ENERGY

Janet Raloff reports from the 12th Intersociety Energy Conversion Engineering Conference in Washington

Heat pipes for hostile environments

Heat pipes, devices that transfer heat, show great promise for recovering waste heat from 200 °C to 600 °C gas streams. Recovered heat saves fossil fuels and can be used to preheat water or air; in some applications it may even generate power.

The Hughes Aircraft Co. in Torrance, Calif., is experimenting with ceramic and ceramic-coated metal heat pipes which can withstand hot, corrosive environments such as exist in incinerators, coal gasifiers and sulfur plants—conditions under which ordinary heat pipes can't survive, says A. Basiulis of Hughes. Material stress and cracked coatings are just two of the problems that plague materials that must withstand a temperature gradient of 300° C to 500° C within only one inch.

Heat pipes with three new coatings that have already proved successful in laboratory tests will be installed in the stream exiting a coal gasifier at the Morgantown Energy Research Center in West Virginia. Initial tests will run 300 hours to measure external damage. Later, "lifetime" tests will measure internal gas generation, mass transport of chemicals and diffusion of gases in and out of the pipes.

Superheating reactor steam

Burning coal in a fluidized bed (SN: 8/27/77, p. 134) to superheat a nuclear reactor's steam output increases the efficiency not only of the reactor but also of the coal combustion, according to B. B. Gamble and J. C. Corman of the General Electric Co. The resulting cost of generating electricity can be as much as 20 percent lower than using a conventional steam plant with stack-gas cleaning. The reason, they say, is because reactor safety prevents steam output at temperatures above 500° F to 600° F. By using coal to increase the steamcycle temperature of a nuclear plant, the reactor's efficiency increases from 33.2 percent to as much as 35.2 percent, and the efficiency of a fluidized bed from 34 percent to as much as 39.7 percent.

In its tests, GE burned particularly "dirty" Illinois No. 6 coal, containing almost 4 percent sulfur, in both atmospheric and pressurized fluidized beds. Results were compared with solvent-refined coal burned in a conventional furnace and high-Btu coal gas burned in a pressurized furnace. Atmospheric fluidized bed coal offered the most efficient combustion and the lowest cost electricity.

Gas heat pumps for cold climates

Electric heat pumps, the only kind now available, operate well in warm climates, but their efficiency falls as the temperature differential between heat source and heat sink increases. If outdoor temperatures go below 40°F, the heat pump must be backed up by costly resistance heating. A gas heat pump under design by Consolidated Natural Gas Service Co., however, preheats incoming air with exhaust from its turbine, thereby narrowing the source-to-sink ratio and raising efficiency, according to Paul Swenson of CNG. It should operate very efficiently down to 15°F and continue working, albeit less efficiently, even if temperatures fall below zero.

Although heat pumps can either heat or cool, the gas heat pump is most efficient when heating; an electric heat pump is most efficient when cooling.

Swenson says a gas heat pump will probably cost up to 50 percent more than an electric one, but it should cost only one-third as much to operate—meaning it could pay for itself with savings in only two years (at current gas prices and assuming continued natural gas availability). A prototype of the CNG heat pump is due to begin testing soon.

ENVIRONMENT

Bowhead vs. Eskimo

Whaling villages on the northern coasts of Alaska are making impassioned pleas before the National Marine Fisheries Service this week for exemption from the proposed international ban on killing endangered bowhead whales. For more than 1,000 years, the bowhead has been a focal point of Inupiat (native Eskimo Indian) culture. Each spring and fall, they harvest the giant behemoth. Within hours of beaching their prize, whalers butcher and cart off the entire carcass to divide among the village with ceremonial ritual. Their culture and nutrition is tied to the whale.

This year, however, the International Whaling Commission voted to ban all bowhead slaughter. Indigenous aboriginal cultures, often exempted from commercial bans on the harvest of threatened (and some endangered) species, were specifically included on the IWC's recommended ban of the bowhead, whose northwest Arctic population is estimated at about 1,500.

Ebon Hopson, mayor of Alaska's North Slope Borough, said before an Aug. 8 Washington hearing that, regardless of whether the United States decides to enforce a ban, "we Inupiat will always hunt the bowhead .... You can intimidate and arrest us. You can even use force and violence. Come what may, our people will be on the ice leads next spring poised in our eternal hunt."

Friends of the Earth, an international environmental group, sided with the Eskimos, but called for a quota on the Inupiat harvest. Although it would normally support efforts to protect endangered species, this case was special; it said the bowhead and Eskimo cannot be separated, adding, "If we are to speak in support of one and not the other, we are very apt, in the long run, to lose both." The Environmental Defense Fund, the National Wildlife Federation and many smaller groups opposed the Eskimos' pleas for exemption. In cautiously worded testimony, the National Audubon Society said it could only "reluctantly" endorse the ban at this time.

The one common area of agreement for all who testified was that too little is known about the bowhead generally, and about the Inupiat in the white man's world.

Drinking glasses and lead

All drinking glasses decorated with something other than gold or semi-precious metals contain lead, according to the Aug. 29 CHEMICAL AND ENGINEERING NEWS. Pictures decorating glasses contain up to 10 percent lead, by weight. Preliminary findings indicate that lead may leach off by coming into contact with acids in beverages, or by someone licking the paint or possibly handling the glass with sticky fingers and then touching the mouth. Scientists are still unsure about whether there is any health hazard.

Penthouse pool—for bees

Persuading bees to pollinate fields and produce honey is difficult when temperatures climb. The bees turn their efforts, instead, to air conditioning. Bees without water die within 24 hours at temperatures above 100 degrees; fanning their wings over water cools the inhabitants of the hive by evaporation. One device that makes water gathering more efficient is a honeycombed pool that fits atop the hive and contains three gallons of water. At the bottom of the pool's liner is an opening through which a sponge-like material is inserted that draws water like a wick. Bees drink from the sponge without drowning, and a floating board provides bees a raft in case the sponge overflows. The pool for bees was developed in conjunction with pesticide research by Joseph O. Moffett and Arthur L. Wardecker of the Agricultural Research Service in Tucson, Ariz., and Adair Stoner of the University of Wyoming.