

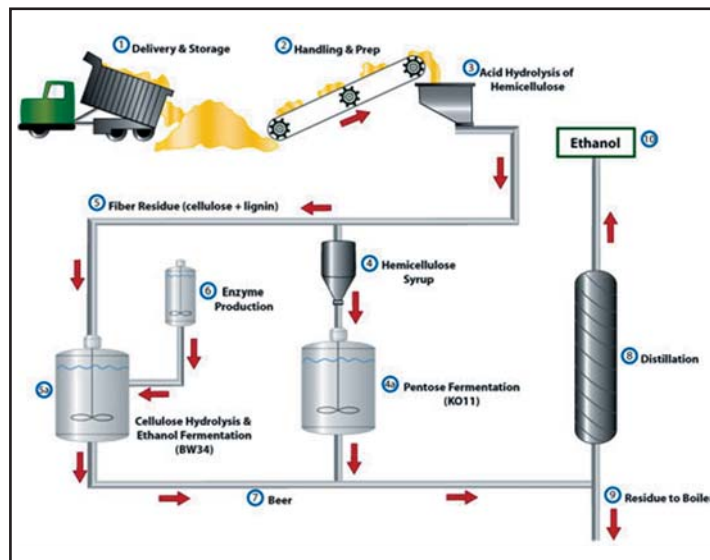
ENERGY TRENDS

Cellulosic ethanol plant based on agricultural waste

A biorefinery built to produce 1.4 million gallons of ethanol a year from cellulosic biomass has opened in Jennings, La. Built by Verenum, Cambridge, Mass., the plant will make ethanol from agricultural waste left over from processing sugar cane. The facility will enable the company to evaluate its process for making ethanol at a commercial scale, and validate cost and performance assumptions to prepare for the development of its first series of commercial plants. This phase puts Verenum on

track for its goal of beginning construction in the middle of next year on a 30 million-gallon-per-year commercial plant, which will be the first of its kind, located in the southeastern United States.

Verenum's technology enables almost complete conversion of all the sugars found in cellulosic biomass. It is based on a combination of acid pretreatments, enzymes, and two types of bacteria to make ethanol from the plant matter. This efficiency advantage, combined with the low input cost of cellulosic biomass, results in superior economics in the production of ethanol.



Lithium-ion battery electrode made of Li-Fe phosphate

A lithium-ion battery electrode material made from nanoparticles of lithium iron phosphate modified with trace metals has reportedly been developed by A123 Systems, Cambridge, Mass. The resulting batteries are unlikely to catch fire, even if crushed in an accident. Called Nanophosphate lithium ion batteries, they are also much more durable than conventional lithium-ion batteries: A123 predicts that they will last longer than the typical lifetime of a car, about 15 years.

The A123 batteries for GM's Volt store enough energy for 40 miles of driving, enough to cover daily commutes. (On longer trips, the small gasoline engine would kick in to recharge the battery, extending the range to more than 400 miles.) GM plans to sell the vehicles for around \$30,000 to \$35,000.

In addition to being safer than other lithium-ion batteries, A123's operate at a lower temperature, which makes it simpler to pack hundreds of them together into a large battery pack.

Versions of A123's batteries can deliver as much power as nickel-metal hydride batteries at one-fifth the weight.

For more information: Yet-Ming Chiang, A123 Systems, Watertown, MA 02472; www.a123systems.com.

The process begins when the cane is ground up and cooked under high pressure with a mild acid to hydrolyze the hemicellulose and separate it from the cellulose. The five-carbon sugars in hemicellulose are then fermented via genetically modified *E. coli*. The cellulose is broken down with enzymes and fermented with another type of bacteria. This bacteria also produces enzymes that break down cellulose, cutting in half the amount of enzymes needed from outside sources. The product is dilute ethanol, which is then distilled to make fuel. www.verenum.com

Hydrogen fuel produced from formic acid and amine

A way to convert formic acid into hydrogen gas at low temperatures has been reported by researchers at the Leibniz Institute of Catalysis, in Rostock, Germany. New research shows that formic acid could be used as a safe, easy-to-transport source of hydrogen for fuel cells.

BRIEFS

Auburn University announces that the **U.S. Department of Energy** is funding AU's **Center for Actinide Science** to find chemical compounds that would combine with radioactive elements, allowing them to be safely stored without risk of radiation leakage. The nuclear material would be recycled for future use in energy production. www.auburn.edu

BASF SE has announced plans for a significant expansion of its production plant for the biodegradable plastic Ecoflex at the company's Ludwigshafen site. The move will raise Ecoflex production capacities from the current 14,000 by 60,000 metric tons per year. Production at the expanded plant will commence in the third quarter of 2010. Ecoflex is a petrochemicals-based plastic which has the properties of conventional polyethylene but is fully biodegradable in accordance with DIN EN 13432 requirements. www.basf.com

Brad Foote Gear Works Inc., a wholly owned subsidiary of **Broadwind Energy Inc.**, has purchased 14 additional advanced gear manufacturing systems from **Hofler Company**, Eitlingen Germany. This brings the number of Hofler machines the company owns to 29. With the new equipment, Brad Foote's annual production will grow from the current equivalent of 2000 MW of installed wind turbine capacity to more than 5000 MW.
www.broadwindenergy.com

Curtiss-Wright Corp. has signed an agreement with **Westinghouse Electric Company LLC** to provide reactor coolant pumps (RCP) for up to four AP1000 Generation III+ commercial nuclear power plants, or a total of 32 RCPs. In conjunction with the agreement, Curtiss-Wright has received purchase orders valued in excess of \$300 million to supply the first 24 domestic AP1000 RCPs. The RCPs will be used in Westinghouse's AP1000 design reactors, which will produce 1100 megawatts each.
www.curtiss-wright.com

