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NEWS

UI study finds benefits in burning oat hulls for thermal energy

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Biofuel use is a well-known contributor to meeting sustainability goals at the University of Iowa. Since 2003, UI has used oat hulls sourced from Quaker Oats in Cedar Rapids to generate electricity, heating and cooling on campus.

Several chemistry department faculty and students recently completed a study of gas and particle emissions from co-firing coal and two types of biomass versus straight coal at UI's main power plant.

Researchers also found that using oat hulls with coal reduced carbon-dioxide emissions by 40 percent and significantly reduced the release of particulate matter, hazardous substances and heavy metals.

“The UI is working toward meeting a goal of using 40 percent renewable energy by 2020,” said Betsy Stone, an assistant professor in UI's chemistry department. “Part of their plan to achieving that goal is the use of biofuel, which is a renewable source of energy, instead of fossil fuel, in this case coal.”

The group was interested in understanding how using biomass instead of coal changed emissions released into the atmosphere, Stone said.

“When burning 50 percent oat hulls and 50 percent coal, we saw a big reduction in criteria pollutants compared to burning 100 percent coal,” she said. “When I say ‘criteria pollutants,’ I’m talking about things like fossil carbon dioxide, sulfur dioxide and particulate matter.”

Use of the 50/50 mixture reduced the mass of particulate matter by 90 percent, Stone said.

While overall CO₂ emissions were constant among the three fuels used in the study — straight coal, 50/50 oat hulls/coal, and 3.8 percent wood chips/96.2 percent coal — the use of plant material makes the process more sustainable, Stone said. Biomass takes CO₂ out of the atmosphere and incorporates it into the plant. When it's burned, CO₂ is released.

“It's considered to be a renewable fuel because we have that carbon cycle going on,” Stone said. “With fossil fuels, we're releasing fossilized carbon. It goes into the atmosphere and takes millions of years to get back to fossilized form again.”

The major take-home message is there is a significant reduction in fossilized CO₂, sulfur dioxide and particulate matter, which is beneficial to people living near the power plant, Stone said.

“I thought the study was definitely encouraging and in line with our thoughts that biomass is good for the environment,” said Ben Anderson, UI power plant manager. “Overall, the results are encouraging and provided assurance we are going the right way with the biomass project.”

The biomass project brings the renewable component to the plant, but is also a component of fuel diversity, he said.

“That's really important for reliable operations,” Anderson said. “Natural gas markets have been known to spike from a cost perspective. If there is a problem with pipeline transport, we can use the biomass and still keep this plant online.”

Maureen McCue, coordinator for Iowa Physicians for Social Responsibility, noted important considerations of this study, including locally sourced fuel options and the avoided cost of buying and shipping coal. McCue called UI's biofuel efforts "a good use of a resource that might otherwise go to waste."

“The mixture avoids some of the known adverse health effects associated with burning more coal,” McCue said in an email. “There is no health benefit to anyone unless you assume burning coal is obligatory/unavoidable and thus count as benefited the person(s) who would have been impacted by more coal.

“It's like saying not hitting your head with a hammer is a health benefit,” she added. “No one wants to risk their health breathing coal emissions or headaches by hammer if there are alternatives.”

More about the project

More information about the University of Iowa biomass project can be found at sustainability.uiowa.edu/initiatives/biomass-fuel-project/power-plant/.