ENERGY

Food or fuel: The liquids dilemma

In the continuing search for alternatives to petroleum-based liquid fuels, some researchers probe the exotic. Take South Africa, which is investigating the potential of sunflower oil to power domestically manufactured diesel engines. Government researchers logged 100 hours of tests at a federal diesel-research facility before deciding to scrap the promising option as being too costly. Recent spiraling increases in oil-import prices, however, have rekindled the sunflower fever.

Alcohols — used alone or as a part of a blend in gasohol — are analyzed in "Food or Fuel: New Competition for the World's Cropland," a Worldwatch Institute report published last week. "As countries turn to alcohol distilled from agricultural commodities as a source of fuel for automobiles, more and more farmers will have a choice of producing food for people or fuel for automobiles," writes Worldwatch president Lester Brown; "they are likely to produce whichever is more profitable." The agricultural economist goes on to project that "the price of oil may soon set the price of food." And he adds that crop shifts to fuel cut back the grain available for export.

In some cases, measures that reduce oil imports may be as important and effective as producing alternate new sources of fuel. For example, working with statistics from the Environmental Protection Agency's 1980 new-car-mileage-rating table, Brown calculates that banning automatic transmissions in all new automobiles (except those for the handicapped) "would save more fuel by the mid-eighties than [President Jimmy Carter's] ambitious alcohol fuel program is expected to yield." While the concept requires that drivers sacrifice some comfort, "this should be weighed against the worldwide social costs of diverting food production resources to energy crops," he says.

The magnetic heat pump

Capitalizing on the fact that some magnetic materials become warmer in the presence of a magnetic field, cooler when removed from such a field, researchers at the National Aeronautics and Space Administration's Lewis Research Center in Cleveland have developed a magnetic heat pump. Key to the system is gadolinium, a rare-earth metal whose temperature can fluctuate as much as 57°F when a strong magnetic field is applied and then rapidly removed. (And it will do this at room temperature.)

But the maximum temperature differential possible has been expanded for the heat pump with creation of a "regenerator" — a fluid-filled tube suspended vertically inside a doughnut-shaped electromagnet and about a cylindrical, stainless-steel canister containing gadolinium. Filled with a 50:50 mix of alcohol and water, the regenerator tube is the only moving part of the pump; both the magnet and canister of gadolinium are anchored in place.

As the regenerator slides up and down between the anchored parts, the gadolinium alternately finds itself at opposite ends of the regenerator. The result is an alternate heating and cooling of the regenerator fluid. Repeating the pumping has a cumulative effect making the hot end progressively hotter, the cool end cooler.

When circulated through copper tubes across which a fan blows air, the liquid can be harnessed to heat or cool a home, office or commercial freezer. Expected to prove up to 20 percent more efficient than conventional electric heat pumps, NASA Lewis engineers believe it may eventually replace all but the smallest conventional heat pumps. Further major refinements might even open it to specialty applications, such as liquefying low-boiling-point gases such as helium and hydrogen. During tests of the pump last year, peak temperatures of 131°F and −21°F were achieved.

EARTH SCIENCES

Flood deaths down in 1979

California's recent rain-lashing is certain to make 1980 a record flood year, but 1979 will go down as one of the least devastating — in terms of flood-claimed lives — of the decade. Floods in 1979, resulted in 100 deaths and caused $4 billion in property losses, compared with 1973, during which floods claimed 550 lives and $4.4 billion in damage, according to the National Oceanic and Atmospheric Administration.

The decline in deaths was partially attributable to better forecasting by the National Weather Service, says NOAA administrator Richard A. Frank. Frank also notes a U.S. Corps of Engineers estimate that better forecasts accounted for about $1.9 billion of the $19 billion damage that was averted by preventive flood measures last year.

Texas was hardest hit by 1979 floods, claiming about half the year's property damages and 15 of the lost lives, according to NWS's Jose Marrero. Nearly half the 1979 deaths were the result of flash floods and, as in the past, most were children or elderly persons. All the deaths were related to automobiles and road washouts, according to NOAA.

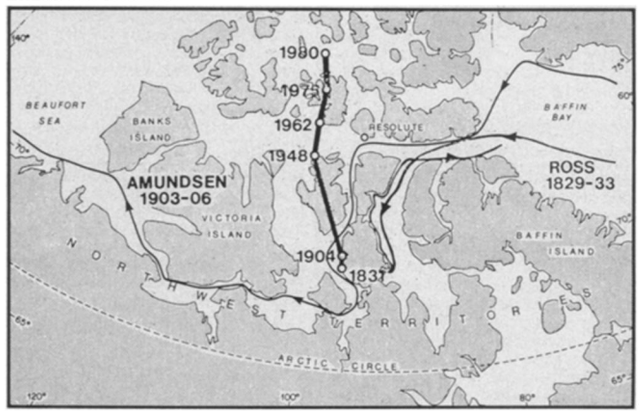
Tracking magnetic north

The magnetic north pole "is the point on the earth's surface, some 1,400 kilometers distant from the north geographical pole, to which a magnetic compass should lead a traveller starting from any other point," says geophysicist Paul H. Serson. "There would be no rest for the traveller upon reaching the pole, however, since it is in continuous motion."

Serson should know. Now director of the Division of Geomagnetism in Canada's Department of Energy, Mines and Resources (EMR), he has been pursuing the north magnetic pole for 35 years. And, as illustrated below, the job has kept him on the move.

British explorer James Ross was the first to pinpoint the magnetic pole on June 1, 1831. His journey, along with that of Roald Amundsen, the next explorer to reach magnetic north, is traced in the illustration. Since then, the Canadian government has taken responsibility for following the pole.

The elusive pole makes measurable day to day as well as year to year excursions, which are believed to be caused by the same fluid motions of the earth's core that create the geomagnetic field, Serson explains in a recent issue of EMR's GEOS. Every 24 hours the pole makes an elliptical path centered on a mean position for the day; disturbances in the geomagnetic field may change the size of the ellipse. The mean position of the pole moves about 0.1° per year. At present, says Serson, it is moving north by 24.4 km per year and west by 5.4 km per year and is located just south of King Christian Island, one of the Queen Elizabeth Islands.



Serson/Geos