

The majority heating effects are due to hysteresis and eddy currents. When removing oil from unheated storage hot excess oil is returned to blend with cold oil from storage in a special tank unit. Since all oil piping is kept at design temperature under all conditions of flow or standby, constant oil circulation or cycle pre-circulation is not needed. The thermostatic control of pipe and oil temperature results in fully automatic operation.

Oil burners designed for automatic operation on No. 5 or No. 6 oil are generally equipped with thermostatically controlled electric immersion heaters. The function of a burner immersion heater is to heat the oil at the rate being burned from the transportation temperature (usually at 120 F level for No. 6 oil) to the temperature required for efficient combustion. This temperature ranges from 130 F to 220 F, depending on the grade of fuel oil and design of burner. In an emergency the burner immersion heater may be used alone to heat a modulated, very low quantity of oil for combustion. However, in a normal operation, it functions in conjunction with the primary preheating system.

Maintaining Piping and Tank Temperature

In using No. 5 and No. 6 oils it is necessary to make special arrangements to keep the oil fluid in the piping at all times and to keep at least a portion of the oil in the storage tank fluid as well.

The piping may be heated by one or more of the following methods:

1. Wrapping the supply line with electrically heated tape.
2. Passing a current through the supply line itself.
3. Enclosing the supply line with a steam or hot water line in the same envelope.
4. Insulating the supply line so as to decrease the thermal losses.
5. Setting up a dual system in which the primary preheaters have a capacity greater than the burner requirement and returning the excess heated oil continually to the fuel oil tank.

The oil in the tank or a portion of it may be heated by one of the following methods:

1. By putting steam coils in the bottom of the tank.
2. By putting hot water coils in the bottom of the tank.
3. By putting a suction-bell, which is provided with either steam or hot water coils, in the bottom of the tank.
4. By providing a hot-well that extends from the top to the bottom of the tank, and provides enough heated oil to supply the burner under a full load.
5. By submerging an electric preheater in the wall or bottom of the tank.

Pipe Sizes for Heavy Oil

Table 2 gives recommended good practice pipe sizes for handling No. 5 and No. 6 oils.

OIL STORAGE TANKS AND PIPING

Storage tanks, also the piping and pumping facilities for delivering the oil from the tank to the burner, are very important considerations in the design of an industrial oil burning system. The construction and location of the tank and oil piping are usually subject to local regulations which should always be consulted, and to the standards of the *National Board of Fire Underwriters*, such as *NBFU Pamphlet No. 31*.

The size of the storage tank is usually based on the rate at which oil is to be consumed, the space available, method of oil delivery (truck or tank car) and the ease with which deliveries can be made under all weather

conditions. A minimum capacity of at least the maximum weekly usage is desirable. If deliveries are to be made by tank car, the capacity should not be less than 15,000 gal.

The 275 gal oil storage tank is commonly used for domestic installations. In most localities it may be installed in basements without being enclosed. Where a greater storage capacity is necessary, local regulations usually permit inside installation of two tanks of 275 gal each in accordance with *NBFU Standards Pamphlet No. 31*.

GAS-FIRED HEATING EQUIPMENT

A gas burner is defined by the *American Gas Association* as "a device for the final conveyance of the gas, or a mixture of gas and air, to the

TABLE 2. RECOMMENDED MINIMUM SUCTION AND RETURN PIPE SIZES
FOR FUEL OIL LINES^a
(For Nos. 5 and 6 Fuel Oil)^b

EQUIVALENT LENGTH OF SUCTION LINE, FEET	PUMP CAPACITY, GALLONS PER HOUR													
	50		100		150		200		300		600		900	
	GRADE OF OIL (NUMBER)													
	5	6	5	6	5	6	5	6	5	6	5	6	5	6
	DIAMETER OF PIPE, INCHES													
10-50	1½	1½	1½	2	2	2	2	2	2	2	2½	3	3	4
60-100	1½	1½	2	2	2	2	2	2½	2½	2½	3	3	3	4
110-150	1½	2	2	2	2	2½	2½	2½	2½	3	3	4	4	4

^a Pipe sizes shown are based on vertical suction lift not to exceed 10 ft from bottom of storage tank to oil pump.

^b A suction line length in excess of 100 linear feet is not recommended for systems using No. 5 or No. 6 oil. Where the length is greater a separate pump should be installed near the storage tank.

^c Equivalent length of pipe includes all horizontal and vertical measured piping plus proper allowance for valves and fittings as follows:

Multiply pipe diameter in inches by factor below to obtain equivalent pipe length in feet.
Elbow = Factor 3; Tee = Factor 6; Gate Valve = Factor 1½; Globe Valve = Factor 9.

combustion zone." Burners used for domestic heating are of the atmospheric injection, luminous flame, or power burner types.

Because of the ease with which gas fuel may be controlled, automatic gas-fired heating equipment has become very widely used, and is available in a number of types of domestic gas heating appliances and systems. These may be classified in types designed for central heating plants and those for unit application. Gas designed units and conversion burners are available for the several kinds of central systems in which gravity and forced warm air furnaces or steam and hot water boilers are used, and for other applications where warm air floor furnaces and room heaters are installed in the space being heated.

Central Heating Systems

Boilers and furnaces specially designed for gas-firing incorporate design features for obtaining maximum efficiency and performance. Small flue