ENERGY

Insulated windows

On July 16 President Jimmy Carter's cooling and heating limits in public buildings went into effect. The temperatures in these buildings should not go lower than 78°F in the summer or higher than 65°F in the winter. Water heater temperatures will be lowered to 150 degrees. All this should save the nation between 195,000 and 390,000 barrels of oil a day, according to the Department of Energy, which claims that nearly a quarter of the energy consumed goes to space heating and cooling and to heat water.

As part of a national energy conservation effort, one particular energy waster in buildings will have to be taken to task: the window. Compared with an insulated wall, even a double-paned window is a virtual flood-gate of heat and cold into a building. The thermal resistance (R) of an insulated stud wall is 11, as compared with 1.8 for a double-paned window; the window loses heat six times faster than the wall and twice as fast as an uninsulated concrete floor, according to a University of Wisconsin study. Adding a third pane increases the R-value to 2.4, but is much less cost-efficient, the study says.

One solution is to insulate the window itself, first by weather stripping to eliminate drafts, and then by adding a thermal cover. One such cover already on the market is the Window Quilt, developed by Appropriate Technology of Brattleboro, Vt. It is literally a foil-lined quilt that rolls down the window and is air-sealed on all four sides. The foil reflects heat and the seals create a dead air space for insulation. A double-paned 15-square-foot window will lose 2,394 Btu's of heat during a 24-hour period at an average outdoor temperature of 30°F when covered by a Window Quilt — less than one-third the loss without the Quilt. That's an R-value of 5.2 for the Quilt-covered window, they say. A Window Quilt that size costs about $40. Appropriate Technology claims the Quilt can cut heating bills by half.

Forging reflectors

In metal processing, heat is a prime ingredient. Metals must be heated to temperatures of 1,000°F to 2,400°F and often must remain that hot while being moved from one processing step to another. All the while the metal glows a familiar red-orange, losing surface heat at rates of 7,000 Btu to 90,000 Btu per hour per square foot. Thermal radiation accounts for 80 to 90 percent of the heat lost in the metal itself, and the equivalent heating value of 60 barrels of oil per day from large open furnaces, according to Charles A. Berg, who recently patented a device to reduce the wasted heat.

Berg has designed a multifaceted reflecting panel, known as Pyreflex radiant heat recuperators, which have been tested by his company, Pyreflex Corp., of Buckfield, Maine, and by the Owens-Illinois Corp. The tests showed that the panels reduced radiant heat losses from a 1,500°F source by between 46 percent and 91 percent.

The recuperator panels are made of a number of hexagonal reflecting cells with three facets each, 2 inches square. The facets are highly reflective to infrared radiation, sending the heat back to its source the way a bicycle safety reflector reflects a car light. As the heat is reflected back, less heat must be generated, and so fuel is saved. And it also means an increased production rate, which saves time and money, and less chemical deterioration of the metal, caused by repeated heating and cooling as it goes from the furnace to the forge. The end product should be cheaper and of higher quality, Berg told SCIENCE NEWS.

Owens-Illinois is now using one of Berg's panels and is licensed to use more. Berg also is negotiating a sale with another major forging company, and has patents pending on other optical devices to control high temperatures in industrial processes — devices that also can lessen production costs.

A former MIT professor, deputy director of engineering at the National Bureau of Standards, and chief engineer of the Federal Power Commission (until 1974), Berg is now a private consultant. He has noticed "a potential technological watershed" brought on by the energy crunch. Industries, pressed to reduce production costs by reducing the energy they use, are seeking out "new concepts of processing technology" such as his, rather than refining old concepts. For many, it is the first time in more than 100 years, he says.

A call for gasohol

The pace of the gasohol saga is picking up. During the first week of July:

- Amoco decided to take the plunge as the first major oil company to set up a test market for gasohol. Five stations will be selling Amoco's gasohol in Ottumwa, Iowa, and six other midwestern towns for the next year. The gasohol will be one part ethanol and nine parts unleaded gasoline and will sell for the price of premium, says Amoco spokesman Carl Mayerdirk.
- DOE came out with its alcohol fuels report on July 11, calling ethanol "the only alternative fuel commercially available now, and the only one likely to be available in quantity before 1985." By 1982, ethanol production is expected to rise from 4,000 barrels per day to 20,000, extending gasohol supplies to 3 billion gallons per year, or three percent of present consumption. Methanol is expected to play an even larger role because it can be produced from coal as well as from biomass (organic wastes) and can be used in turbines for power as well as in motor vehicles. It will also be cheaper than ethanol at about 50 cents a gallon as compared to ethanol at $1.00 a gallon (with improvements in technology). Alcohol fuels should improve the environment, the report said, by recycling previously discarded waste materials. Even methanol made from coal "appears to be more environmentally benign" than coal combustion alone.
- Senator Frank Church (D-Idaho) held a hearing on July 12 on Title 9 of the "Energy Supply Act of 1979," which requires that all gasoline sold by 1990 contain a 10 percent blend of ethyl alcohol. Church chided the administration and DOE for "timid thinking" on gasohol and said "we cannot afford to poke around." Alvin L. Alm, head of DOE's alcohol fuels task force, outlined DOE's incentives to encourge gasohol development, and William H. Podolny of United Technologies Corp., said that gas turbines run just as well or slightly better on alcohol as on conventional fuels. But Weldon Bardon, director of the Agriculture Department's Energy Office, said the Title 9 goals would require too much of the domestic grain supply. For a 5 percent alcohol blend by 1985, more than 2 billion bushels of corn would be needed (although two-fifths would be recoverable as protein). That would mean a boost in the price of other foods — meat and soybeans, for instance. Bardon advised a more conservative goal, such as a one percent blend by 1982.

Facts to know and tell

- According to 1979 World Bank figures, the average yearly per capita consumption of energy (measured in coal equivalents) in less developed countries is 52 kg; in middle income countries, 524 kg; in industrial countries, 5016 kg; and in the United States — 11,000 kg.
- A study prepared by System Consultants, Inc., for DOE, predicts that a typical consumer will spend more than 20 percent of after-tax income on energy by 1985 — based on the rising price of oil, which affects the price of petroleum-based products from phonograph records to polyester shirts, as well as gasoline, says the July 16 BUSINESS WEEK.