

Ethanol plowing the way toward biocrude development

By David Lias

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When it comes to all sources of power, corn ethanol provides the worst energy return on investment.

The technological breakthroughs that have allowed corn to be an energy source for several decades now, even with the inefficiencies involved, are allowing scientists and researchers to plow new ground in the area of research and development of biofuels that could one day be as economical and practical as today's fossil fuels.

That was the message of Richard Sayre, Ph.D., who gave the keynote address Tuesday evening during IdeaFest being held at the University of South Dakota in Vermillion.

Sayre spoke in the Muenster University Center on the USD campus.

Legislation passed by Congress in 2007 to establish the renewable fuel standard serves as the foundation of the United States' energy policy. This bill set mandates that must be met throughout the years, and in 2010, the U.S. hit the production cap of ethanol provided by the legislation.

Future milestones set by Congress through 2022 and beyond include the addition of advanced biofuel feedstocks. Those biofuels' sources include cellulose materials and biocrude made from algae.

The 2007 legislation has helped generate new start-up companies, has helped people into developing advanced

biofuels, and has required the petroleum industry to purchase advanced biofuels.

"It's safe to say at the present time that this is not efficient to push the economy in a more sustainable direction," Sayre said. "Those of us that are interested in the (energy) industry and where it is going have come to the recognition that what is needed to pull the industry, in terms of investment and building the infrastructure necessary for a sustainable energy economy is a carbon tax or a cap and trade system.

"Without that kind of economic incentive, the big dollars, I mean billions that are required to build this industry, are not going to be invested in pushing this industry forward," he said.

Sayre is currently a senior research scientist at Los Alamos National Laboratory (LANL) and the New Mexico Consortium (NMC). His research centers on processes of photosynthesis, algal and plant biotechnology, and nutritional biofortification of crop plants.

Los Alamos may best be known as the birthplace of the first atomic bomb. National security remains at the forefront there, as the LANL continues its research in biofuel production.

"There is a major focus on energy security. That is part of trinity of security areas that the national lab at Los Alamos focuses on today," Sayre said.

Topics of interest to scientists at the lab, besides national security, include climate change and its effect on weather, oceans, glacial and climate modeling.

The lab is also researching environmental stress, and water remediation.

Sayre's specialty is biofuels. The lab is also researching solar and nuclear energy.

"Much of our defense budget is focused on securing a safe and constant energy supply throughout the world," Sayre said.

Another focus of the lab is the development of "the next generation of energy-generating systems," he said.

Bringing the best energy return on investment currently are fossil fuels, including shale gas, coal and petroleum. A major disadvantage of these energy sources, Sayre noted, is the high amounts of carbon emissions that are the byproduct of burning them.

The U.S. economy has moved very rapidly to being based on natural gas, thanks to fracking and the discovery of new reserves of natural gas.

"That has been very, very good for carbon emissions, because burning natural gas emits about half as much carbon as burning coal," he said. "The largest gains that we've made in the past few years in reducing carbon emissions in the United States are based on two criteria: one is the switch from coal to natural gas, and two is the downturn in the economy.

"It's not about bringing new technologies on board; the reasons our carbon emissions are dropping in the United States are largely due to economic factors influencing the selection of fuels and the quantity of fuels being used," Sayre said.

Corn-based ethanol has an energy return on investment (EROI), on a scale of 100, of about 2. Researchers' goals are to develop new biofuels with an EROI of greater than 10.

"South Dakota is a state that has a lot of interest in biofuels, and reasonably so," he said. "There are a number of advantages that biofuels have, and one of the points that I think is particularly important is not only do we reduce carbon emissions, but we also reduce particulate emissions and sulfur emissions. Their emissions are substantially cleaner."

Sayre, through his involvement with a number of energy consortiums in the United States, is in regular communication with individuals involved in the petroleum industry, including Honeywell UOP, a company that has constructed half of the world's oil refineries.

"In discussions with their vice president for research, UOP will openly say that if they had their choice of feedstocks to run their refineries, that their first choice would be biofeedstocks," he said. "In other words, biomass, for a number of reasons, but most importantly because it's so clean, and the emissions that are released from it are substantially reduced."

Those low emissions have a positive impact on catalysts that are used in refineries to convert feedstock into fuel, and it has impacts on engine life in the long term.

"The major constraint that we're addressing in biofuels is the source of our ultimate energy

input, and of course, that's the sun," Sayre said. "The density of solar energy on the surface of the earth is really quite low, so the question then is how do we harvest that energy as efficiently as possible?"

Current technology in the field of biofuels is focused largely on the production of ethanol that is blended with gasoline.

"There are other alternatives. The latest technologies produce a new kind of product called biocrude," Sayre said. "This technology involves high pressure and heat transformation of the biomass into a product that, if you look at it in a flask, looks just like petroleum. This biocrude is very high in energy density. It's very similar to petroleum."

Biocrude not only has twice the energy density of ethanol, but it is also compatible with the world's current infrastructure for petroleum.

"That includes the transport, the oil pipelines, the refinery, it's the combustion engine - it's the whole, complete nine yards," he said. "That is a very important factor. What it means is we don't have to rebuild our energy infrastructure, which is a \$1 trillion expense."

IdeaFest is an annual event at USD celebrating student research, creative scholarship and academic engagement. Undergraduate and graduate students in all disciplines present their work in oral and poster presentations, live performances, readings, exhibits, and displays.

