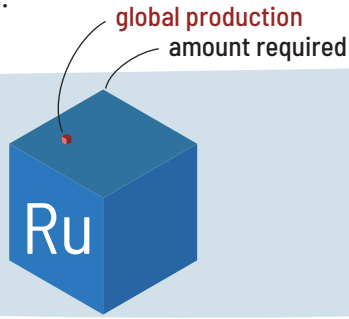
Would it be climate-friendly if it worked out?

The climate benefits of alternative fuels remain to be proven as the European Union Aviation Safety Agency stated in 2019: 'the emissions of a bio-based aviation fuel as compared to the emissions from the production and combustion of conventional aviation fuel can be lower, comparable or even higher.' More importantly, one unit of engine thrust releases similar quantities of CO_2 and H_2O into the atmosphere regardless of the fuels' origin, so jet fuels – which must meet the latest specifications – will perform identically when burned.

What about some journal articles that provide evidence for the technical viability of waste-derived jet fuels?

Just two academic studies are commonly cited to support jet fuel production from waste. One states that the process requires very high energy input. The methods suggested by different studies rely on hydrogen (H_2) kept at certain pressures and temperatures, which would make it prohibitive to build infrastructure at an industrial scale. The methods also require rare elements such as ruthenium (Ru) and platinum (Pt) as catalysts, and the amount required to process hundreds of thousands tonnes of plastic waste is simply far more than what we currently have on Earth. Another concern about these catalyst-heavy processes is treatment of spent solvents after deactivation of the catalysts, as the process generates a large amount of solvent, which contains toxins both from plastic and newly-created unwanted byproducts.

> For a commercial waste-derived jet fuel plant with a capacity of 100,000 tonnes per year, **2500** tonnes of ruthenium (Ru), one of the rarest elements on Earth, is needed, while the total annual global production of Ru is only **30** tonnes.



What are the alternatives?

Domestic flights are responsible for a third of all aviation fuel use. Therefore, displacing domestic flights with train travel can make a dramatic change. Other alternatives include implementing fuel-saving air traffic control management and improving engine technology to increase efficiency and reduce emissions.

- Replacing domestic flights with train travel
- Fuel-saving air traffic control management
- Improving engine technology

See the technical briefing at: www.no-burn.org/jetfuels