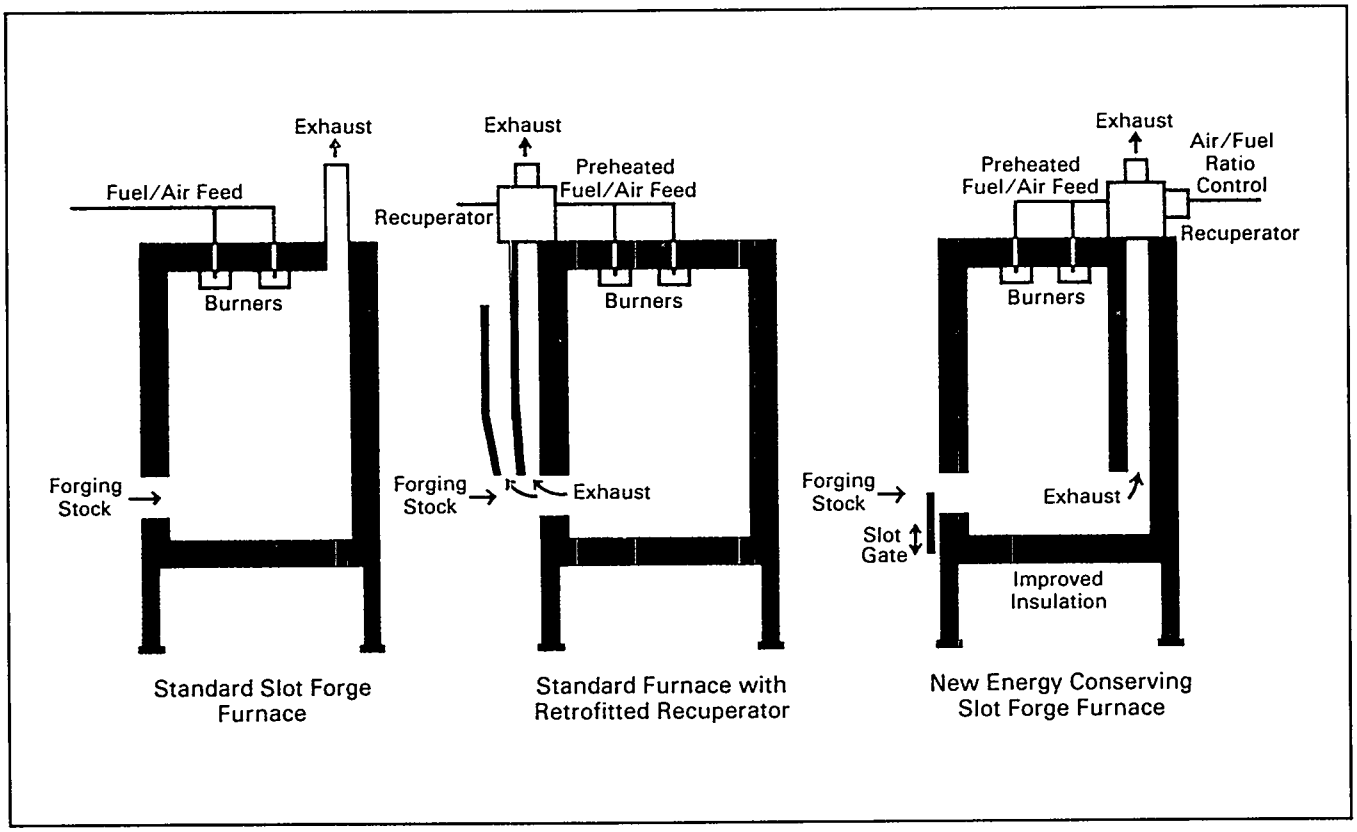
conduction through the furnace walls and roof, and heat radiation through the slot. A high-performance slot forge furnace that minimizes these and other heat losses has been developed, tested, and demonstrated in a DOE cost-shared project with Hague International. The furnace design incorporates features that offer energy savings of 50 percent or more, while retaining the simplicity of a conventional slot furnace. The key feature is a ceramic recuperator that heats incoming combustion air with furnace exhaust gases. Other energy saving modifications include recirculation burners, improved temperature and air/fuel ratio controls, slot closure doors that open only for metal stock insertion or removal, and lightweight furnace wall insulation. Some 12,000 furnaces used in the forging industry could benefit from the improved technology. Due to a DOE acceleration effort, 21 units are now in operation, saving an estimated 0.46 trillion Btu in 1987. Projected savings in the year 2010 are 88 trillion Btu per year.

Slow-Speed Diesel Cogeneration

Low-speed, two-stroke diesel engines, used extensively in marine applications, have a higher electrical-to-thermal output ratio than alternative cogeneration system components such as steam turbines. In addition, when fired with residual oil, this engine offers a relatively compact size, excellent efficiency, greater load flexibility, lower fuel costs, and lower maintenance costs than cogeneration options presently used. To prove the advantages of such a system, DOE and Hoffman-LaRoche, Inc. cofunded the design, installation, and evaluation of an industrial cogeneration system using this technology. The system uses a low-speed, two-stroke diesel engine fired with low-sulfur fuel oil coupled to an electrical generator; a supplementary oil-fired waste heat boiler that reburns the diesel's exhaust for steam production; and heat exchangers for recovering waste heat from the engine to provide hot water. The engine system generates 23.3 MW of electricity.



Improved designs for slot forge furnaces incorporate ceramic recuperators and other energy conservation features to attain energy savings of 50% or more in comparison to standard furnaces.