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CHAPTER 51

AUTOMATIC FUEL-BURNING EQUIPMENT

Classification of Stokers, Combustion Process and Adjustments, Combustion Chamber Design, Classification of Oil Burners, Types of Burners, Combustion Process, Storing and Handling Heavy Fuel Oil, Oil Storage Tanks and Piping, Classification of Gas-Fired Heating Equipment, Combustion Process and Adjustment Ratings, Sizing of Gas Piping, Fuel-Burning Rates, Controls for Automatic Fuel-Burning Equipment

AUTOMATIC mechanical equipment for the combustion of solid, liquid, and gaseous fuels is considered in this chapter. The type of fuel to be burned affects the design of the heat exchanger (furnace, boiler, etc.); therefore, one should refer to Chapter 52, Heating Boilers, Furnaces, Space Heaters, when considering fuels and fuel-burning equipment. Some heat exchangers are designed specifically for one type of fuel. As a result, maximum efficiency and best performance require the simultaneous consideration of fuel and fuel-burning equipment during the initial stages of equipment selection.

MECHANICAL STOKERS

A mechanical stoker is a device that feeds a solid fuel into a combustion chamber, provides a supply of air for burning the fuel under automatic control and, in some cases, incorporates a means of removing the ash and refuse of combustion automatically. Coal can be burned more efficiently by a mechanical stoker than by hand firing because the stoker provides a uniform rate of fuel feed, better distribution in the fuel bed, and positive control of the air supplied for combustion.

In many cities, measures for control of excess smoke require installation of stokers even in residences, unless fuel used contains less volatile matter than bituminous coal.

Classification of Stokers According to Capacity

Stokers may be classified roughly according to their coal burning capacities, as follows:

- Class 1 10 to 100 lb per hr
- Class 2 100 to 300 lb per hr
- Class 3 300 to 1200 lb per hr
- Class 4 over 1200 lb per hr

Class 1 Stokers

These stokers are used primarily for home heating and are designed for quiet, automatic operation.

The general responsibility for this chapter is assigned to TC 3.5, Combustion and Fuels.

They are usually of the underfeed type with a screw feed. Stokers in this class are made for burning anthracite, bituminous, semi-bituminous, and lignite coals, and coke. They are designed to feed coal to the furnace intermittently in accordance with temperature or pressure demand. A special control is used to maintain a fire during periods when no heat is required. Stokers in this class may have automatic or manual ash removal. The U. S. Department of Commerce has issued commercial standards for household anthracite stokers.¹

Class 2 Stokers

Stokers of this class are usually of the underfeed type and are used extensively for heating apartments, schools, hotels, and commercial installations. They are available for burning anthracite, bituminous, and lignite coals.

Ash removal may be automatic or manual.

Class 3 and 4 Stokers

These stokers may be of the underfeed type, overfeed flat grate type, overfeed inclined grate type, or the vibrating grate type.

The grate type stokers may be of the traveling grate type or they may be of the stationary grate type with overhead feed. The latter is sometimes referred to as a spreader type stoker.

Information on stoker-fired equipment is available from the National Coal Association.²

Combustion Process

In anthracite stokers of the underfeed type, burning takes place entirely within the stoker retort.

Stokers designed for handling bituminous coals are designed to ignite and burn the volatile matter released from the coal as it is heated. This is provided for with underfeed stokers and with the chain grate type of stoker by locating and controlling the feed of fresh coal into the combustion zone.

With the underfeed stoker the volatile gases must pass through the hottest part of the burning bed of fuel and are thus ignited.

In the traveling grate type stoker or the vibrating grate type stoker, the fuel is fed in at the front end. As the volatile