

surface arrangement to reduce deposition of chemical solids and facilitate removal of solids that are deposited. Mechanical soot blowing can be applied successfully to clean the entire unit, eliminating crews for hand lanceing. Parallel flow of air and gas instead of counterflow eliminates formation of hard chemical deposits in air heater.

Paper also presents economic factors influencing steam production and how they enter into over-all design of unit. *ASME Paper No. 48-S-2.*

Mechanisms of Combustion and Their Relation to Oil-Burner Design, by H R Heiple and W A Sullivan, Shell Oil Co, Inc. Combustion of fuels generally occurs in the vapor phase. To understand the combustion process the authors take up first a study of the kinetics of gaseous reactions.

Rate of reaction depends on temperature because collisions occur more often (proportional to the square root of the absolute temperature) and the percentage of molecules, possessing excess energy above the minimum needed, increases. Activation energy is expressed by $e^{-E/RT}$, where E and R are constants; T is absolute temperature.

Chemical reactions occur by one of two mechanisms, namely, thermal or chain. Thermal reactions involve molecular species only. Reactant molecules dissipate excess energy liberated by the reaction nonspecifically. Frequently this dissipation raises the temperature of the reacting mass, accelerates the reaction. If the initial temperature is above a certain value, reaction accelerates until the rate becomes infinitely large. A thermal explosion results.

Chain mechanism, the second path for reactions, has the initial reaction followed by a chain of successive ones. Sometimes resultant molecules transfer excess energy to one or another of the reactant molecules. This gives rise to a series of reactions. The reaction is described as an energy-chain one. Other chain reactions include as reactants atoms and radicals (metastable molecular species). The over-all rate of reaction is proportional to concentration of chain carriers. The rate of formation or destruction of these carriers is most important.

With this background the authors study oxidation of hydrocarbons and in turn their properties as they affect burner design. Next, they discuss major burner types, how they fit theory developed. *ASME Paper No. 47-A-34.*

To Obtain Complete Text

Material in these briefs comes from one of two sources:

American Soc of Mechanical Engineers, annual meeting, Atlantic City, N. J., Dec. 15, 1947. Papers identified by initials ASME and paper No. preceded by 47-A.

American Soc of Mechanical Engineers, spring meeting, New Orleans, La., March 14, 1948. Papers identified by initials ASME and paper No. preceded by 48-S.

Available while supply lasts at American Soc. of Mechanical Engineers, 29 W 39th St, New York.

Synthetic Liquid Fuels in the United States, by W C Schroeder, U. S. Bureau of Mines. The disappearance of reserve capacity to produce natural crude oil in the U. S. is the most important difference between the country's prewar and postwar economic and security situation. Since the passage of the Synthetic Liquid Fuels Act in 1944 it has become increasingly apparent that the U. S. will turn to synthetic sources to augment its petroleum resources. Anticipated costs at the plant for products produced from, first, natural gas and, later, oil shale and coal, will run from 3 to 5¢ a gallon higher than the present prices. *ASME Paper No. 47-A-40.*

GAS TURBINES

Performance of Commercial Gas Turbines, by Paul R Sidler, Brown Boveri Corp. After reviewing experience with original 4000-kw standby installation at Neuchatel, Switzerland, and with 2200-hp locomotive unit of Swiss Federal Railways, paper describes and gives performance of several larger units tested and shipped in last year or so. Tests of 10,000-kw standby unit for Filaret Station, Rumania, show: (1) overload capacity to 12,000 kw at 68-F air-inlet temperature (2) ability to reach full speed about 5 minutes after starting motors are switched in, or 4 to 4.5 minutes after combustion chambers are ignited (3) ability to take full load as fast as load can be applied after speed has been reached, and (4) shutting-down time no longer than for steam turbines. Tests of generally similar unit for base-load service at Lima, Peru, show guarantee of 28% over-all thermal efficiency met by comfortable margin. Part-load efficiency for

the base-load unit is definitely superior to that of peak load.

Tests of 4000-kw standby unit for Chimbote, Peru (Power, Apr 1947, p. 228-9) again show better than guaranteed performance and indicate advances made since design of similar Neuchatel unit.

Paper also describes other current designs: (1) Two 4000-kw units for Southern Iran, using natural gas as fuel, employ a single-stage impulse turbine for starting. Expansion of gas from well pressure of about 400-psi to 60-psi pressure of the combustion chamber, drives this turbine, which provides additional net power after starting is accomplished. (2) Sets of 13,000 and 27,000 kw (largest yet built) under construction for Bemaun Station in Switzerland, where they will serve to back up hydro system in water-short winter months. Low inlet-air temperatures then prevailing give considerable added capacity; 13,000-kw unit is same as 10,000-kw design for normal air-inlet temperature, 27,000-kw machine is essentially the same as a 10,000-kw design doubled.

Paper concludes with reasoning behind adherence to relatively conservative throttle temperatures in light of lack of long-time data on high-temperature alloys. *ASME Paper No. 48-S-1.*

The Gas Turbine as a Stationary Prime Mover, by L N Rowley and B G A Skrotzki, Power, McGraw-Hill Publishing Co. Because fuel cost and plant investment vary widely from place to place and time to time, comparison of gas turbines with steam and diesel plants is presented with these elements as variables. Curves show, for any given fuel cost and plant investment, the justifiable investment in the competing form of plant. These comparisons, for an isolated plant of 10,000 kw, are supplemented by an economic evaluation of gas turbines and steam plants, for both base and peak loads, as an addition to an existing system. This case study shows marked influence of the efficiency level of the existing system on the results. The gas turbine as a booster at the end of a transmission line is also evaluated.

To adapt the gas turbine to industrial power applications, provision for obtaining process heat is often necessary. Various possible modifications of the gas-turbine cycle to effect heat recovery are illustrated. Diagrams show possibilities of heat recovery at high temperature as well as at exhaust-temperature level. *ASME Paper No. 48-S-5.*

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