VERMILLION POLICE DEPARTMENT PRESS BRIEFING

03/30/14 05:14 – Officers responded to a medical call and assist a man who had broken his leg. Care was provided until the ambulance arrived.

03/31/14 13:58 – Officers responded to a noise complaint about loud music coming from a vehicle. The man in the vehicle was contacted and did not have ID but provided a name. The man turned off the music and walked into a nearby residence. Records check showed the name the man gave did not come back to anyone. Additional investigation revealed the man had given a false name and had a warrant for his arrest out of Minnesota for felony drug dealing. Officers went to the residence the man had entered and were initially told the man had left. A search of the residence found the man hiding in a closet under some clothes. He was arrested for false information and the arrest warrant.

03/31/14 20:47 – Officers assisted a university police officer who had arrested a man who was kicked out of the Dome for drinking during a concert and had returned.

04/02/14 18:44 – Caller reported her young son and been assault by another child. The case was investigated and information was forwarded to the States Attorney.

04/02/14 23:39 – Officers responded to a domestic dispute between an adult daughter and intoxicated mother. The mother assaulted the adult daughter in front of the officers and was arrested for domestic assault.

04/04/14 21:40 – Caller reported being threatened by a woman. Investigation showed the woman in question had tried to enter a contest and was told the contest was for men and the deadline for signing up was past. When told this she made a vialed

statement that was not a direct threat but could be intimidating. No crimes were committed.

04/05/14 00:26 – Officers were called to a report of a fight. While attempting to locate the participants or potential witnesses, officers contacted a young woman was drunk. The woman was under 21 and was cited for underage consumption.

04/05/14 01:30 – Caller requested assistance removing two drunken subjects from the home of a friend who was in custody. Officers contacted the subjects and found the caller was the responsible party for the residence. One of the drunken subjects was on probation and not allowed to drink. The court services officer was notified and requested the man be arrested. A later drug test showed the man had been consuming marijuana.

04/05/14 10:54 – A mother in Colorado called and asked us to

check the welfare of her adult son who she had not heard from in several days. Officers located the son and contacted him and gave him the message to contact his mother. Officers called the mother and assured her that the son was all right.

04/05/14 12:41 – Caller reported a drunken woman and entered the caller's residence looking for a relative of the caller. The caller had ordered the woman to leave but she refused only leaving when the police were called. The drunken woman was arrested a short time later threatening another woman. Charges of trespass were referred to the state's attorney.

04/05/14 12:44 – Caller requested help with a domestic dispute. Officers found that two adult women who had been living together were in a dispute because one was moving out and when asked for the key threatened to beat the other woman up. Since

there had been repeated violence in the past the threat was taken seriously. Officers arrested the suspect for domestic assault.

04/05/14 18:44 – Fraud alert: Caller received a call from an automated line reporting that her credit card had been compromised. The next prompt asked her to enter her bank account information to verify her identity. She terminated the call and contacted her bank, which confirmed her suspicions that the call was a fraud and an attempt to steal her banking information.

04/05/14 20:51 – Officers were called an

escalating argument between two adult sisters. The argument was over the rights of one remove personal property from the home of the other as she was moving out. Officers stood by to insure no physical violence occurred.

04/05/14 23:41 – Caller reported the side mirror of his vehicle had been broken while the vehicle was parked on the side of the road. Investigation revealed this was likely not caused by a collision with another vehicle but was rather an intentional act.

Total Records: 14

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Wakonda Heritage Manor
Avera Health

The Wakonda Heritage Manor is looking to fill the following positions:

- CNA'S DAY & NIGHT
- RN'S AND LPN'S 12 HOUR ROTATING DAY & NIGHT SHIFT

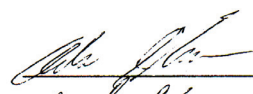
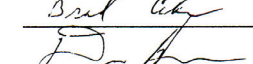
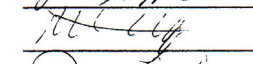
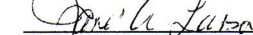

Interested candidates contact
The Wakonda Heritage Manor
605-267-2081

ATTENTION TAXPERS: NOTICE OF PROPERTY TAX INCREASE OF \$20,000. RESOLUTION FOR OPT OUT

The Governing Board of Meckling Township do state that the above said board is unable to operate under the tax limitation measure currently in statute. We therefore OPT OUT of such tax limitation in the amount of \$20,000 starting with calendar year 2014 taxes payable in the calendar year 2015. This opt out will be for 10 (ten) years, which be through taxes payable in the calendar year 2024. This action has been taken by the board and approved by at least a two-thirds vote of the board.

This decision may be referred to a vote of the people upon a petition signed by at least five percent of the registered voters in the district and filed with the governing body within twenty days of the first publication of this decision.

Unless this action is referred to a vote of the people and reversed by such vote, this resolution authorizes the county auditor to spread an excess levy to raise tax dollars in the above stated amount.

 Andrew Johnson, Chairman
 Brad Cuka, Board Member
 David Hanson, Board Member
 Michael Slattery, Treasurer
 Jane Larson, Clerk

March 27th, 2014

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CONCRETE MATERIALS
Concrete Materials of Yankton is looking for drivers for our Ready Mix trucks.

Class B CDL and DOT Medical card required, or must be able to obtain. This is for local deliveries only and you are home every night. If you would like to know more, visit our website at www.cmcsd.com/employment or stop by our location at 2210 Alumax Rd. EOE and Drug Free Workplace

