ENERGY

Gas turbine tests shale oil

Recent tests confirm shale oil as a potential replacement for more conventional petroleum products in industrial powerplants. Under an Electric Power Research Institute contract, United Technologies and the Long Island Lighting Co. (LILCO) burned 32,000 gallons of the viscous oil — generating 305 megawatt-hours of electricity — in a LILCO gas-turbine engine.

LILCO's Island Park generator was chosen because it permitted automatic and repeated switching between the fuels under comparison — No. 2 home heating oil and shale oil — without shutting the engine down. In addition, its exhaust stack was already equipped with detectors to monitor engine emissions.

Results of the tests, conducted in August, are still being analyzed. Preliminary findings, however, indicate that emissions from the combustion of shale oil were similar — except for nitrous oxides (NO_x) — to those from conventional fuels. Even shale oil's naturally high nitrogen levels — 0.4 to 0.5 percent — were brought under control; adding water to the fuel, a common technique, quenched NO_x emissions by roughly half. Although shale oil's high viscosity — it won't pour at room temperature — had initially caused some concern, maintaining it at 150°F to 180°F with mobile heaters and insulation blanketing crucial machinery kept it flowing reliably.

Courting a wood renaissance

Use of "humanity's oldest fuel" is likely to increase by at least 50 percent, according to a study released last week by the Worldwatch Institute in Washington. Perhaps more surprising, "Wood has recently surpassed nuclear power as a source of energy in the United States and could provide up to one-fifth of the country's energy by the year 2000," the report says.

The skyrocketing cost of home-heating oil is fueling the domestic wood renaissance. Prices for oil rose from 12¢ a gallon in 1972 to more than $1 in 1980. (And with President Reagan's full decontrolling of oil prices last week, the average cost of heating oil by summer could well exceed $1.25 a gallon.) "Since a cord of well-seasoned hardwood contains roughly as much energy as 150 gallons of heating oil," writes Worldwatch's Nigel Smith, it already "pays to switch to an efficient wood stove if a cord can be purchased for less than $150." Those with access to free wood save more. Three to eight cords will heat most homes (depending on house size and insulation). A power saw will prepare six of those cords — roughly the equivalent of $900 worth of heating oil — on only $10 to $15 worth of gasoline.

It's worth moving to wood heat from natural gas only if hardwood costs less than $70 a cord. (That assumes wood contains a heating value of 22.5 million Btus per cord and the wood stove operates at 50 percent efficiency.) Where consumers pay 5.8¢ per kilowatt-hour (the national average in late 1980) for electric heat, wood conversion pays where cords cost less than $190.

Many in the United States have already recognized wood's economy. Wood-stove sales jumped from less than 200,000 in 1972 to 1.5 million in 1979 and are holding at around 1 million annually. But mirroring that increase has been a jump in wood-stove emissions. Haze from residential wood stoves and hearths "has reached alarming proportions" in parts of New England and the western states, Smith says. And "ironically," he notes, "the more efficient airtight cast-iron stoves now selling so well generally produce more of the hazardous particulates than traditional open hearth fires do because the stoves burn wood more slowly." Already there is speculation about whether residential smokestack scrubbers may be required to limit emissions. Some cities, like Vail, Colo., have taken another approach: New-housing permits limit each dwelling to a single wood stove.

ASTRONOMY

Suggestion of a quasar cluster

One of the things that some astronomers have always said about quasi-stellar objects, or quasars, since their discovery two decades ago is that they are somehow related, in a physical or evolutionary sense, to ordinary galaxies. For a number of years it was a very few astronomers who said that. Now more and more astronomers are finding (or finding again) relationships of this sort.

In the most recent ASTROPHYSICAL JOURNAL LETTERS (Vol. 242, p. L55) a group of well-known quasar observers — E. Margaret Burbidge, Vesa T. Junkkarinen, Alan T. Koski and Harding E. Smith of the University of California at San Diego and A. A. Hoag of the Lowell Observatory in Flagstaff, Ariz. — present evidence for the possible existence of a cluster of quasars near the galaxy M82.

Plates of the sky field around M82 show three objects that on examination turned out to be quasars with very nearly the same redshift in their light, about 2 in each case. If the redshifts are regarded as due to the expansion of the universe, the quasars would all be about the same distance from the earth, and from that their distances from each other can be calculated. The dimensions of the group (3 megaparsecs across) make it plausible to assume some physical relation among them. At that distance they might be the three brightest of a cluster of quasars, most of which are invisible to us.

Galaxies customarily group in clusters. One of the objections to supposing a relation between quasars and galaxies is that known quasars appeared to stand alone. If quasars cluster — and especially if they cluster with galaxies — they come to seem more similar to galaxies.

Another suggestion relating quasars and galaxies is that quasars are ejecta from the energetically active centers of galaxies. This group of observers suggests, as an alternate possibility, that the three quasars they have found were shot out by M82, but in that case, the observers say, it is puzzling that the differences among the quasars' redshifts (and so the differences among their velocities) are not greater than they are.

Quasar fuzz for 3C273

Astronomers have also suggested that quasars might themselves be the active centers of galaxies, either centers that had never developed galaxies or centers for which the surrounding galaxies were too faint to be seen from earth.

In fact, luminous "fuzz" has been found around a number of quasars. In recent years spectra of the fuzz have been obtained in a few cases and shown to be similar to the spectra of known elliptical galaxies.

To the ranks of fuzzy quasars now comes the brightest known quasar, one of the most famous and one of the nearest, 3C273. In spite of its nearness and possibly because of its brightness, the image of 3C273, its shape and size, had never been well resolved. S. Wyckoff of Arizona State University at Tempe, P.A. Wehinger and T. Gehren of the Max Planck Institute for Astronomy at Heidelberg, West Germany, D.C. Morton of the Anglo-Australian Observatory in Siding Spring, Australia, A. Boksenberg of University College London and R. Albrecht of the University of Vienna report in ASTROPHYSICAL JOURNAL LETTERS (Vol. 242, p. L59) that they have succeeded in doing so. Sharpening the image of 3C273 revealed a nebulosity around it too.

The observers were able to identify a few emission lines in the spectrum of the nebulosity and determine from their redshifts that the nebulosity is physically associated with 3C273. Furthermore, spectroscopic and photometric data together indicate that the dominant emission of the nebulosity is continuum (or white light) radiation typical of the smearing together of stars in a galaxy.