Synergies that Save — Cellulosic Ethanol & Power Plants

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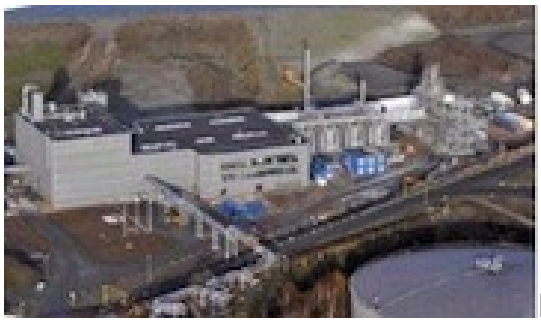 New reports surface almost daily that add to ethanol's credibility as a fully viable energy alternative. Last week at the International Fuel Ethanol Workshop, POET — the world's largest ethanol producer — shared the results of an independent lifecycle analysis that concluded that ethanol produced by Project LIBERTY (POET's first planned cellulosic ethanol plant) would reduce carbon emissions by 111 percent over gasoline.

This means that POET's cellulosic ethanol can actually result in negative emissions — offsetting more greenhouse gas emissions than it produces. And a new report released by the United States Department of Agriculture (USDA) concludes that current ethanol plants yield "a substantial net energy gain."

Exciting breakthrough technologies continue to be announced for both starch and cellulosic ethanol — in the form of new feedstocks, improved fermentation efficiency and production processes, and new co-products that make ethanol even more economically and environmentally sustainable.

Efforts within the biofuels industry to make cellulosic ethanol more commercially viable are especially increasing. Biomass feedstocks are in abundant supply, and the reduction in CO_2 emissions is impossible to ignore, as is the potential of cellulosic ethanol to boost energy independence and create jobs.

Co-location of a cellulosic ethanol facility and a coal-fired power plant is one strategy that holds promise. Joining these industries in the same location can result in significant economic and environmental benefits for both, in the form of feedstock sharing, cost savings and regulatory compliance.

A power plant that is co-located with a cellulosic ethanol facility can benefit from co-firing lignin in its coal boilers to produce electricity. Lignin possesses high BTU levels and is a clean burning substrate. These properties make it an effective power source that results in much lower carbon emissions than those produced by burning coal. This environmental benefit is increasingly relevant in light of the current Renewable Portfolio Standard (RPS) state regulations that could become federal policy in the future.

An RPS requires electricity providers to produce a certain percentage of power from renewable energy sources within a set timeframe. There are currently 30 states including the District of Columbia with some form of RPS, with goals ranging from 10 to 50 percent of electricity produced from renewable sources within the next 20 years. Eligible sources of the renewable energy include hydro, wind, solar, geothermal and biomass.

Clear benefits of RPS policies include improved energy security, reliable energy delivery, and protection against fossil fuel price and supply volatility. There are also significant environmental effects, such as improved air, soil and water quality.

Power plants moving towards ‘green electricity’ production are expected to pay more to purchase biomass than coal, but an effective co-location setup can still result in profit for both the electricity and ethanol producers. Lignin is basically a by-product for the ethanol facility, and it must either be turned into landfill waste or burned into steam and electricity at a relatively high cost, but it has significant value for the power plant.

A similar tradeoff occurs when the power plant’s excess steam and electricity (which is currently wasted) is sold to the ethanol plant for heating its tanks and evaporators. This exchange allows the ethanol producer to realize a significant capital cost savings — up to one third — by avoiding the need to invest in onsite cogeneration equipment, including a lignin-fueled boiler and turbine generator system.

Besides these environmental and economic advantages, other benefits to the power plant include a more cost competitive power supply, capacity increments that meet load growth, portfolio diversity and increased local control of supply assets.

Co-location brings considerable value to the cellulosic ethanol plant as well, through both direct cost savings and operational efficiency. In addition to lower capital and equipment costs, the expenses for labor, warehousing, site development and energy can also be reduced. Other benefits include flow integration, value-added waste stream recovery, and the sharing of management and overhead expenses.

The ethanol plant also gains additional industrial infrastructure and a market for its lignin by-product. Furthermore, onsite generation results in a more reliable and affordable supply of both power and steam. Co-location further reduces the carbon footprint of an ethanol plant and allows it to be more competitive via its decreased operating costs.

In addition to these synergies, co-location of ethanol and power plants contribute significant economic development to their community in the form of new jobs.

A recent Novozymes case study explored various co-firing and co-location production scenarios. Our process modeling showed that in situations where a green electricity premium of $30 per MWh is charged, an ethanol price of approximately $2.10 per gallon (before any ethanol subsidies) is the break-even

point for a co-location producer.

Ethanol prices above this amount would allow the producer to make more money producing ethanol from just the cellulose and hemicellulose (and burning the lignin separately for power) than by burning the whole biomass feedstock. This same model showed that when no green electricity premium is included, the break-even price for the cellulosic ethanol is approximately $2.35 per gallon (pre-subsidy).

With plans in place for a growing number of bio-electricity plants, there is some concern about competition for biomass feedstock between power and cellulosic ethanol producers. Experts at Novozymes are not subscribing to this theory.

Novozymes Global Business Development Manager Cynthia Bryant explains: “We don’t see this as an ‘either/or’ situation. Instead, we believe that it is feasible to optimize the feedstock to meet the needs of both the ethanol and electricity industries. When effective co-location strategies are put into place, any increase in startup costs is well worth the investment because of the higher return in the end.”

For more information, please contact Cynthia Bryant, Global Business Development Manager at Novozymes, or visit www.novozymes.com/en [1].

Links:
[1] http://www.novozymes.com/en