EverPower Renewables Corp. has broken ground on the Highland Wind Project in Southwestern Pennsylvania, which will include 25 Nordex N90 turbines, which could produce more than 164,000 megawatt-hours of power annually.
www.everpower.com

Goodfellow Cambridge Ltd., parent company of **Goodfellow Corp.**, Oakdale, Pa., has acquired **Technical Glass Company**, a UK-based supplier of ceramics, ceramic components and specialist glass for scientific and industrial applications.
www.goodfellow.com

Reactive NanoTechnologies Inc., developer and manufacturer of NanoFoil, has secured an additional \$7.5M in financing led by partners of the Masdar Clean Tech Fund, which focuses on the development and commercialization of technologies in renewable energy, energy efficiency, and carbon management.
www.rntfoil.com

The U.S. Department of Energy recently released a report, "20 Percent Wind Energy in 2030," which examines the technical feasibility of harnessing wind power to provide up to 20% of the nation's total electricity needs by 2030. Most notably, the report identified opportunities for 7.6 cumulative gigatons of CO₂ to be avoided by 2030, saving 825 million metric tons in 2030 and every year thereafter if successful.
www.energy.gov

Victrix has launched a microsite that will showcase how Victrix PEEK polymer products solve the demands of the energy industry.
www.victrixenergy.com

While hydrogen produced by this method might not be placed in fuel-cell vehicles anytime soon, the researchers say that the process could produce sufficient quantities for micro fuel cells that power portable electronic devices, such as cell phones and laptops.

The new process works at temperatures of 26 to 40°C. The researchers mix formic acid with amines and expose the mixture to a ruthenium-based catalyst, which breaks down the acid into hydrogen and carbon dioxide.

Tekion, based in Burnaby, Canada, is working with BASF, the largest producer of formic acid, to commercialize a fuel cell that uses formic acid directly. Tekion, which does not have a product on the market yet, claims that its formic-acid fuel cells are smaller and less complex than direct methanol fuel cells. However, both technologies are less efficient than hydrogen fuel cells.

For more information: Matthias Beller, Leibniz Institute of Catalysis, Rostock, Germany; tel: 49(381)1281-113; Matthias.beller@catalysis.de; www.catalysis.de.

DOE to advance U.S. wind power manufacturing capacity

The U.S. Department of Energy announces a Memorandum of Understanding (MOU) with six leading wind industry turbine manufacturers: GE Energy, Siemens Power Generation, Vestas Wind Systems, Clipper Turbine Works, Suzlon Energy, and Gamesa Corporation. The two-year collaboration is designed to promote wind energy through advanced technology research and development, and siting strategies aimed to advance industrial wind power manufacturing capabilities.

Under the MOU, DOE and the six turbine manufacturers will collaborate to gather and exchange information to define specific needs for achieving 20% wind energy by 2030.

In 2007, U.S. cumulative wind energy capacity reached 16,818 megawatts, with more than 5000 MW of wind installed in 2007. Wind contributed to more than 30% of the new U.S. electricity generation capacity in 2007, making it the second largest source of new power generation in the nation, surpassed only by natural gas. The U.S. wind energy industry invested approximately \$9 billion in new generating



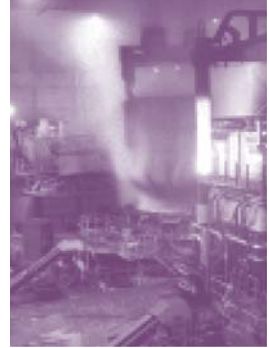
Wind sparring

This power platform designed by Norway's StatoilHydro uses a spar buoy, a common technology in its offshore oil and gas operations, to place a conventional wind turbine in waters up to 700 meters deep — multiplying the sites available for offshore wind parks. The company expects to be operating a full-scale device off Norway's North Sea coast by next fall. Image courtesy StatoilHydro

capacity in 2007, and has experienced a 30% annual growth rate in the last five years. <http://www1.eere.energy.gov/windandhydro/>

Carbon nanotubes could replace platinum in solar cells

A film of carbon nanotubes may be able to replace two of the layers normally used in a solar cell, with improved performance at a lower cost, according to a team of researchers from the Santa Fe Institute, Michigan State University, and Columbia University. Currently, these solar cells, called dye-sensitized solar cells, have a transparent film made of an oxide that is applied to glass and conducts electricity. In addition, a separate film made of platinum acts as a catalyst.



The American Iron and Steel Institute (AISI) reports that steel import permit applications for the month of April totaled 2,911,000 net tons (NT). This was a 14% increase from the 2,546,000 permit tons recorded in March 2008, and also a 16% increase from the March preliminary imports total of 2,513,000 NT. Import permit tonnage for finished steel in April was 2,217,000 NT, an increase of 7% from the preliminary imports of 2,064,000 NT in March. For the first four months of 2008, total steel imports were 10,574,000 NT, down 8% from the 11,504,000 NT imported in the first four months of last year. Total steel imports for 2008 would annualize at 31.7 million NT, or 5% below the 2007 12-month total. www.steel.org

However, the oxide films can not easily be applied to flexible materials: they function much better on a rigid and heat-resistant substrate such as glass. In addition, expensive equipment is necessary to create the platinum films.

The researchers found that a single layer of carbon nanotubes could replace both the oxide and platinum layers, but they needed to increase the catalytic activity. Previous theory had suggested that materials may function better as catalysts when they have tiny defects, providing sites for chemicals to attach. So the researchers tried exposing the carbon nanotubes to ozone, which roughs them up a bit. Very thin films, they found, became dramatically better catalysts, with more than a ten-fold improvement.

For more information: Jessika Trancik, Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, NM 87501; tel: 505/946-2794; trancik@santafe.edu; www.santafe.edu/~trancik.

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