5. Specific Fuel Oil Consumption

See Plate 70611

Calculation of the specific fuel oil consumption (g/kWh) requires that engine power, and the consumed fuel oil amount (kg), are known for a certain period of time.

The method of determining the engine power is illustrated in *Section 706-05.*

The oil amount is measured as described below.

To achieve a reasonable measuring accuracy, it is recommended to measure over a suitably long period – dependent upon the method employed i.e.:

- If a day tank is used, the time for the consumption of the whole tank contents will be suitable.
- If a flow-meter is used, a minimum of 1 hour is recommended.

The measurements should always be made under constant load conditions.

Since both of the above-mentioned quantity measurements will be in volume units, it will be necessary to know the oil density, in order to convert to weight units. *The density is to correspond to the temperature at the measuring point* (i.e. in the day tank or flow-meter).

The specific gravity, (and thus density) can be determined by means of a hydrometer immersed in a sample taken at the measuring point, but the density can also be calculated on the basis of fuel specifications.

Normally, in fuel specifications, the specific gravity is indicated at 15°C/60°F.

The actual density (g/cm3) at the measuring point is determined by using the curve on *Plate 70611*, where the change in density is shown as a function of temperature.

The consumed oil quantity in kg is obtained by multiplying the measured volume (in litres) by the density (in kg/litre).

In order to be able to compare consumption measurements carried out for various types of fuel oil, allowance must be made for the differences in the lower calorific value (LCV) of the fuel concerned.

Normally, on the testbed, gas oil will have been used, having a lower calorific value of approx. 42,707 kJ/kg. If no other instructions have been given by the ship owner, it is recommended to convert to this value.

Usually, the lower calorific value of a fuel oil is not specified by the oil companies. However, by means of the graph, *Plate 70611,* the LCV can be determined with sufficient accuracy, on the basis of the sulphur content, and the specific gravity at 15°C.

The corrected consumption can then be determined by multiplying the "measured consumption", by:

LCV / 42,707

LCV = the specific lower calorific value, in kJ/kg, of the fuel oil concerned.

Example: (6L60MC)

Effective engine power, P_e :	11,500 kW
Consumption of fuel oil, C_o :	7.125 m3 over 3 hours
Measuring point temperature :	119°C
Fuel data : (Specific gravity at 15°C, 3% sulphur)	0.9364 g/cm3
Density at 119°C: (0.9364-0.068) *(See Plate 70611)*	= 0.8684 g/cm3

Specific consumption:

$(C_o \times p119 \times 10^6) / (h \times P_e)$

where:

C_o	= Fuel oil consumption over the period, m3
ρ119	= Corrected gravity, g/cm3
h	= Measuring period, hours
P_e	= Brake power, kW

$((7.125 \times 0.8684 \times 10^6) / (3 \times 11{,}500)) = 179.3$ g/kWh

Correction to ISO reference conditions regarding the *specific lower calorific value:*

LCV = 40,700 kJ/kg, derived from *Plate 70609.*

Consumption corrected for calorific value:

((179.3 x 40,700) / 42,707) = 170.9 g/kWh

The ambient conditions (blower inlet temperature and pressure and scavenge air coolant temperature) will also influence the fuel consumption. Correction for ambient conditions is not considered important when comparing service measurements.