DPNS/DOE QS 014:2018
ICS xxxxxxx

Petroleum Products – Residual Marine Fuels – Specification

Foreword

This Philippine National Standard PNS/DOE QS 014:2018 Petroleum products - Residual marine fuels – Specification was prepared by the Department of Energy through the Technical Committee on Petroleum Products and Additives (DOE/TCPPA) and was approved for adoption as Philippine National Standard by the Bureau of Philippine Standards.

The DOE/TCPPA prepared this standard in keeping with the objectives of the Clean Air Act of the Philippines as well as with the DOE's policy and program of formulating/developing /updating the fuel quality specifications of petroleum products in terms of the current requirement of the industry, its users and manufacturers vis-à-vis the continuing commitment in ensuring supply availability and also by endeavoring to harmonize internationally/regional environmental standards for fuels.

In preparation of this document ISO 8217:2017 (E) Petroleum Products-Fuels (class F) – Specifications of marine fuels was adopted specifically the residual marine fuel category ISO-F-RMG 180 and ISO-F-RMK 380. Additionally, the statutory requirement for the sulfur content is set at 3.0%, mass, maximum based on the current Philippine condition and PNS for Fuel oil standard (PNS/DOE QS 006).

This standard also intends to adopt the program/guidelines of the International Maritime Organization (IMO) for the requirement of sulfur content at 0.5% mass, maximum by 2020.

This entire standard is subject for review and/or revision when necessary.

1 Scope

This document specifies the requirements for fuels for use in marine diesel engines and boilers, prior to conventional onboard treatment (settling, centrifuging, filtration) before use. The specifications for fuels in this document can also be applied to fuels used in stationary diesel engines of the same or similar type as those used for marine purposes.

This document limits only the 2 categories of residual fuels.

2 References

The title of the standard publications referred to in this standard are listed on the inside back cover.

3 Definition

For the purpose of this standard, residual marine fuel is defined as petroleum fuels containing residues of distillation processes that meet the international limits on the flash point of fuels for marine use.

4 Classification

Residual marine fuels shall be classified based on the maximum kinematic viscosity of the residual fuel, in millimeters squared per second (mm^2/s) at 50 ^0C.

4.1 RMG 180
4.2 RMK 380

Note: the category of fuel consisting of three letters:
- "R" for residual
- "M" designating the application for "Marine"
- A letter, e.g. "A", B", ... Z, which taken separately has no significance, but has meaning in relation to the particular properties in accordance with ISO 8217.

5 Requirements

5.1 The fuel as supplied shall be homogenous and conform to the characteristics and limits given in Table 1 as appropriate when tested in accordance with the test method specified.

5.2 The fuel shall be free from any material at a concentration that causes the fuel to be unacceptable for use in accordance with Clause 1 (i.e. material not at a concentration that is harmful to personnel, jeopardizes the safety of the ship, or adversely affects the performance of the machinery).

Table 1 – Chemical and physical requirements for Residual marine fuels

Property		Unit	Limit	Category		Test Methods (s) and references
				RMG 180	RMK 380	
Kinematic viscosity at 50 °C		mm^2/s[a]	Max	180.0	380.0	ISO 3104
Density at 15 °C		kg/m^3	Max	991.0	1010.0	ISO 3675 or ISO 12185; see 6.1
CCAI			Max	870	870	See 6.2
Sulfur[b]		mass %	Max	**3.0**	**3.0**	ISO 8754 or ISO 14596 or ASTM D4294; see 6.3
Flash point		°C	Min	60.0	60.0	ISO 2719; see 6.4
Hydrogen sulfide		mg/kg	Max	2.00	2.00	IP 570; see 6.5
Acid number[c]		mg KOH/g	Max	2.5	2.5	ASTM D664; see 6.6
Total sediment – Aged		mass %	Max	0.10	0.10	ISO 10307-2; see 6.9
Carbon residue – Micro method		mass %	Max	18.00	20.00	ISO 10370
Pour point (upper)[d]	winter	°C	Max	30	30	ISO 3016
	summer	°C	Max	30	30	
Water		volume %	Max	0.50	0.50	ISO 3733
Ash		mass %	Max	0.100	0.150	ISO 6245
Vanadium		mg/kg	Max	350	450	IP 501, IP 470 or ISO 14597; see 6.14
Sodium		mg/kg	Max	100	100	IP 501, IP 470; see 6.15
Aluminium plus silicon		mg/kg	Max	60	60	IP 501, IP 470 or ISO 10478; see 6.16
Used lubricating oil (ULO): Calcium and zinc or Calcium and phosphorus		mg/kg		Calcium >30 and zinc >15 or Calcium >30 and phosphorus >15		IP 501 or IP 470, IP 500; see 6.17

[a] 1 mm^2/s = 1 cSt.
[b] The purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See Introduction.
[c] See Annex E.
[d] The purchaser should confirm that this pour point is suitable for the ship's intended area of operation.

