

INDUSTRIAL OIL BURNING

Burners

Atomizing burners are used exclusively for installations with heavy oil. Of these, there are three types: steam atomizing burners, air atomizing burners and mechanical atomizing burners.

The steam atomizing burner has two classifications, the outside mixing and the inside mixing type. With the outside mixing type, the oil is forced through an orifice at a comparatively low-pressure and just as it emerges from this orifice it is struck by a jet of steam traveling at a high velocity from a direction at right angles with the flow of oil. The steam jet breaks the oil and injects it into the combustion chamber in a fine spray or mist. The inside mixing type has a turbulence mixing chamber between the steam orifice and the burner opening. The mixing inside the burner permits some vaporization of the lighter hydrocarbons from the heat in the steam so that the mixture issuing from the burner opening lights readily and maintains a steady burning flame. Steam burners require from 1.5 to 5 per cent of the total steam generated for atomization; 2 to 2.5 per cent being a good average. This average can be easily maintained by correct adjustment of the burners. For the best results the steam should be dry.

Air atomizing burners using high-pressure air are similar in design to those using steam. This type is not used as much as low-pressure air burners. Ordinarily, high-pressure air burners are used where a supply of compressed air is available. Low-pressure air burners use comparatively large volumes of air under pressure of $1\frac{1}{2}$ to $2\frac{1}{2}$ lb. per square inch. Air atomizing burners are efficient and if the blowers or compressors supplying the air are steam driven, they will require approximately $2\frac{1}{2}$ to 3 per cent of the steam generated for the motive power, but the exhaust steam is available for use in the pre-heaters, so that the steam consumption compares very favorably with steam atomizing burners. The first cost, however, is greater with air atomization than with steam atomization.

Mechanical atomizing burners are those which atomize the oil without the aid of air or steam, although it is common practice to use air under low-pressure in connection with mechanical atomizers to further atomize the fuel but this is not essential. The high-pressure atomizer forces the oil through the small orifice under high pressures (100 to 200 lb. per square inch). The oil is given a rotary motion by slots cut tangentially to the diameter of the orifice of the burner, so that the centrifugal force of the oil leaving the orifice acts as an aid in atomizing the fuel. Another type of mechanical burner is the rotary cup burner. In some burners the cup is positively driven by an electric motor or steam turbine and has a fan mounted on the same shaft so as to provide a portion of the air for combustion under pressure to aid in the atomization of the oil as it leaves the edge of the rotating cup. Another type of rotary cup burner has the cup driven by an air turbine utilizing the velocity of low-pressure air from a centrifugal blower. This blower is usually located at a remote point from the boiler and is of sufficient capacity to supply all of the burners in the battery, although there are some installations where each burner has its own individual blower. While the first-cost of mechanical atomizing burners is usually comparatively high, they have the advan-

tage of returning all the steam used for pumping for heating the boiler feed water. Further advantages of this type are simplicity and economical operation with uniform combustion regulation.

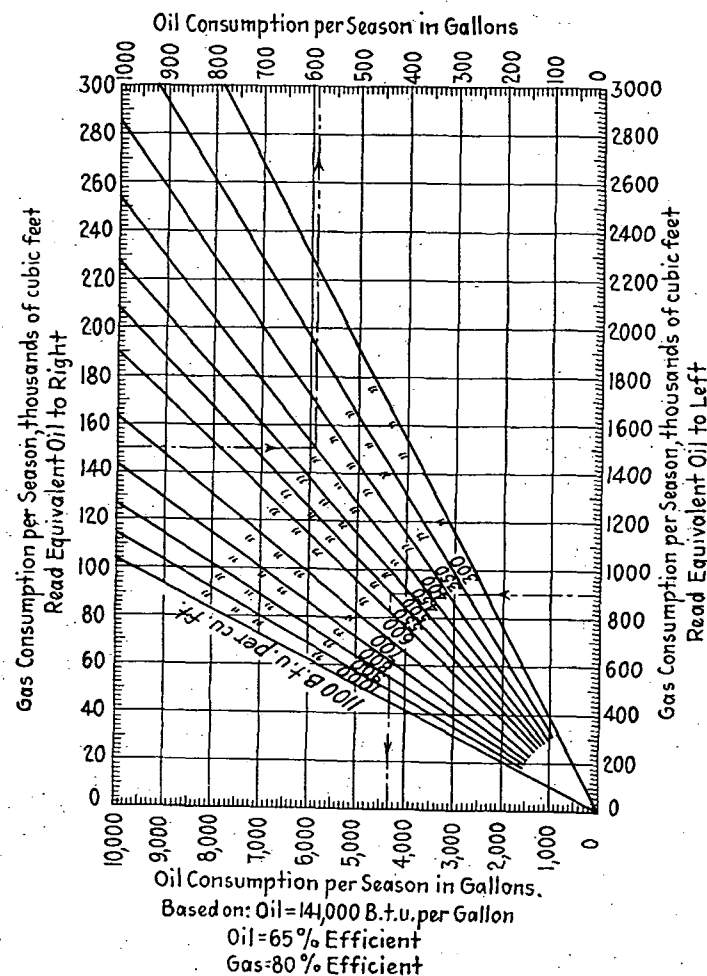


FIG. 4. OIL CONSUMPTION PER SEASON AS COMPARED WITH GAS CONSUMPTION, FOR HEATING

Burners for commercial installations are usually manually operated although they have semi-automatic controls which vary the amount of air and oil as the load fluctuates.

For some burners, the air for combustion is partially supplied from a