

ENERGY

Soybean oil extends diesel fuel

George Washington Carver would no doubt be proud to see what Louisiana State University researchers are doing with the soybean. LSU engineers are blending diesel fuel in mixes with 10-, 20- and 40-percent soybean oil to power nonmodified single-cylinder research engines and multicylinder tractor engines. So far, they have found no sign of a change in horsepower for the soybean-oil blends — coined diesel — although the thermal efficiency per unit of fuel increases slightly with soybean oil.

The flash point for diesel blends was identical to that for diesel fuel when the soybean-oil content was held to 30 percent or less, the LSU team has found; higher oil levels increased the flash point. (Diesel mixes with more than 40 percent soybean oil proved too viscous at ambient temperature for the fuel-distribution systems of multicylinder tractor engines to handle smoothly.) Although exhaust smoke from diesel is more visible than that from diesel fuel, diesel gases contain fewer sulfur compounds, making them seem less hazardous, according to B.J. Cochran. They are also less irritating to the eyes.

If the hybrid fuel received tax breaks similar to those now afforded gasohol, preliminary LSU estimates project that the cost of diesel could be competitive with standard diesel prices.

Diesel's sulfury breath

Though they log only about five percent of the total miles traveled in the United States, diesel-fueled vehicles have been estimated to contribute as much as one-third of the sulfate (SO_4^{2-}) emissions produced. One of the reasons why is that diesel fuel generally contains 0.2 percent sulfur by weight, roughly an order of magnitude more than gasoline. But lowering diesel-sulfate emissions may prove a thornier problem than merely decreasing the fuel's sulfur content because, as Ford Motor Co. researchers now show, diesel-sulfate emissions are not proportional to fuel-sulfur levels. In fact, they report in the September *ENVIRONMENTAL SCIENCE AND TECHNOLOGY*, the sulfur to sulfate conversion ratio increases as the fuel's sulfur level decreases. In characterizing the diesel vehicle's metabolism of sulfur, Timothy Truex and colleagues also noted that sulfuric acid (H_2SO_4) is the predominant sulfate species belched from diesel engines.

Gasing down coal-sulfur emissions

There has been more than a little concern in research circles about what the effect will be of implementing the Carter administration's proposed Powerplant Fuels Conservation Act. Its goal — converting 51 existing power plants from a diet of oil to coal — could result in the dumping of an additional 340,000 tons of sulfur-oxides into the atmosphere annually — about one percent more than current levels. But the American Gas Association claims to have a solution that would permit the conversion to occur without any increase in national sulfur-oxide output. Their proposal: Gas up those coal stokers.

Termed the "select" use of gas, utilities would burn a limited quantity of natural gas (a much cleaner-burning fuel) — either in the same boiler that burns coal, or in separate boilers at the same facility. Environmental Protection Agency figures suggest that to convert the above-mentioned power plants to coal without raising SO_x emissions, the coal-to-gas ratio burned would have to average 62 percent to 38 percent. In other words, the increased use per year of 280 to 460 billion cubic feet of gas (a one to three percent increase nationally) would permit burning an additional 42 million tons of coal annually without increasing sulfur emissions, according to AGA vice president Benjamin Schlesinger.

ENVIRONMENT

Coal wastes form ash-sludge reef

Two weeks ago 500 tons of concrete-like blocks were dumped three miles off Fire Island, N.Y., in 65 feet of water. The artificial reef they form — roughly five feet high and 200 feet to 300 feet long — is an experimental laboratory to test the safety of dumping at sea the silty fly ash and gooey sludges from a coal plant's stack-gas scrubbers.

The reef represents the wastes from a single day's operation of a 500-megawatt power plant, says Dean Golden, project manager at the Electric Power Research Institute in Palo Alto, Calif. Preliminary estimates suggest creation of waste reefs may prove economically attractive for coastal utilities that now haul coal wastes more than five or 10 miles to landfill dumps.

Combined with lime and occasionally cement, the coal wastes were cast into 8 x 8 x 16-inch bricks at a conventional concrete-block plant. Laboratory tests suggest that the material will dissolve slowly, a characteristic Golden describes as desirable.

Marine scientists have experimented with artificial reefs — using anything from construction rubble to sunken "liberty" ships — as a way to control shore erosion and increase coastal fisheries. Together with several government agencies, over the next three years EPRI will monitor this reef and its already-present marine community. In addition, EPRI is exploring freshwater waste reefs.

Portable PCB transmutation

A process to inexpensively strip chlorine atoms from PCB (polychlorinated biphenyl) molecules — converting them into stable, nontoxic and disposable residues — will be demonstrated Oct. 2 for 18 Environmental Protection Agency officials in Ohio. Sunohio, developer of the PCBx process, which it hopes to market and license, claims that details such as the commercial reagent employed must remain proprietary. Reactors mounted atop tractor trailers will travel to cleanup sites where PCB-contaminated oil and fluids are to be processed. Fluids exit clean and reusable, the Canton, Ohio, developers claim.

The economists' environment

"Have environmental and health/safety regulations played a significant part in the economic downturn of the 1970s?" That's the question Gregory Christainsen, Frank Gollop and Robert Haveman of the University of Wisconsin were commissioned to explore for the Office of Technology Assessment by the Senate Commerce Committee. And their 94-page analysis, published last month by the Joint Economic Committee, confirmed that at least the environmental sector had a notable impact: "A reasonable estimate would attribute from 8 to 12 percent of the [nation's macroeconomic] slowdown to environmental regulations."

Productivity-growth rate is the key indicator of economic performance they analyzed because it "summarizes in a single measure changes in both outputs and inputs." (Simply, productivity is output per unit input.) As such, the authors say, it provides a convenient measure of the efficiency with which an economy is operating. According to their study, "environmental regulations may have reduced the annual rate of productivity growth by as much as a quarter of a percentage point during the mid-1970s," but maybe by as little as 0.1 percentage points. In contrast, they found the effect of health/safety regulations on overall productivity to be "slight" and found that any increase in the inflation rate by these regulations "is likely to have been temporary." What's more, "[e]mpirical work to date indicates that the effect on the nation's unemployment rate is probably less than one-quarter of a percentage point during the 1970s."