Let's Talk About

CONVERTING WOOD TO BIOFUELS

Did you know that wood contains sugar? Cellulose, an organic compound in wood, is made up of long chains of sugar. These sugars can be extracted and converted into biofuels and biochemicals.

WOOD CHIPS TO BIOFUEL

There are a variety of ways that cellulosic biomass can be converted into biofuels. AHB's research focuses on a conversion process that uses heat, bacteria, and chemical reactions to convert the wood from poplar trees into biofuels and bio-based chemicals. The backbone of this process is releasing the sugars from the cellulosic biomass. Once the sugar is available it can be converted into a variety of biofuels and bio-based chemicals.

The advantage of AHB's process is that along the conversion pathway to biofuels intermediate chemicals are produced. These chemicals can be sold on their own, or undergo further refining to produce biofuels such as bio-jet fuel. Creating multiple products can increase the profitability of a biorefinery because it can change the products it sells depending on the market.

CURRENT PRODUCTION IN THE PNW

AHB's industry partner, ZeaChem, has been working to fine-tune their process to convert poplar wood chips to acetic acid and ethanol in their demonstration biorefinery in Boardman, Oregon. Conversion of wood chips to jet fuel has been successfully completed in the lab. However, the cost to produce jet fuel from poplar trees is currently greater than that of petroleum-based jet fuel, making commercialization unviable at this time.

To watch a video on converting wood to biofuels click Here.

Advanced Hardwood Biofuels Northwest (AHB) is a program funded by the USDA National Institute of Food and Agriculture. AHB integrates research, education, and extension to develop a poplar-based biofuel and biochemical industry in the Pacific Northwest (PNW).

THE CONVERSION PROCESS

1. PRETREATMENT

Poplar wood chips are treated with high pressures and steam to breakdown the tough fibers in the wood (lignin) and expose the sugars (cellulose and hemicellulose).

2. HYDROLYSIS

Enzymes break the long chains of sugars into individual sugar molecules such as glucose and xylose.

3. FERMENTATION

The sugars are fermented by naturally occurring bacteria, similar to those found in termite stomachs, to produce acetic acid.

4. ESTERIFICATION

The resulting acetic acid is combined with an intermediate product and converted to ethyl acetate.

5. HYDROGENATION

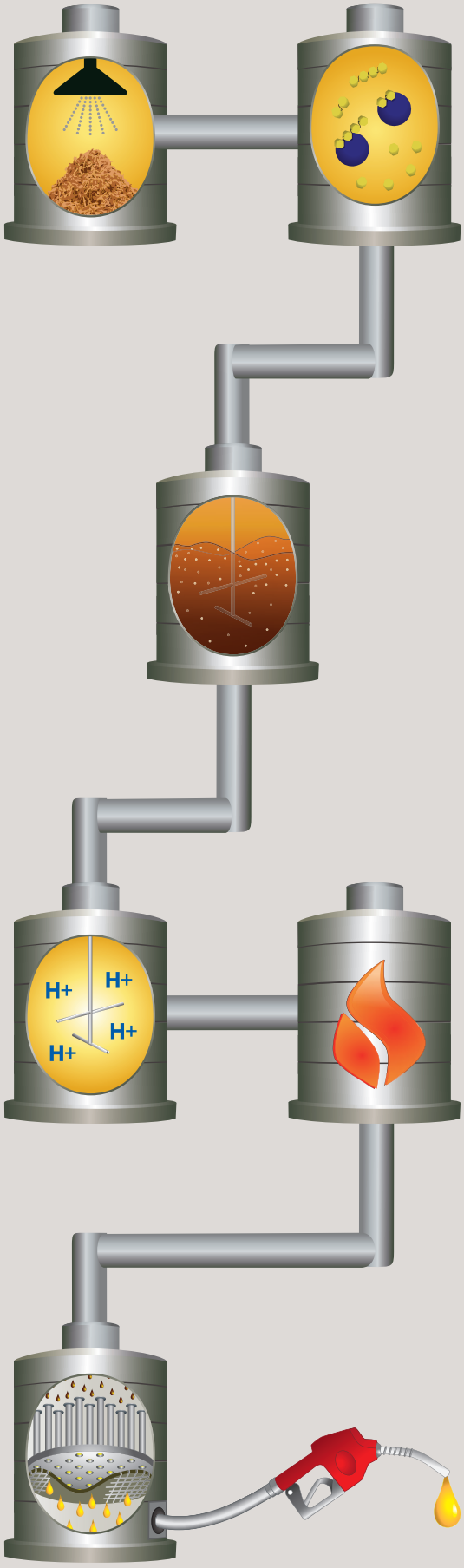
Ethyl acetate is then reacted with hydrogen with the presence of a catalyst to make ethanol.

6. ETHANOL DEHYDRATION

Ethanol is then dehydrated at high temperatures using an acid catalyst to produce ethylene and water. The water is reused in other parts of the conversion system.

7. POLYMERIZATION

The ethylene molecules are combined to create larger hydrocarbon chains. Additional hydrogen is added to these larger molecules to form bio-based hydrocarbon fuels, including gasoline, diesel, and jet fuel that are identical to traditional petroleum-based fuels.



TRANSPORTATION BIOFUEL PRODUCTS

Poplar can be converted into a variety of hydrocarbon fuels including gasoline, diesel, and bio-jet fuel. These bio-based transportation fuels are chemically identical to traditional petroleum fuels and can be used in existing engines and infrastructure.

WASHINGTON STATE UNIVERSITY EXTENSION

For more information contact WSU Extension
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hardwoodbiofuels.org

USDA

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