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Conversion of lignocellulose including biosolids and green waste to biogas

Lignocellulosic biomass is the most abundantly available raw material on the Earth for the production of biofuels. The conversion of lignocellulose into renewable energy and more valuable chemicals has been limited. Several methods for increasing the conversion of lignocellulose into energy by pretreating the feedstock have been developed, but all of the existing methods have large economic penalties, e.g. disposal of toxic wastes and greatly increased capital and operating costs. The discovery and characterization of *Caldicellulosiruptor* microbes; extremophilic organisms capable of solubilizing lignocellulose, suggested a possible solution to the economic problem of pretreatment. Beginning in 2014, recognizing the potential for anaerobic digestion of lignocellulose for biogas production, a multidisciplinary team including a biochemist, chemist, microbiologist and agricultural engineer, from Brigham Young and Utah State Universities has been conducting experiments to determine if we could break down lignocellulose feedstocks for later anaerobic digestion. The definition of breakdown in this case means conversion of organic solids in a high temperature vessel (175°C) containing *Caldicellulosiruptor bescii* into a type of tea that contains mostly acetate and lactate in water. Results

to date indicate nearly 90% breakdown in 18 – 24 hrs of certain plant materials including grass and leaves collected at municipal sanitary landfills. Perhaps the most significant results were that brewery waste that is somewhat refractory to anaerobic treatment could be partially broken down (50%) and even aerobic sludge from a wastewater treatment plant that was previously anaerobically digested in a mesophilic process and sun dried could be further broken down (additional nearly 40% destruction). This presentation will report the results of work we have done to take the process from the lab to the market; the hurdles to scaling and commercializing the anaerobic digestion of lignocellulose in an economically viable way.

Speaker Biography

Conly Hansen has completed his PhD in Agricultural Engineering from the Ohio State University and joined as a Project Engineer for United States Army (discharged as Captain). At present, he is working as a Professor and Graduate Program Director at Center for profitable uses of Agricultural Byproducts, USA. He has published more than 56 research articles in reputed journals along with 6 book and presented more than 38 presentations with abstracts in national/international conference/symposia. He has around 14 significant honors on his name.

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