

Due to the use of draft hoods and gas pressure regulators both the input and combustion conditions of gas appliances are maintained quite uniform until deposits of dirt, corrosion, or scale accumulate in the air inlet openings, burner ports or on the heating surface. Periodic cleaning is, therefore, necessary to keep any gas appliance in proper operating condition.

Measurement of the Efficiency of Combustion

The efficiency of combustion may be judged from the percentage of carbon dioxide (CO_2), oxygen (O_2) and carbon monoxide (CO) in the flue gases. The CO_2 and O_2 may be obtained by means of an Orsat apparatus but the CO must be determined by more accurate equipment. It is customary to use simple indicators to determine whether CO is present and to make adjustments of the appliances to reduce the CO below 4/100 of one per cent before continuing tests in which the CO_2 and O_2 can then be found by use of the Orsat apparatus. Since the ultimate CO_2 for any gas depends on the total hydrogen content the quality of the combustion should not be judged from the value of the CO_2 in the flue gas without reference to the ultimate CO_2 obtainable. Practical values of CO_2 will usually be from 8 to 14 per cent depending on the gas used.

Ratings for Gas Appliances

Input rating for a gas appliance is established by demonstrating that the appliance can meet the Approval Requirements of the A.S.A. The tests are conducted at the A.G.A. Testing Laboratories. Output rating is determined from the approved input and an average efficiency stated in the Approval Requirements and represents the heat available at the outlet of the appliance.

Sizing Gas-Fired Heating Plants

Although gas-burning equipment usually is completely automatic, maintaining the temperature of rooms at a predetermined figure, there are some manually controlled installations. In order to overcome effectively the starting load and losses in piping, a manually-controlled gas boiler should have an output as much as 100 per cent greater than the equivalent standard radiation which it is expected to serve.

Boilers under thermostatic control, however, are not subject to such severe pick-up loads and consequently, it is possible to use a lower selection factor. For a gas-fired boiler or furnace under thermostatic control a factor of 20 per cent is usually sufficient for pick-up allowance.

The factor to be allowed for loss of heat from piping, will vary somewhat, the proportionate amount of piping installed being greater for small installations than for large ones. Selection factors to be added to the installed radiation under thermostatic control are discussed in Chapter 12.

Appliances used for heating with gas should bear the approval seal of the A.G.A. Testing Laboratories on the manufacturer's nameplate, together with the official input and output ratings. It is not permissible to operate a gas heating unit above its stated rating. It may be necessary to operate below this rating if the appliance is installed at elevations more than 3,000 ft above sea level.

Installations should be made in accordance with recommendations shown in the publications of the American Gas Association.

Controls

Temperature controls for gas burners are described in Chapter 33. Some central heating plants are equipped with push-button or other manual control. The main gas valve may be of either the snap action or throttling type. Automatic electric ignition is available for gas heating equipment.

FUEL BURNING RATES

The burning rate for automatic fuel burning devices is determined by the gross heat output required of the boiler, or furnace, to carry the net heating load plus allowances for system losses, and pick-up. General values for these allowances previously have been noted. Detailed information for piping and pick-up allowances for steam, and hot water systems is given in Chapter 12. Similar data for warm air systems are given in Chapters 18 and 19.

When the gross output, operating efficiency, and heat value of the fuel are known, the required rate of burning can be determined. Figs. 18, 19 and 20 afford a convenient method for finding rates of burning for the several fuels.

For a given efficiency, the rate of fuel burning is directly proportional to the load and therefore these charts can be extended by moving the decimal points the same number of digits in both vertical and horizontal scales.

The correct fuel burning rate can be determined directly from the several charts for oil or gas burning installations, as these customarily operate on a strictly intermittent basis. These fuel burning devices usually introduce the fuel at a single fixed rate during the on periods and this rate should be sufficient to carry the gross load. In the case of coal stokers, which are usually capable of variable rates of firing, it is desirable to operate at as low a rate as weather conditions will permit, but the maximum firing rate of the stoker should be sufficient to carry the gross load. This rate may be determined by the same method as used for oil or gas.

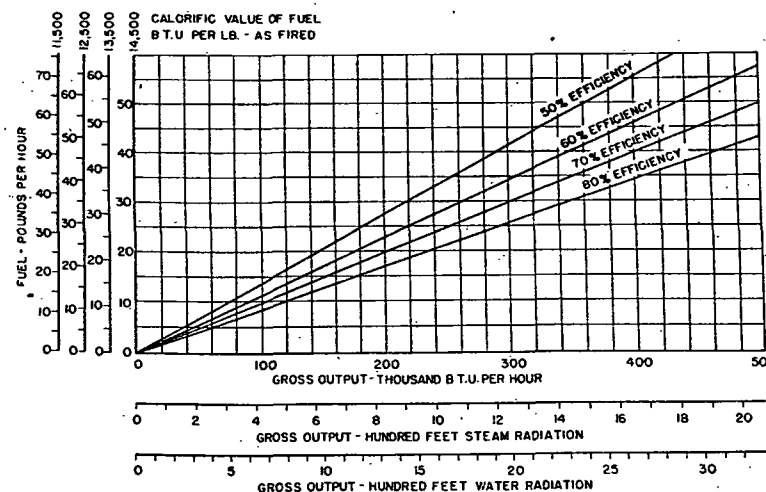


FIG. 18. COAL FUEL BURNING RATE CHART