6 Sampling

The sampling of fuels for analysis shall be carried out in accordance with the procedures given in ISO 13739 or an equivalent national standard. Where specific sampling requirements are documented in the referenced test methods, these shall be adhered to.

7 Test methods

Residual marine fuel shall be tested in accordance with the methods specified in Table 1.

References:

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

PNS ISO 2719, *Determination of flash point — Pensky-Martens closed cup method*

PNS ISO 3015, Petroleum products — Determination of cloud point

PNS ISO 3016, *Petroleum products — Determination of pour point*

PNS ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

PNS ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

PNS ISO 3733, *Petroleum products and bituminous materials — Determination of water — Distillation method*

PNS ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test*

PNS ISO 4264, *Petroleum products — Calculation of cetane index of middle-distillate fuels by the four-variable equation*

PNS ISO 6245, *Petroleum products — Determination of ash*

PNS ISO 8754, *Petroleum products — Determination of sulfur content — Energy-dispersive X-ray fluorescence spectrometry*

PNS ISO 10307-1, *Petroleum products — Total sediment in residual fuel oils — Part 1: Determination by hot filtration*

PNS ISO 10307-2, *Petroleum products — Total sediment in residual fuel oils — Part 2: Determination using standard procedures for ageing*

PNS ISO 10370, *Petroleum products — Determination of carbon residue — Micro method*

PNS ISO 10478, *Petroleum products — Determination of aluminium and silicon in fuel oils — Inductively coupled plasma emission and atomic absorption spectroscopy methods*

PNS ISO 12156-1, *Diesel fuel — Assessment of lubricity using the high-frequency reciprocating rig (HFRR) — Part 1: Test method*

PNS ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

PNS ISO 12205, *Petroleum products — Determination of the oxidation stability of middle-distillate fuels*

PNS ISO 12937, *Petroleum products — Determination of water — Coulometric Karl Fischer titration method*

PNS ISO 13739, *Petroleum products — Procedures for transfer of bunkers to vessels*

PNS ISO 14596, *Petroleum products — Determination of sulfur content — Wavelength-dispersive X-ray fluorescence spectrometry*

PNS ISO 14597, *Petroleum products — Determination of vanadium and nickel content — Wavelength-dispersive X-ray fluorescence spectrometry*

PNS ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

PNS ASTM D4294, *Standard Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry*

PNS ASTM D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*

PNS ASTM D7963, *Standard Test Method for determination of the contamination level of Fatty Acid Methyl Esters in middle distillate and residual fuels using flow analysis by Fourier-Transform Infrared spectroscopy-rapid screening method*

PNS EN 14214, *Liquid petroleum products — Fatty acid methyl esters (FAME) for use in diesel engines and heating applications — Requirements and test methods*

PNS IP 309, *Diesel and domestic heating fuels — Determination of cold filter plugging point*

PNS IP 470, *Determination of aluminium, silicon, vanadium, nickel, iron, calcium, zinc and sodium in residual fuel oil by ashing, fusion and atomic absorption spectrometry*

PNS IP 500, *Determination of the phosphorus content of residual fuels by ultra-violet spectrometry*

PNS IP 501, *Determination of aluminium, silicon, vanadium, nickel, iron, sodium, calcium, zinc and phosphorus in residual fuel oil by ashing, fusion and inductively coupled plasma emission spectrometry*

PNS IP 570, *Determination of hydrogen sulfide in fuel oils — Rapid liquid phase extraction method*

PNS IP 579, *Liquid petroleum products — Determination of fatty acid methyl ester (FAME) content in middle distillates — Infrared spectrometry method*

PNS IP 612, *Diesel and domestic heating fuels — Determination of cold filter plugging point Linear cooling bath method — Linear cooling bath method*

PNS ISO 8216-1, *Petroleum products — Fuels (class F) classification — Part 1: Categories of marine fuels*

PNS ISO 8217, *Petroleum products — Fuels (class F) — Specification of marine fuels*

Abbreviations

ASTM	-	American Society for Testing and Materials
EN	-	Euro Norm (Regional Standard European Countires)
ISO	-	International Organization for Standardization
IP	-	Institute of Petroleum IP Test Method
PNS	-	Philippine National Standard

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