Cellulosic Center and Economics of lignocellulosic biomass conversion

Ali Manesh, Ph.D., P.E.
CEO
American Science and Technology
Chicago, Illinois

Eric L. Singsaas, Ph.D.
Professor
University of Wisconsin Stevens Point
Stevens Point, Wisconsin

During the last few years, sugar has emerged as the main feedstock for the production of biofuels and chemicals. The cost availability of these fuels/chemicals vastly depends on the source of the sugar. Currently most of the processes are based on sugar from corn, cane, and beets; however the use of such food-derived raw materials is not sustainable. Although lignocellulosic sugar is sustainable, it has not yet been proven to be economically viable when compared to other food-based feedstocks. However, the new Organosolv process, which also produces pure lignin and organic solvents as byproducts, has proven to be a potential pathway for an economically competitive lignocellulosic sugar production. Over the last 10 years, American Science and Technology (AST) has developed processes to extract xylose, high quality fibers, glucose, Lactic Acid, organic solvents, and pure lignin from agricultural wastes and forestry products.

Currently AST's pilot plant includes a 20 kg biomass pretreatment reactor, a 650 L hydrolysis reactor, a 150 L fermenter, a 1 kg/h fluidized bed fast pyrolysis with in situ catalyst upgrade facility, a 7 kg/h auger type fast pyrolysis and a high temperature-pressure autoclave reactors. Since 2009, these equipments have been used to determine governing parameters for producing fiber, chemicals, sugar, pure lignin, biofuel and other high value byproducts. AST uses its proprietary patent pending process to break down lignocellulosic materials into various products.
Building on the current AST's capabilities, central Wisconsin’s powerful timber and agricultural processing, and the innovative research at the Wisconsin Institute for Sustainable Technology (WIST), a Cellulose Pilot and Processing Lab (PCCL) is being designed and developed to be operational by Mid 2015. PCCL will act as spring board for AST to collect the required data that will help to design a large scale biorefinery production plant. In addition, PCCL will bring together industry scientists, academics and entrepreneurs to support existing bioprocessing industries and accelerate the development of new renewably-sourced products, and provide a much-needed experimental and research facility.

The CPPL will comprise a two-ton-per-day pilot digester suitable for any pulping process such as Kraft, Organosolv, etc., a lignin recovery unit, a cellulose hydrolysis system, a fermentation facility, and a biopolymer production equipment. It will incorporate laboratory services with shared laboratory space for entrepreneurs to develop new industries based around harvesting, transporting, processing, and marketing of agricultural and forest products into new value-added materials, chemicals, fuels and services. These outcomes provide the foundation for new industry development based around green chemicals and

materials sourced from biomass and agricultural resources. The CPPL will expand on these by offering a unique set of services in a highly creative and entrepreneurial environment to support existing biomass processing industries and workforce as well as well as facilitate the development of these new processes and products by area entrepreneurs.