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PATENT POTENTIAL: CELLULOSIC ETHANOL

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This is the second of two articles on patent aspects of two exciting and emerging biofuel feedstocks: cellulose and algae. The first dealt with algae-based biofuel production, whereas here we focus on cellulose for producing ethanol.

The scientific and economic development of cellulosic ethanol may profoundly depend on the patent rights surrounding important technologies in the industry.

The general concept of using cellulose as an abundant albeit stubborn primary material for producing ethanol has been known for decades. Distilleries, for instance, have used various methods for breaking down some forms of cellulose to ferment the resulting sugars and distil out the alcohol. Nevertheless, innovations in cellulosic ethanol are needed to increase yields. Such innovations could occur in several categories to constitute patentable inventions: improved processes, new enzymes for breaking obstinate chemical bonds, separation techniques of lignin from hemicellulose, and even genetically engineered feedstocks that overproduce desired enzymes or otherwise facilitate treatment.

Various companies are involved in researching the bottlenecks plaguing cellulosic ethanol production.

Novozymes and Genencor International, two R&D juggernauts in the fields of enzymes and microorganisms, not surprisingly rely on patenting to protect their innovations. Novozymes reportedly has over a thousand active patent families, including patents drawn to enzymes for use in bioethanol production such as amylases, cellulases and xylanases.

Novozymes has also shown itself not to be shy about enforcing its patent rights in the biofuel industry, as it brought suit against Genencor International (since acquired by Danisco), for infringing its U.S. patent No. 6,867,031 entitled "Amylase variants." Novozymes' patent was found to be infringed by Genencor's Spezyme® Ethyl product and punitive damages totalling 8MM USD were awarded. Novozyme and

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Genencor International eventually settled the case for about 15MM USD and both continue to pursue patent applications geared to enzymatic cellulosic ethanol production.

To protect their research and operations at many different levels, logen Corp of Ottawa, Ontario, has filed for patents for enhanced expression of proteins in genetically modified (GM) fungi, GM microbes for better production of particular enzymes, upstream pre-treatment processes for feedstocks and downstream methods of processing lignocellulosic feedstock to produce ethanol.

As is the case for algae-inventions, it seems that patenting in the field of cellulosic ethanol is being pursued by players of all kinds. From energy giants like Lockheed Martin Energy Systems and its affiliates, to start-ups like Enerkem, to several individual inventors, patent rights seems to be distributed throughout the industry.

Other companies that have filed for patents for cellulose-related biofuel technologies include Renessen, Zeachem, Prokaria, Waste Energy Integrated Systems, Calgene, Novo Nordisk, Bioenergy International, Bio-industries, Controlled Environmental Systems Corp, Solvay Enzymes, and Parsons & Whittemore.

Not to be outdone, many Research Institutes, Universities and Departments of State (especially the United States Department of Energy) also hold patents or applications in the field.

In addition, the distillery industry is one that has long been interested in valorizing starchy slurries via saccharification and ethanol production. Companies like National Distillers and Chemical Corp that hold saccharification patents may have a strategic position in the adjacent ethanol biofuel industry.

Cellulosic ethanol has been experiencing a period of intense innovation and patenting. The race to innovate and grab market share is undoubtedly on, and patenting has been and will continue to be an integral part of the equation.

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