

## Technical Information

### Heater Selection - Oil Heating

#### Watt Density & Oil Viscosity

The viscosity of oils and hydrocarbons varies widely with type and temperature. Since highly viscous liquids transfer heat poorly, sheath watt densities and operating temperatures are critical in oil heating applications. As a general rule, regular oil heaters rated 20-23 W/in<sup>2</sup> are recommended for heating light weight oils (SAE 10 to SAE 30). For medium weight oils (gear oils, etc.), 12-15 W/in<sup>2</sup> are suggested. Bunker C, tar, asphalt and other highly viscous oils may require 6-8 W/in<sup>2</sup> or less to prevent carbonization, particularly if not under flowing conditions. Some oils may have additives that will boil off or carbonize at very low watt densities. When oils of this type are encountered, a watt density test is recommended to determine a satisfactory watt density. The following charts provide guidance and suggested watt densities for various oils.

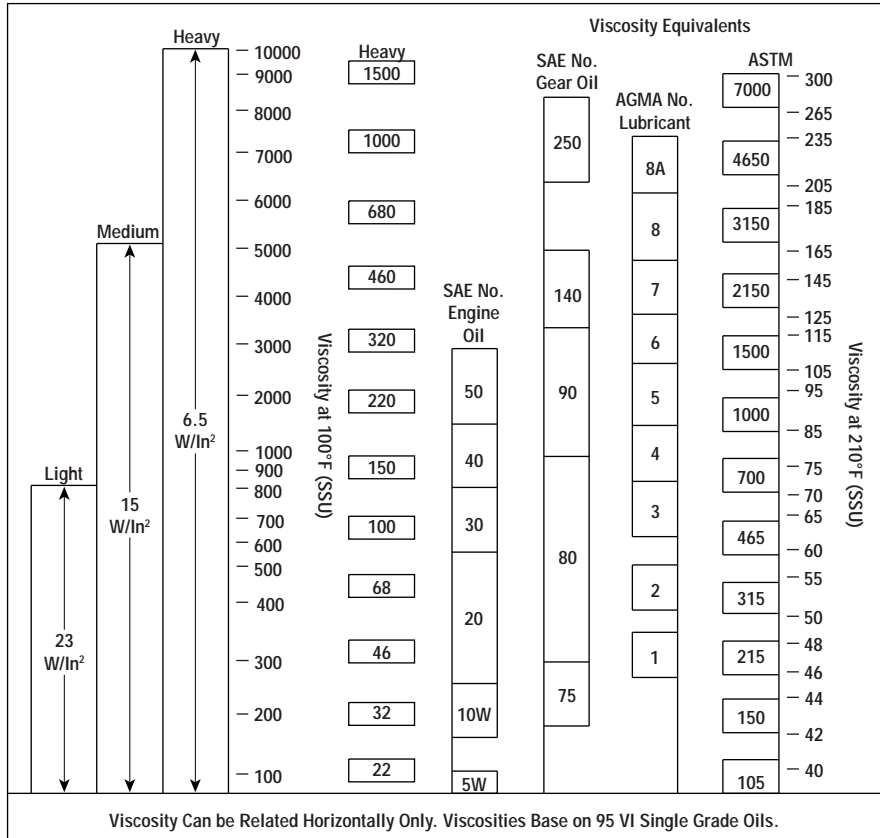
#### Typical Viscosities of Various Oils

Weight	Viscosity
SAE 10	90-120 SSU at 130°F
SAE 20	120-185 SSU at 130°F
SAE 30	185-255 SSU at 130°F
SAE 40	255 SSU-up (Drops to 80 at 210°F)
SAE 50	80-105 SSU at 210°F
#2 Fuel Oil	40 SSU at 100°F (Kerosene)
#4 Fuel Oil	45-120 SSU at 100°F
#5 Fuel Oil	150-400 SSU at 100°F
Bunker C	500-2,000 SSU at 100°F
#6 Fuel Oil	3,000 SSU at 122°F (Very Viscous)

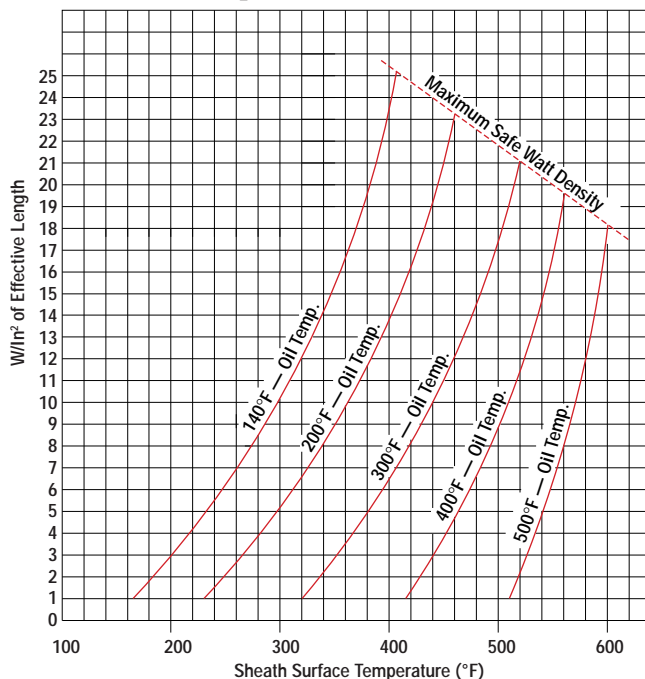
#### Viscosity Conversion

Seconds Saybolt Universal (SSU)	Kinematic Viscosity Centistokes (Cst)	Seconds Saybolt Furol (SSF)
31	1	—
35	2.56	—
40	4.30	—
50	7.4	—
60	10.3	—
70	13.1	12.95
80	15.7	13.7
90	18.2	14.44
100	20.6	15.24
150	32.1	19.3
200	43.2	23.5
250	54	28
500	110	51.6
1,000	220	100.7
5,000	1,100	500
10,000	2,200	1,000
20,000	4,400	2,000

Centistokes = Centipoise/specific gravity  
Centipoise x 2.42 = Lbs/ft/hr



**Graph G-122S — Surface Temperatures of Oil Immersion Blade Heater for Various Oil Temperatures & Watt Densities**



#### Notes —

- Curves based on natural convection of machine oil or its equivalent having an SAE viscosity rating of 30 (5 centipoises at 200°F).
- Effective Length of Immersion Heater = "B" Dimension.
- Area Per Linear Inch of 1-1/2' Wide Immersion Blades = 3.75 Sq. In.
- Area Per Linear Inch of 1' Wide Immersion Blades = 2.63 Sq. In.
- In No Case, Exceed 27 Watts Per Sq. In.