Low-cost process produces natural gas from algae

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(PhysOrg.com) -- A new method for converting algae into renewable natural gas for use in pipelines and power generation has been transferred from the Department of Energy's Pacific Northwest National Laboratory to the marketplace under a license between Genifuel Corporation and Battelle.

The method, called catalytic hydrothermal gasification, creates natural gas out of algae - more quickly, more efficiently and at higher yields than other biofuel processes. Genifuel expects the process also requires less capital investment. The license agreement moves this technology for renewable energy production a step closer to commercial reality. Battelle operates PNNL for DOE.

"Algae and other aquatic biomass hold significant promise for our country's ability to produce renewable energy domestically," said Genifuel President Jim Oyler. "At Genifuel we have developed efficient growth and harvesting techniques for the aquatic biomass. With this gasification process, we can convert the biomass to a clean fuel that is almost completely carbon-neutral."

He calls the PNNL process an "elegant system," noting that more than 99 percent of the biomass is gasified to produce renewable natural gas and byproducts such as carbon dioxide which can be recycled and reused in the algae growth ponds.

PNNL originally developed the catalytic gasification process to clean up industrial and food processing waste as an alternative to incineration. Over the past 10 years, PNNL scientists advanced the technology to include a more stable catalyst that enables it to also convert wet biomass, such as algae. PNNL has tested the gasifier with terrestrial plants, kelp and water hyacinths. It works especially well for aquatic biomass such as algae, because the feedstock doesn't require drying before fuel production.

Battelle granted Genifuel an exclusive license for the technology. As a national laboratory, one of PNNL's missions is to advance science and technology toward solutions that industry can take to the marketplace.

"Electricity produced from this natural gas can help electric utilities meet Renewable Portfolio Standards that require renewable energy sources," Oyler said. "Existing natural gas pipelines can deliver the fuel, or it can be used to produce electricity onsite in conventional natural-gas turbine generators."

The PNNL gasifier runs at relatively low temperatures - 350-degrees Celsius compared with 700-degrees or more for other systems - in a small stainless steel reactor.

According to Doug Elliott, the PNNL scientist who invented the gasification process, "It is simple - we put wet biomass like algae in the gasifier, where it is catalytically converted, and we collect fuel gas and byproducts.

"It's serendipity that our system creates carbon dioxide as a byproduct that Genifuel needs naturally to grow the algae," he said. "It's a completely green process."

Compared with other methods of gasifying biomass, such as anaerobic digestion, PNNL's process works 400 times faster and gives higher yields.

While simple in concept, the science behind the gasification process is actually quite complex. The technology has been under development for a number of years. PNNL scientists have achieved significant advances in the chemistry of catalysts and the selection of the optimum temperatures and pressures for the process, as well as improving the

systems to protect the catalyst from impurities in the biomass.

PNNL scientists have extensive expertise in catalysis and reaction engineering, with particular focus on solutions for efficient use of bioproducts, converting biomass and renewable feedstocks to fuels and chemicals, and reducing environmental emissions.

Genifuel grows aquatic biomass, such as algae, in shallow ponds or troughs, then harvests and processes the biomass for conversion using the PNNL technology. Water used in the growth ponds doesn't have to be high-quality fresh water, and can be treated wastewater, brackish or alkaline water, or even salt water, Oyler said. Non-crop land can be used, so the process doesn't compete with food production.

Provided by Pacific Northwest National Laboratory (news : web)