Slow-Speed Diesel Cogeneration

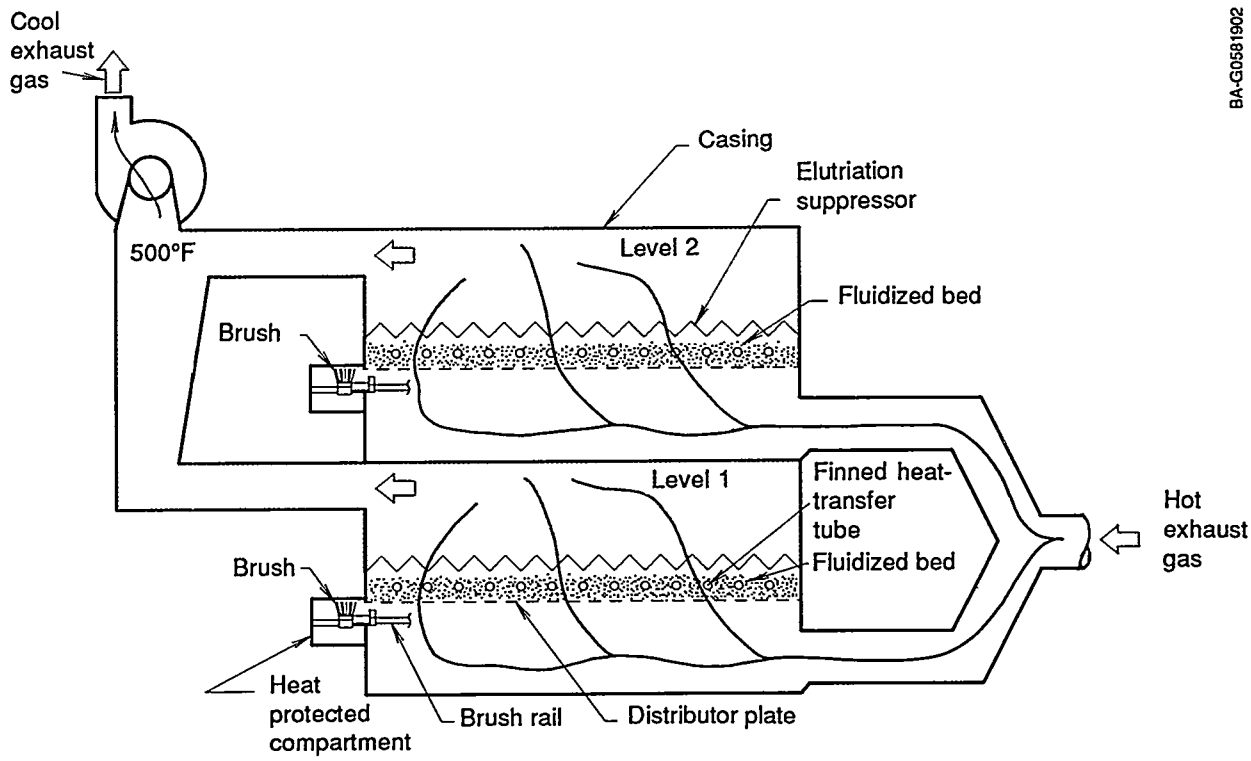
Slow-speed, two-stroke diesel engines, which are used extensively in marine applications, have a higher electrical-to-thermal output ratio than steam turbines currently used in cogeneration systems. In addition, when fired with residual oil, these slow-speed diesel engines offer a more compact size, higher efficiency, greater load flexibility, lower fuel costs, and lower maintenance costs than cogeneration options currently used.

To prove the advantages of such systems, DOE and Hoffman-LaRoche 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 and coupled to an electric generator; a supplementary oil-fired waste-heat boiler that burns the diesel's exhaust for steam production; and heat exchangers for recovering waste heat from the engine to provide hot water. The system generates 23.3 megawatts of electricity.

Evaluations are continuing at the Hoffman-LaRoche pharmaceutical plant where this system was installed. This unit and three others are operating at a Florida utility, saving 1.93 trillion Btus per year. Energy savings from this technology are estimated at 167 trillion Btus per year by 2010.

Fluidized-Bed Waste-Heat Recovery System

In this cost-shared project, Aerojet General developed a self-cleaning waste-heat recovery system that can operate in dirty exhaust gas streams (those that cause fouling and corrosion problems for conventional heat recovery systems). Heat is recovered by finned heat-exchange tubes submerged in a bed of spherical alumina particles. As hot waste gases flow through the bed, the particles absorb the heat and transfer it to the tubes. Water circulated through the tubes is heated to form steam for use elsewhere in the plant. Because the flow of the waste gas constantly agitates the alumina particles, the particles tend to distribute the heat



The fluidized-bed waste-heat recovery system uses finned heat exchange tubes submerged in a bed of spherical alumina particles to recapture waste heat.