

Modularized Pyrolysis Biorefinery

Iowa State University, Easy Energy Systems (EES), and Stine Seeds are collaborating to demonstrate a transformative approach to processing lignocellulosic feedstocks into chemicals, fuel, power, and products. The team is pioneering a modularized pyrolysis system as one unit operation of a Modular Energy Production System (MEPS™). The unit operations of MEPS are designed as individual modules that are mass produced and transported as standard shipping container-sized units that can be quickly integrated in the field as a fully automated, operational biorefinery.

This new approach takes advantage of the modular manufacturing and marketing experience of EES and a research team from Iowa State University's world-recognized Bioeconomy Institute, a pioneer in new approaches to thermochemical processing of biomass.

The demonstration deploys three key innovations that address the historic intractability of lignocellulose:

- Passivation of naturally-occurring alkali and alkaline earth metals, particularly potassium, in biomass so these materials cannot catalyze thermal decomposition of cellulose to form light oxygenated compounds and thereby reduce yields of the desired fermentable sugars;
- Autothermal pyrolysis, a process that simplifies and intensifies the pyrolysis process and makes the modular approach viable by eliminating requirements for heat exchangers and other large ancillary equipment, while increasing feedstock throughput by as much as five fold without degrading product yield or quality;
- Bio-oil recovery from fast pyrolysis as distinct fractions, including a sugar-rich fraction (US Patent 8476480), a lignin-derived coal substitute (Lignocol™), and acetic acid.



Sugars



Lignocol™



Acetic Acid

The Market

EES has exclusive or co-exclusive license to these technologies and will manufacture and market these systems in conjunction with other proprietary third-party technologies it has already modularized, such as proprietary sugar-to-N butanol technology.

Units will be sold to companies and municipalities that have waste streams or distributed feedstocks with high levels of cellulose, such as waste management companies, food processors, and farmers who annually leave tons of unexploited low bulk density crop residues in their fields.

These customers will have a financially attractive means to convert their distributed and waste biomass into a valuable portfolio of fuels, power and chemicals. While valorizing their waste streams, customers will also be contributing to the goal of reducing carbon emissions.

For More Information

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