Petroleum Products - E-Gasoline fuel – Specification
Foreword

This Philippine National Standard PNS/DOE QS 008:2017, Specification for E-Gasoline 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.

This standard was made in line with the DOE’s policy and program of updating the fuel quality specification of E-Gasoline fuel in terms of current requirement of the industry, its users and manufacturers and also by endeavoring to harmonize internationally/regional environmental standards for fuels.

Specifically, this standard is a revision/update of PNS/DOE QS 008:2012 corresponding with the January 2016 implementation of the Euro 4-PH specification for the sulfur requirement of 50 ppm, maximum in gasoline fuel and updating the test methods.

Further, this standard is consistent with the continuing program of the government towards the use of cleaner fuels and promoting the use of indigenous and renewable energy resources with the end view of reducing dependence on imported oil.

This standard cancels and replaces PNS/DOE QS 008:2012.

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

This standard specifies the requirements for bioethanol-blended gasoline, otherwise referred to as E-gasoline used as fuel in spark-ignition internal combustion engines. This standard does not include aviation gasoline.

2 References

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

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1 base gasoline refers to unleaded gasoline that shall be blended with fuel bioethanol to produce E-gasoline

3.2 bioethanol refers to ethanol, produced from a variety of feedstock such as grains, agricultural wastes, and other biomass resources

3.3 E-gasoline refers to base gasoline blended with fuel bioethanol

3.4 fuel bioethanol refers to the bioethanol denatured with unleaded gasoline for use as blending component to unleaded gasoline, as provided in the PNS for Anhydrous Bioethanol Fuel

4 Requirements

E-gasoline shall conform to the chemical and physical requirements specified in Table 1. Annex A provides guide specification for base gasoline
<table>
<thead>
<tr>
<th>Property</th>
<th>Regular</th>
<th>Premium</th>
<th>Premium Plus</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear and bright, visibly free of suspended or precipitated contaminants</td>
<td>Visual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Green</td>
<td>Red</td>
<td>Blue</td>
<td>Visual</td>
</tr>
<tr>
<td>Copper corrosion, 3 hr at 50°C, max.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PNS ASTM D130</td>
</tr>
<tr>
<td>Density at 15°C, kg/L</td>
<td>0.725-0.783 0.783 max</td>
<td>0.725-0.783</td>
<td>0.725-0.783</td>
<td>PNS ASTM D1298 or PNS ASTM D4052 or PNS ASTM D 7777</td>
</tr>
<tr>
<td>Distillation temperature, °C at:</td>
<td></td>
<td></td>
<td></td>
<td>PNS ASTM D86</td>
</tr>
<tr>
<td>10% recovered, max.</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>50% recovered</td>
<td>70-110</td>
<td>70-110</td>
<td>70-110</td>
<td></td>
</tr>
<tr>
<td>90% recovered, max.</td>
<td>180</td>
<td>180</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>End point, max.</td>
<td>215</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td>Residue, % vol, max.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Existent gum, mg/100 mL, max.</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>PNS ASTM D381</td>
</tr>
<tr>
<td>Hydrocarbons a:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aromatics, % vol, max</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>PNS ASTM D5443 or PNS ASTM D5580 or PNS ASTM D5769 or PNS ASTM D5986 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D6839</td>
</tr>
<tr>
<td>Benzene, % vol, max</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>PNS ASTM D3606 or PNS ASTM D5443 or PNS ASTM D5580 or PNS ASTM D5769 or PNS ASTM D5986 or PNS ASTM D6277 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D6839</td>
</tr>
<tr>
<td>Ethanol (C2) b, % vol,</td>
<td>9.0 – 10</td>
<td>9.0 – 10</td>
<td>9.0 – 10</td>
<td>PNS ASTM D4815 or PNS ASTM D5599 or PNS ASTM D5845 or PNS ASTM D5986 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D 6839</td>
</tr>
<tr>
<td>Ethers (e.g. MTBE) c, d, % vol, max</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>PNS ASTM D4815 or PNS ASTM D5599 or PNS ASTM D5845 or PNS ASTM D5986 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D 6839</td>
</tr>
<tr>
<td>Lead content (not added) e g/L, max.</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>PNS ASTM D3237 or PNS ASTM D3348 or PNS ASTM D5059</td>
</tr>
<tr>
<td>Octane rating, min.</td>
<td></td>
<td></td>
<td></td>
<td>PNS ASTM D2699</td>
</tr>
<tr>
<td>Research Octane Number (RON)</td>
<td>91</td>
<td>95</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Anti-knock index (AKI) e</td>
<td></td>
<td>87.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a: Aromatic hydrocarbons are defined as those with a boiling point less than or equal to 180°C. 
b: Ethanol (C2) is a common additive to gasoline. 
c: Ethers are another type of additive. 
d: MTBE is one such ether. 
e: Lead content is not added as a component. 
|
### Table 1 (concluded)

<table>
<thead>
<tr>
<th></th>
<th>0.005</th>
<th>0.005</th>
<th>0.005</th>
<th>PNS ASTM D1266 or PNS ASTM D2622 or PNS ASTM D4294 or PNS ASTM D5453 or PNS ASTM D7039</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur, % mass max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vapor Pressure at 37.8 °C, kPa, max.</strong></td>
<td></td>
<td></td>
<td>68</td>
<td>62</td>
</tr>
<tr>
<td>Water content, % v/v, max.</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>PNS ASTM E203 or PNS ASTM D6304</td>
</tr>
</tbody>
</table>

* Based on certificate from production site. The product shall not contain more than 0.05% methanol, using the same test methods for ethanol.

