



## Let's Talk About **BIO-BASED CHEMICALS**

Bio-based chemicals can replace the chemicals that we usually get from petroleum-based processes. Bio-based means that the chemical was created out of recently living plants, animals, and their by-products. Hundreds of bio-based chemicals are in the market today. They are used to produce cleaners, solvents, adhesives, paints, plastics, textiles, and many other products.

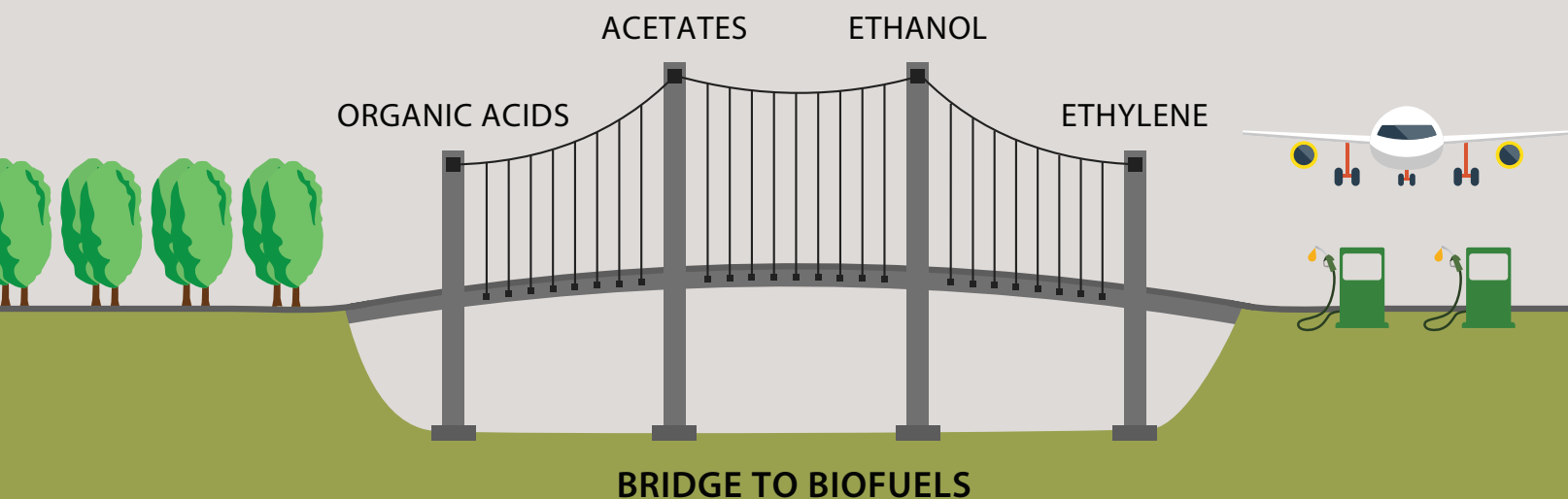


### **POPLAR CHEMICALS**

AHB researchers are investigating the conversion of poplar wood chips to renewable transportation fuels. Along the way, this process creates intermediate bio-based chemicals. Each chemical can be further refined to a different chemical, building a metaphorical “bridge to biofuels.” Organic acids, ethyl acetate, ethanol, and ethylene can be sold on their own or can continue down the conversion pathway to become drop-in biojet fuel.

These chemicals, are traditionally made from petroleum. Using renewable resources such as poplar trees instead of petroleum reduces the carbon footprint of these products, allows for long-term sustainable production, and provides local economic opportunities to rural communities.

Bio-based chemicals tend to have more stable prices and higher economic returns than biofuels. Bio-chemical refineries could be developed now, given current market conditions. In the future, the biorefineries could be scaled up to produce both bio-based chemicals and biofuels when biofuel prices are more competitive with petroleum.



Each of these chemicals can be sold on their own or continue down the conversion pathway to produce drop-in biojet fuel. Producing a diverse portfolio of products can provide more economic stability to a biorefinery.

## ACETIC & LACTIC ACID

Organic acids are produced through the fermentation of biomass using bacteria. Acetic acid is used in many products including paints, plastics, textiles, and de-icing salts. Lactic acid is used to make biodegradable plastics, food preservatives, and other products.



## ETHYL ACETATE

Ethyl acetate is a widely used solvent that has low toxicity. It can be used in glues, printing inks, nail polish remover, and is occasionally used to decaffeinate tea and coffee.



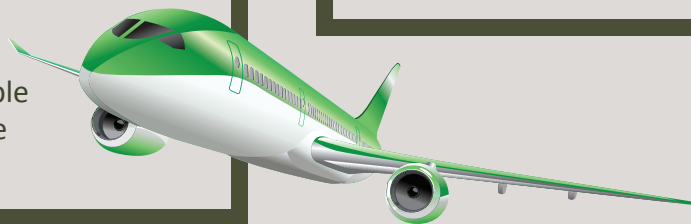
## ETHANOL

Ethanol is an alcohol fuel that is commonly blended with gasoline. It has many desirable qualities, including its ability to act as an oxygenate in regular gasoline. This causes the fuel to burn more completely, reducing smog forming compounds in exhaust.



## BIOJET FUEL

About 80 billion gallons of jet fuel are consumed each year, with nearly all of it coming from petroleum sources. A renewable source of infrastructure compatible jet fuel would greatly help reduce greenhouse gas emissions.



## ETHYLENE

Ethylene is a gas that forms the building block for polyethylene, the most widely produced plastic in the world.

