

University of Maine Chemical and Biological Engineering Biorefinery Update

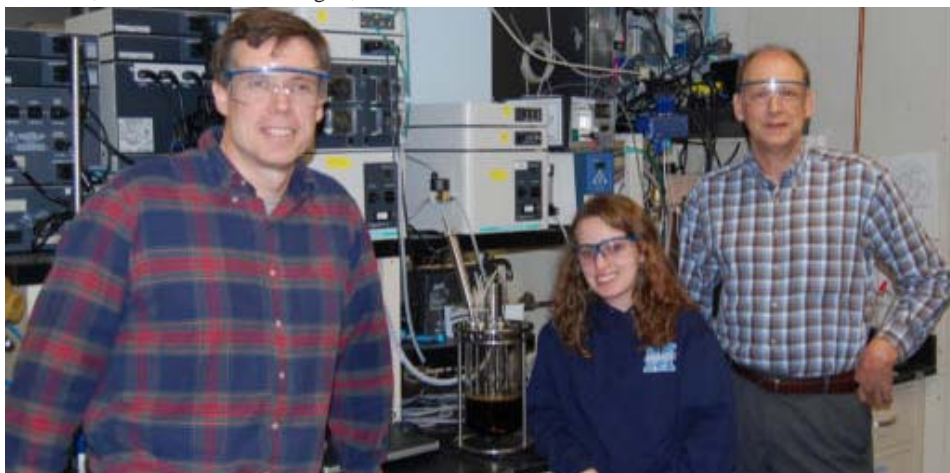
The University of Maine's proprietary "van Heiningen process" for hemicelluloses extraction from woodchips prior to pulping is moving towards technology deployment stage. The "van Heiningen process" is UMaine's patent-pending technology developed with grants from the Department of Energy on its Industries of the Future (IoF) program, the National Science Foundation on its EPSCoR program, and International Paper. This process is key to adding capacity of co-production of new value-added products like fuels, chemicals and polymers to existing pulp mills.

In Fall 2007, UMaine researchers (Peter van Walsum, Adriaan van Heiningen, and Sara

Walton) have fermented hardwood extracts obtained using the "van Heningen process" at a dissolved solids level of 6% without the need for any purification post-processing to remove inhibiting compounds. To date, yields from sugars have generally exceeded 80% of theoretical. Preliminary findings indicate that the organisms are acclimatizing to the extract and that conversion at higher levels of dissolved solids may be achievable. Recent results also suggest that large amounts of supplemental nutrients may not be necessary to enable conversion. Earlier work was limited to "model" mixed sugar solutions and concerns were expressed regarding possible inhibitory effects of sodium in real extracts. Current work with actual

extracts gives increased confidence in design concepts based on extract fermentation .

During December 2007, Red Shield Pulp and Chemicals has converted its two existing single-vessel digester systems to one, two-vessel digester system in the Old Town Mill. Andritz Inc., from Glens Falls, NY supplied engineering and equipment for this conversion. The existing chip feedline is used to feed woodchips to the second vessel which is used as a vapor phase impregnation vessel for extraction. Partially cooked impregnated chips are transferred with a new bottom circulation loop from the second vessel to the existing first vessel which is used as the main cooking vessel. Aqueous extract, rich in dissolved hemicelluloses, obtained using the "van Heiningen process" is to be taken out of the impregnation vessel, with a portion to be used for recirculation within the impregnation vessel itself and the remainder to be used for further conversion to ethanol. The new single two-vessel system has been running well for several weeks. Work on impregnation vessel extract management is now processing well without interrupting the production of salable market pulp production. Extract characterization is expected to provide data necessary to obtain ethanol co-production design parameters for the proposed satellite plant of 2 million gallons per year capacity. Work is underway to optimize the overall framework of an integrated forest product refinery.



Pictured from left to right are Dr. Peter van Walsum, Sara Walton, (Graduate Research Assistant) and Dr. Adriaan van Heiningen.