

TABLE 82. DATA ON FUEL OILS

OIL	BAUME GRAVITY DEG. FAHR.	FLASH POINT DEG. FAHR.	POUNDS PER GALLON	B.T.U. PER GALLON	B.T.U. PER LB.
Kerosene.....	42	140	6.80	135,524	19,900
Distillate.....	38	160	6.96	137,402	19,700
Light Gas Oil.....	36	190	7.03	138,421	19,700
Dark Gas Oil.....	32	200	7.21	140,811	19,600
Light Fuel Oil.....	24	150-200	7.58	145,612	19,000
Heavy Fuel Oil.....	18	180-280	7.89	149,484	18,900

Note. While the use of an oil may be contemplated, having a cold test sufficient to meet the lowest temperatures experienced, if there is any possibility of higher cold test oils being used, heating coils should be installed either in the storage tank or elsewhere in the system.

AIR REQUIRED FOR OIL BURNING*

PER CENT CO ₂ BY VOLUME OF DRY GASES	LIGHT OIL		MEDIUM OIL		HEAVY OIL	
	Lb. of Air per Lb. of Oil	Excess Air Per Cent	Lb. of Air per Lb. of Oil	Excess Air Per Cent	Lb. of Air per Lb. of Oil	Excess Air Per Cent
4	51.40	260.7	51.93	270.4	52.45	280.3
5	41.31	189.9	41.71	197.5	42.12	205.4
6	34.58	142.7	34.90	149.0	35.23	155.4
7	29.77	108.9	30.04	114.3	30.31	119.8
8	26.17	83.6	26.39	88.3	26.62	93.0
9	23.37	64.0	23.56	68.0	23.75	72.2
10	21.12	48.2	21.29	51.8	21.45	55.5
11	19.83	39.1	19.43	38.6	19.58	41.9
12	17.76	24.6	17.88	27.6	18.01	30.6
13	16.46	15.5	16.57	18.2	16.69	21.0
14	15.36	7.8	15.45	10.2	15.55	12.7
15	14.39	1.0	14.48	3.3	14.57	5.6

*C. R. Weymouth, *Transactions, American Society Mechanical Engineers*, Vol. 30. Also see Vol. 34.

A fuel oil burner installation comprises oil storage, pumping equipment, heating equipment if required, an atomizing assembly and a correctly designed fire-box within the boiler for complete combustion and for proper diversion of the fire and gases. There are certain essential accessories, such as pipelines, oil pre-heaters, regulating valves, meters, strainers, pressure gages, relief valves and the proper adaptation of them all to the particular needs of each specific case.

It is not the purpose of this article to discuss the relative merits of various types of burners. The respective claims of burner manufacturers can be carefully weighed and a decision made as to which is best adapted to the work in question. Mechanical simplicity and the assurance of correct principles of atomization should be of foremost consideration in judging burners.

The decision as to the burner will govern the type of oil pump utilized to draw the oil from the storage tank and introduce it into the burners. The various burner companies have provided what they consider the most suitable pumping devices for their equipment.

One of the most important phases of oil burner installations, is the design of the combustion chamber of the boiler or furnace. While the consumption of coal is limited in a boiler, by the square feet of grate and the draft available where handfiring is utilized, with oil burning equipment, the only limit to the oil consumption, is in the cubical contents of the combustion chamber or fire-pot. Practically any of the boilers that

are in use today are adaptable to oil burning equipment but there should be a rearrangement of the combustion chamber. The grates may be removed, and the burner dropped below their level thus enlarging the combustion space.

A wide, long, high combustion chamber is ideal, within certain limits. It is only necessary to extend protecting walls where there are water-drop legs projecting downward from the crown-sheet. All such water surfaces must be protected from any direct contact with the fire. It is well to brick up the sides of boilers, of fire-box or sectional type, to a point 8 or 9 in. higher than the center-line of the burners. Impingement walls should be so built as to properly deflect the gases of combustion.

The brick used should be of the very highest heat-resisting type and each brick should be dipped in a thin batter of heat-resisting cement and water and laid up tightly to the next brick. This will give a very excellent wall which will require a minimum of attention. Oil burner manufacturers have plans for the bricking of the various types of boilers, which plans are usually submitted after the contract has been approved.

There are a number of oil heaters on the market, which are meritorious. If low pressure steam boilers are being equipped with oil burners, ordinary coil waterheaters may be connected below the water-line of the boiler. Sufficient heating capacity should be installed to bring the temperature of the oil up to within 25 or 30 deg. of its flash-point. This pre-heating of the oil not only decreases the viscosity but takes a certain combustion burden from the fire in the boilers and also tends to carry in suspension basic deposits which might otherwise be left in the burners. In high pressure work, coil heaters can be connected into the exhaust or live steam lines depending upon the type of heater selected.

Naturally, the heavier the oil, the greater will be the tendency towards sediment deposit consequently strainers must be provided. Unless the oil is exceedingly heavy, a single strainer in the suction line just before it enters the pumping equipment, will be sufficient. This strainer can be so built as to be easily accessible for cleaning. In some instances, duplex strainers are used, in which case, the mere throwing of a lever, will change the flow of oil from one strainer to another, so that cleaning can be accomplished without interfering with the supply of oil.

The question of the elevation of the pump is of some importance, as some communities prohibit the installation of oil pumping equipment at a point lower than the top of the oil storage tank. As the result, it is frequently necessary to build platforms in the boiler-room on which to mount the pumping equipment, so that there will be no danger of siphoning. If this is not done anti-siphoning devices should be used.

While fuel oil burners are not automatic in character, yet a great many burner companies provide automatic regulators to maintain a fire between "high-low" limits, so as to maintain uniform pressures.

The foregoing discussion refers continually to boilers, it must not be lost sight of that oil fuel is adaptable to scores of industrial purposes. Bake ovens, melting pots, annealing furnaces, dryers and countless other heat demanding units are continually and adequately operated with this modern fuel.

Adequate oil storage should be planned. Where trackage is available,