** As per specification for Fuel Bioethanol in the PNS of Anhydrous Bioethanol Fuel

* Allowable contamination tolerance only. Intentional addition not permitted for both imported and locally-produced gasoline

* Methyl Tertiary Butyl Ether

* To be reported quarterly with Motor Octane Number (MON) using ASTM D 2700

* Oxygen content to be reported preferably not to exceed 4.0% mass max.
5 Sampling

E-gasoline shall be sampled in accordance with PNS ASTM D 4057.

6 Marking/Labeling

The dispensing pump for E-gasoline shall carry the following consumer advisory:

1. This E-gasoline contains 10% Bioethanol

7 Test methods

E-gasoline shall be tested in accordance with the methods specified in Table 1.
# Annex A – Minimum Reference Specification for Base Gasoline

<table>
<thead>
<tr>
<th>Property</th>
<th>Base Gasoline</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Undyed</td>
<td>Visual</td>
</tr>
<tr>
<td>Copper corrosion, 3 hr @ 50°C, max.</td>
<td>1</td>
<td>PNS ASTM D 130</td>
</tr>
<tr>
<td>Density at 15 °C, kg/L, max.</td>
<td>0.783</td>
<td>PNS ASTM D 1298 or PNS ASTM D 4052 or PNS ASTM D 7777</td>
</tr>
<tr>
<td>Distillation temperature, °C at:</td>
<td></td>
<td>PNS ASTM D 86</td>
</tr>
<tr>
<td>10% recovered, max.</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>50% recovered</td>
<td>90-121</td>
<td></td>
</tr>
<tr>
<td>90% recovered, max.</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>End point, max.</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td>Residue, % volume, max.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Existent gum, mg/100 mL, max.</td>
<td>4</td>
<td>PNS ASTM D 381</td>
</tr>
<tr>
<td>Hydrocarbons:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aromatics, % volume, max</td>
<td>38.5</td>
<td>PNS ASTM D 5443 or PNS ASTM D 5580 or PNS ASTM D 5769 or PNS ASTM D 5986 or PNS ASTM D 6729 or PNS ASTM D 6730 or PNS/ASTM D 6839</td>
</tr>
<tr>
<td>Benzene, % volume, max</td>
<td>2</td>
<td>PNS ASTM D 3606 or PNS ASTM D 5443 or PNS ASTM D 5580 or PNS ASTM D 5769 or PNS ASTM D 5986 or PNS ASTM D 6277 or PNS ASTM D 6729 or PNS ASTM D 6730 or PNS/ASTM D 6839</td>
</tr>
<tr>
<td>Lead content, (not added) g/L, max.</td>
<td>0.005</td>
<td>PNS ASTM D 3237 or PNS ASTM D 5059 or PNS ASTM D 3348</td>
</tr>
<tr>
<td>Research Octane Number (RON), min</td>
<td>87</td>
<td>PNS ASTM D 2699</td>
</tr>
<tr>
<td>Oxygen Content, % mass</td>
<td>0</td>
<td>PNS ASTM D 4815</td>
</tr>
<tr>
<td>Sulfur, % mass max.</td>
<td>0.005</td>
<td>PNS ASTM D 1266 or PNS ASTM D 2622 or PNS ASTM D 4294 or PNS ASTM D 5453 or PNS ASTM D 7039</td>
</tr>
<tr>
<td>Vapor Pressure at 37.8 °C, kPa, max.</td>
<td>62</td>
<td>PNS ASTM D 4953 or PNS ASTM D 5191 or PNS ASTM D 5482</td>
</tr>
<tr>
<td>Water content, % v/v</td>
<td>0</td>
<td>PNS ASTM E 203 or PNS ASTM D 6304</td>
</tr>
</tbody>
</table>
References:

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

PNS ASTM D 86-16a (ASTM published 201_), Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure

PNS ASTM D 130-15 (ASTM published 201_), Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

PNS ASTM D 381-12 (ASTM published 201_), Standard Test Method for Gum Content in Fuels by Jet Evaporation


PNS ASTM D 1298-12b (ASTM published 201_), Standard Test Method for Density, Relative Density or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method


PNS ASTM D 2699-16 (ASTM published 201_), Standard Test Method for Research Octane Number of Spark-Ignition Engine Fuel

PNS ASTM D 2700-16a (ASTM published 201_), Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel

PNS ASTM D 3237-12 (ASTM published 201_), Standard Test Method for Lead in Gasoline by Atomic Absorption Spectroscopy

PNS ASTM D 3348-12 (ASTM published 201_), Standard Test Method for Rapid Field Test for Trace Lead in Unleaded Gasoline (Colorimetric Method)

PNS ASTM D 3606-10e1 (ASTM published 201_), Standard, Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography


PNS ASTM D 4815-15b (ASTM published 201_), Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 Alcohols in Gasoline by Gas Chromatography


PNS ASTM D 5059-14 (ASTM published 201_), Standard Test Methods for Lead in Gasoline by X-Ray Spectroscopy


PNS ASTM D 5443-14 (ASTM published 201_), Standard Test Method for Paraffin, Naphthene, and Aromatic Hydrocarbon Type Analysis in Petroleum Distillates Through 200°C by Multi-Dimensional Gas Chromatography


PNS ASTM D 6839-16 (ASTM published 201_), Standard Test Method for Hydrocarbon Types, Oxygenated Compounds and Benzene in Spark Ignition Engine Fuels by Gas Chromatography


**Abbreviations**

ASTM - American Society for Testing and Materials

PNS - Philippine National Standard
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