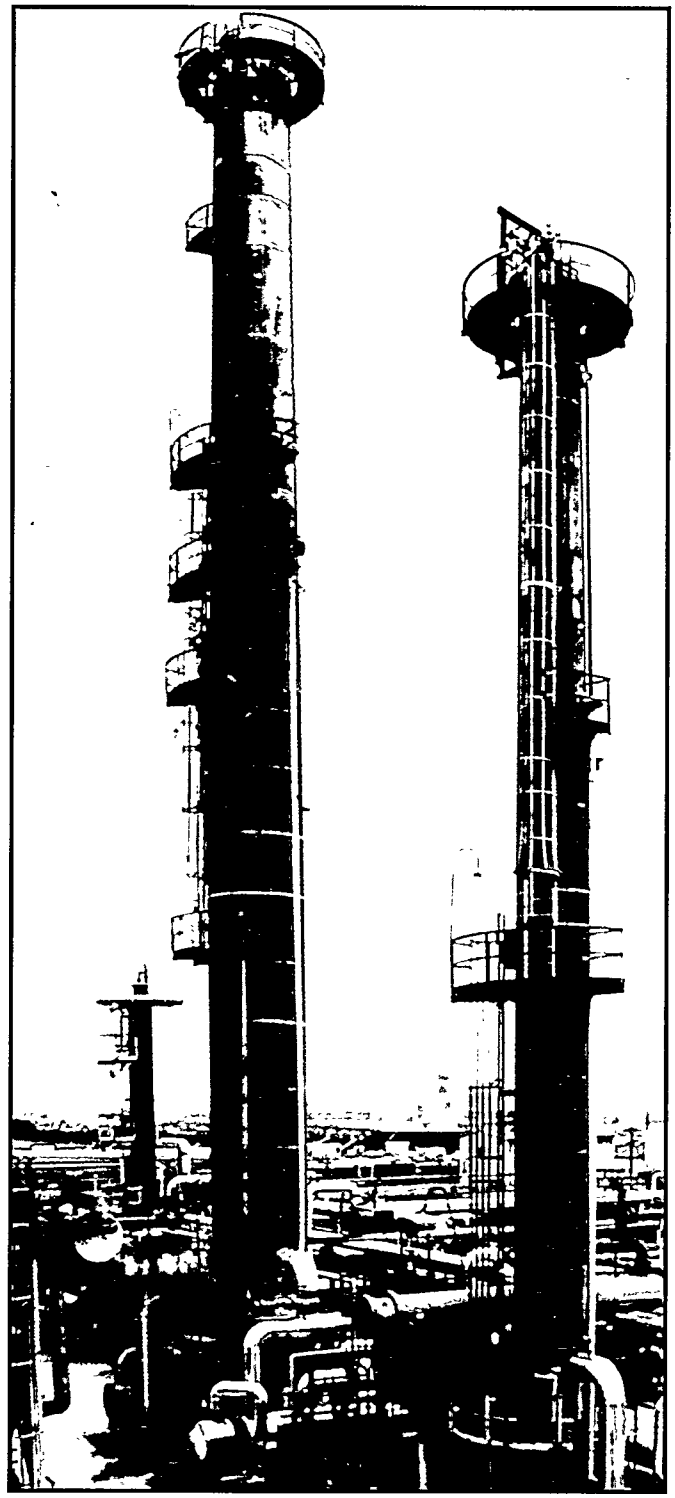
Industrial Programs

Catalytic Distillation

A number of processes in the petroleum refining and petrochemical industries involve producing hydrocarbons via equilibrium reactions. Equilibrium reactions tend to be energy intensive because when equilibrium is reached the product must be removed before the reaction can proceed. The conventional procedure requires reiterative reaction and product separation steps, as in distillation, until the concentration of product and reactants is too low for further affordable recovery. Many of these processes release waste heat. A new single-stage catalytic reaction/distillation process was developed by DOE with Chemical Research & Licensing, Inc. for equilibrium hydrocarbon reactions. Compared to conventional multistage processes, the new catalytic distillation process is more energy efficient and lower in capital cost for a number of petrochemical and petroleum refining applications. Energy savings are realized because the new process directly uses heat released by the equilibrium reaction to remove reaction products by distillation, thus eliminating external heat exchange and its consequent energy losses. As of the end of 1987, five units are in operation in the United States and one each in France, Spain, and China. Estimated current energy savings in the United States are 0.23 trillion Btu per year. Estimated savings in 2010 are 43.3 trillion Btu per year.



External view of distillation towers used in petroleum refining. A new catalytic/distillation process developed by DOE saves energy through the use of heat released in catalytic reactions.

Coal-Fired Steam Turbine Cogeneration

Cogeneration systems, when used for industrial processes, have the potential to save thousands of dollars per year. However, these systems have not been selected for certain industrial operations such as textiles manufacturing because of space limitations or because the temperature of the cogeneration system turbine exhaust is too low for the processes involved. In addition, the textiles industry