limits. The oven exhaust is usually incinerated at temperatures up to 1400°F to meet hydrocarbon air emission standards. This incineration process requires additional energy in the form of natural gas fuel.

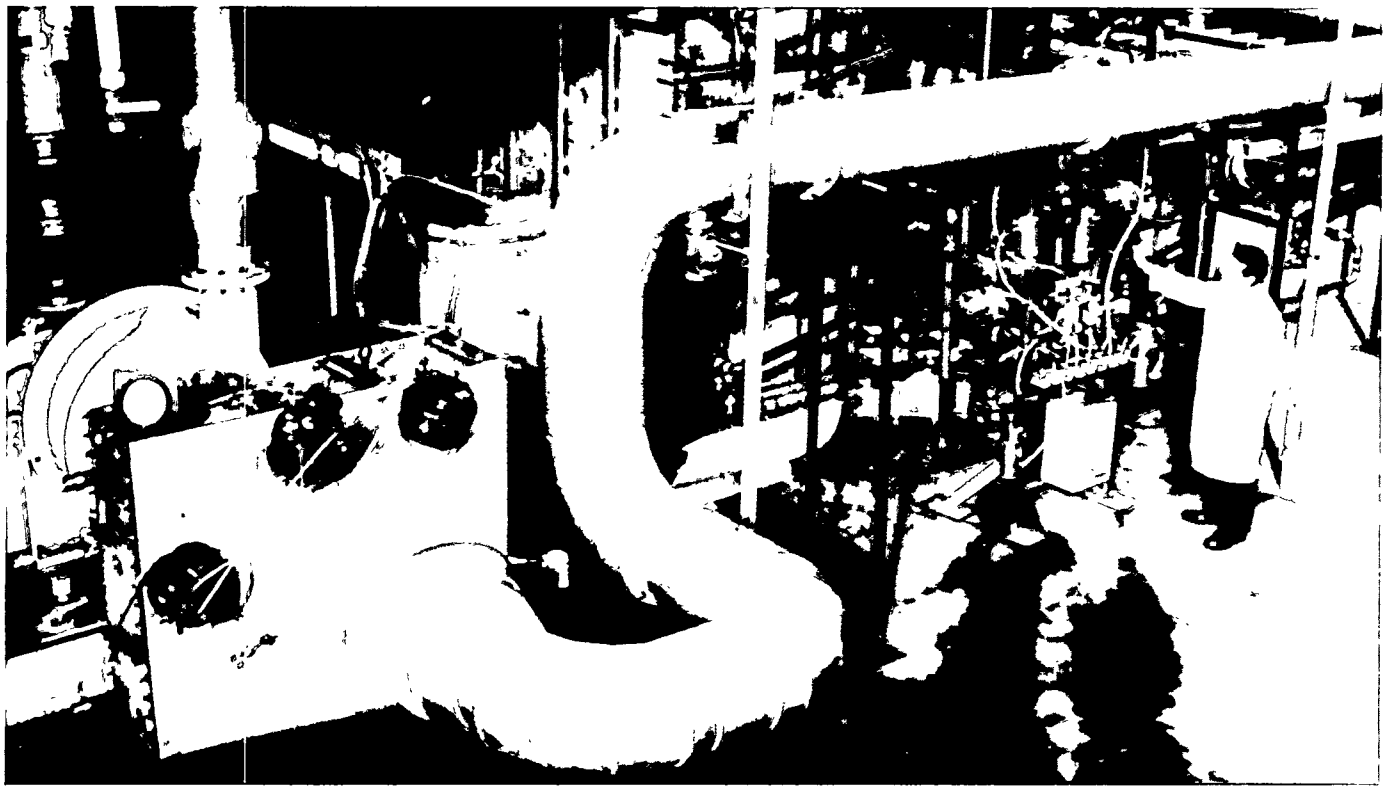
In a DOE cost-shared project, B&K Machinery and Roll Coater tested an innovative coil-coating system that can reduce the natural gas requirements by 74%. The innovative system recovers the heat content of the solvent vapor in newly designed zone incinerators. This heat is then used in the curing oven to vaporize more solvent. The thermal incinerators are replaced by afterburners and waste-heat boilers to produce process steam. Additional energy is saved in pollution control, because the volume of gases is reduced by 50%.

A coil-coating facility was retrofitted with this system, leading to the adoption of this technology by additional coil-coating facilities. Twenty-five operating units saved 2.7 trillion Btus in 1989. Projected savings in 2010 are 7.8 trillion Btus per year. The development of this technology has led coil-coating system manufacturers to develop even newer and more energy efficient systems.

Brayton-Cycle Solvent Recovery

In 1980, about 19.3 million tons of volatile organic solvents were lost through waste emissions from industrial processes in the petroleum, organic chemicals, paint, adhesive, printing, and dry-cleaning industries. Under a DOE contract, Garrett AiResearch developed a Brayton-cycle heat pump designed to recover such volatile organic solvents from waste vapors. The inherent cooling and heating capabilities of a Brayton-cycle heat pump provide a means to recover solvents economically and efficiently through condensation.

With this system, solvent-laden gas enters the Brayton-cycle compressor, where part of the heat of compression drives turbines, thereby augmenting the electrical energy supplied to the motor-driven compressor. The rest of the heat of compression is returned, via a regenerator, for reuse in the industrial process. Solvent precipitation begins in the condenser and continues as the gas mixture expands through the turbine. Expansion of the gas causes further condensation of the solvent, which is collected in a coalescing separator.



The Brayton-cycle heat pump recovers volatile organic solvents from waste vapors.