TECH TALK TUESDAY

Exploring Science Frontiers

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Cleaning the Air

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BATON ROUGE -- Millions of years ago ocean beds became the repositories of the hydrocarbons -- oil and gas -- we use as fuel. Now scientists are looking at ways to put the carbon dioxide released by burning those fuels back into the ocean deeps.

A proposal by LSU scientists to do just that has won a grant from the U. S. Department of Energy. The scientists -- chemical engineering chair Carl Knopf, chemical engineering professor Kerry Dooley and professor of oceanography Robert Gambrell -- received the go-ahead recently to develop a means of increasing the quantity of attached -- as distinguished from free-floating -- microalgae in shallow estuarial waters.

"Attached microalgae are 20 times more efficient in the fixation of carbon dioxide than their unattached counterparts," Dooley said.

The researchers propose to do this with "reef-balls" -- large, hollow half-spheres of specially made concrete. The idea is to use the attached microalgae to remove carbon dioxide from the water, which will in turn absorb it from the atmosphere. When the algae die or are consumed, they will eventually become part of the sediment of the seafloor, replicating the process by which carbon dioxide was stored in fossil fuels more than 60 million years ago.

The trick to getting microalgae to establish themselves on the reef-balls is making the concrete pH neutral, Knopf said. Normal concrete is too alkaline for microalgae, and in

the year or so it takes for seawater to neutralize it, other organisms not as sensitive to alkalinity have already attached, preventing the microalgae from doing so.

The reef-balls will be made pH neutral by the application of high-pressure carbon dioxide while the concrete is still wet, Knopf said. In addition, the wet concrete will be treated with foaming agents to give the hemispheres a sponge-like texture with a greater surface area. Nutrients that microalgae feed on can be added to the mix.

"A one-meter hemisphere can remove one ton of carbon dioxide a year," Knopf said. U.S. power plants generate approximately 1.7 billion tons of carbon dioxide a year, about 20 percent of the world's carbon dioxide emissions, according to Dooley.

Another advantage of the concrete hemispheres is that they will act as an artificial reef, providing habitat for fish and other marine creatures, Dooley said.

Increased efficiency might be obtained by injecting carbon dioxide into the water near the fixed microalgae, or putting the reef-balls in the vicinity of such injection wells to give them a rich carbon dioxide environment in which to grow.

The development of artificial reefs with the reef-balls is part of the Department of Energy's "Global Climate Change -- Novel Concepts for Management of Greenhouse Gases" program. The LSU researchers could receive more than $700,000 over the next five years to develop their ideas.

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