



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 9109.5-2017

**Petroleum and liquid petroleum products dynamic
measurement -- Part 5: Calculation of oil quantities**

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1 Scope

This Part of GB/T 9109 specifies the oil quantity calculation method for dynamic measurement of petroleum and liquid petroleum products (hereinafter referred to as oil);

defines the terms and symbols used in the dynamic measurement of oil products; gives the weight in air under different measurement methods using different measuring instruments, OR the formula for calculating the oil quantity under standard reference conditions; provides the relevant measurement parameters, correction factors, corresponding formulas and tables, which are involved in the calculation of the oil quantity.

This Part only applies to the dynamic measurement of single-phase oil products.

This Part does not apply to the oil quantity calculation of liquefied petroleum gas and stable light hydrocarbons.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document;

for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 260 Test method for water in petroleum products - Distillation method

GB/T 1884 Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method

GB/T 1885-1998 Petroleum measurement tables

GB/T 4756 Method for manual sampling of petroleum liquids

GB/T 6531 Crude petroleum and fuel oils - Determination of sediment - Extraction method

3 Terms, definitions, symbols

The following terms, definitions, symbols apply to this document.

3.1 Terms and definitions

3.1.1 Indicated volume or mass During measurement, the oil value displayed by the flowmeter counter or other display unit, including water and sediment transported through the flowmeter.

3.1.2 Total observed volume or mass The indicated volume or mass as multiplied by the flowmeter factor corresponding to the oil product and its flow rate. This value is not corrected for temperature and pressure.

3.2 Symbols

See Table 1.

4 Significant digits of measurement parameters and

numerical rounding

4.1 Effective digits of measurement parameters

4.1.1 Depending on the density reading and density conversion, keep 1 decimal place, that is, 0.1 kg/m³.

4.1.2 Measurement of moisture content in oil (distillation method), round to two

decimal places 0.01%.

4.2.1 The numerical rounding off method shall comply with the provisions of GB/T

8170. In most cases, the number of decimal places used is affected by the data source.

In the absence of other limiting factors, rounding off shall be performed, according to the decimal places specified in Table 2.

4.2.2 MF, Ctl, Cpl, Csw, Fa shall be rounded to the fourth decimal place, in accordance

with the provisions of GB/T 8170.

4.2.3 The oil quantity settlement value follows the requirements of GB/T 8170; the

volume value is rounded to 0.001 m³; the mass value is rounded to 0.001 t.

Example.

5.1 Overview

In order to obtain accurate results of the oil quantity (volume or mass), which is measured by the flowmeter, it shall first ensure that the basic data for calculating the oil quantity (such as the indicated volume of the flowmeter, measuring temperature, measuring pressure, density, moisture content, etc.) are obtained, in accordance with the standard method (or procedure) (see Appendix A);

5.2 Flowmeter

The accuracy level of flowmeters, which are used for trade transfer measurement, shall be no less than level 0.2.

5.3 Measuring temperature

The measurement temperature of oil products shall be measured or recorded, using a mercury-in-glass thermometer, which has a graduation value of not less than 0.2 °C, OR other types of temperature transmitters, which are not lower than the same accuracy requirements.

5.4 Measuring pressure

Oil measuring pressure shall be measured or recorded, using a 0.4 grade pressure gauge or other types of pressure transmitters, which are not lower than the same accuracy requirements.

5.5 Sampling

Oil sampling shall be carried out, in accordance with the requirements specified in GB/T 4756 or GB/T 27867.

5.7 Moisture content

It is measured according to GB/T 8929; it can also be measured according to GB/T 260 and GB/T 6531.

6.1.1 The settlement basis for oil trade is divided into weight or volume in the air.

Therefore, oil quantity calculation is also divided into two methods.

6.1.3 Taking the volume-weight method as an example (flowmeter factor method), during the measurement period, record the indicated volume (V_t),

6.2.2.1 Determine V_t

The indicated volume, which is measured by the flowmeter under measuring pressure, is calculated according to formula (4).

If the flowmeter uses K factor, the indicated volume, which is measured by the flowmeter under metering pressure, is calculated according to formula (5).

6.2.2.4 Determine C_{pl}

If the reading of the flowmeter has been corrected by pressure compensation, OR the impact at low pressure is less than 0.01%, then set $C_{pl} = 1.0000$; otherwise, calculate it according to formula (6).

6.2.2.6 Determine V_{sw}

V_{sw} is calculated according to formula (8).

6.2.2.7 Calculation formula of mass flowmeter volume

V_{gs} is calculated according to formula (9).

6.3 Settlement based on weight in air

It is divided into three types according to the measurement method. One is a flowmeter based on volume measurement coupled with a glass float meter.

6.3.4 Calculation formula of oil moisture content

m_{sw} is calculated according to formula (26).