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# Philippine National Standards and its Importance

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Energy Consumers and Stakeholders' Conference 2018

Theme: E-POWER MO!

24 April 2018

Hotel Supreme, Baguio City



# Presentation Outline

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- I. Overview of the Downstream Oil Industry Fuel Supply Chain
- II. Mandate on Standard Setting
- III. Development of Standards
- IV. Enforcement of Standards
- V. Roadmap on Fuel Quality



# ...Standards are more than just one means of regulating

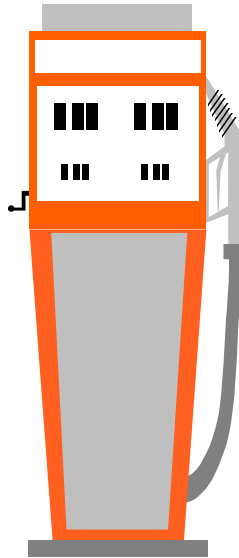
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# Importance of Fuel Quality



**safety**



**FUEL**



**engine**

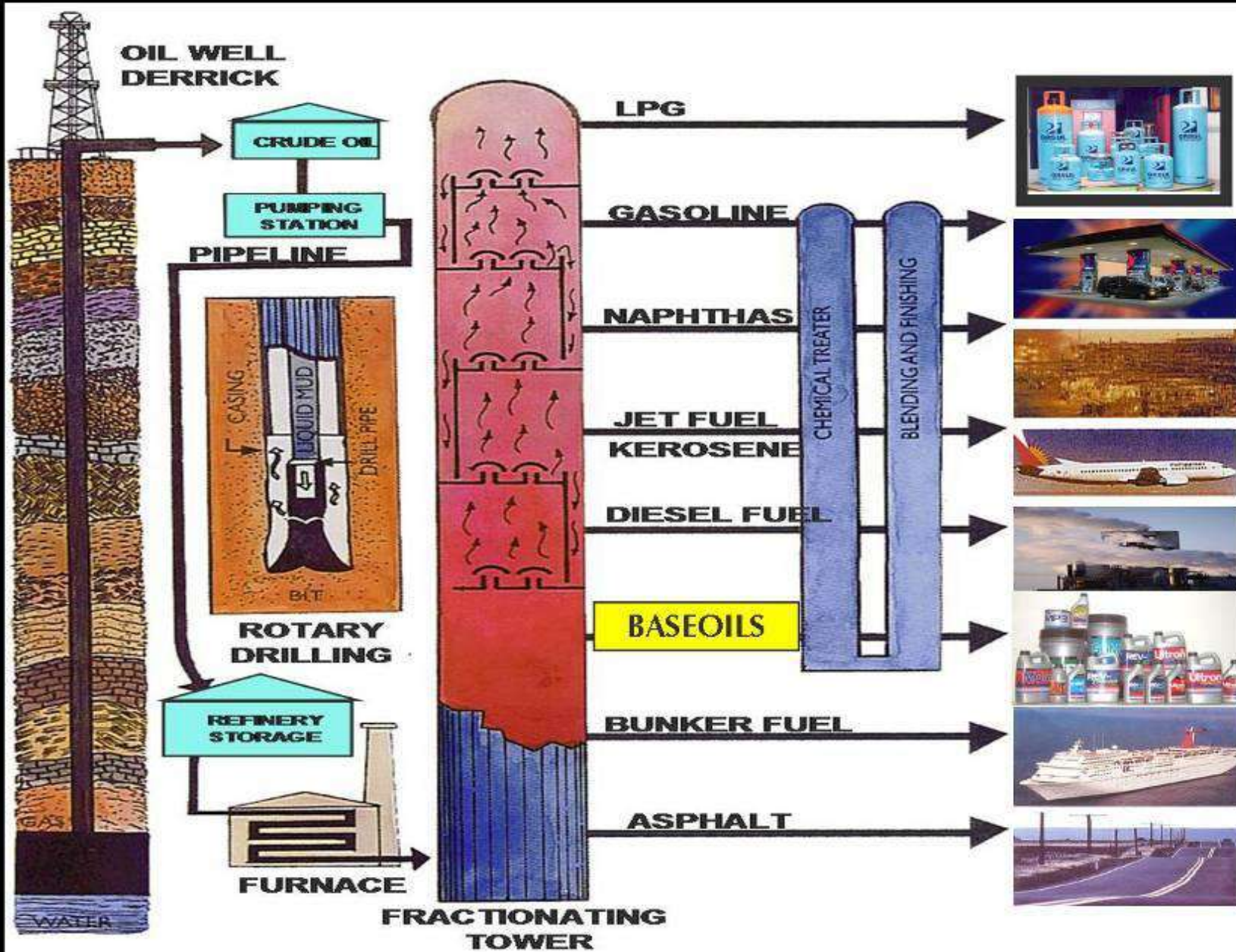


**fit for purpose**

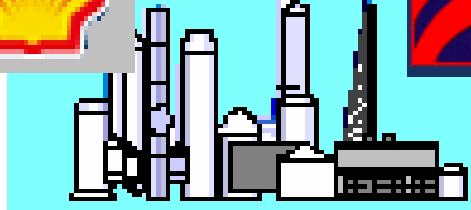




# PETROLEUM REFINING



# Crude Oil Imports

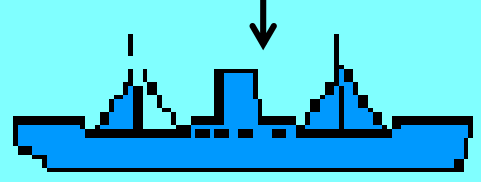


## Refinery



Product Exports  
Product Imports

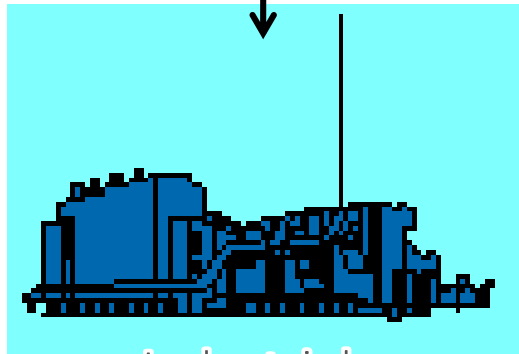
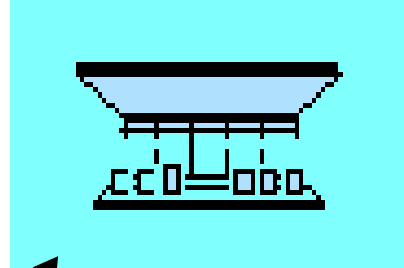
## Refinery/Import/Export Terminal



## Oil Depot / Terminal

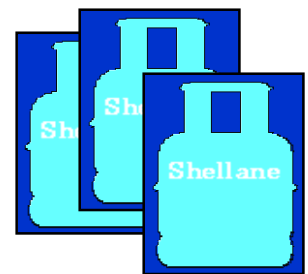


## Retail Outlets



## Industrial

## Consumer/End User



## LPG Retails

# Standardization Mandate

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## ***RA 8479 - Downstream Oil Industry Deregulation Act***

- ensure a truly competitive market for petroleum products under a regime of fair price, adequate and continuous supply of environmentally, clean and high quality petroleum products
- Use of clean and safe (environment and worker-benign) technologies

## ***RA 8749 - Clean Air Act of 1999***

- set the specifications for all types of fuel and fuel-related products (Sec.26)
- set every two (2) years or thereafter or as the need arises, the specification of ULG and diesels shall be reviewed and revised (Sec. 26)

## ***RA 9367 - Biofuels Act of 2006***

- establish technical fuel quality standards for biofuels and biofuel-blended gasoline and diesel which comply with the PNS (Sec. 7c)



# Standardization Technical Committees

## Technical Committee on Petroleum Products & Additives (TCPPA)

- Chair : DOE and DENR
- Members

### Government:

DOE  
DENR  
BPS-DTI  
ITDI-DOST

### Oil Industry Sector:

Petron  
Shell  
Chevron  
PIP  
IPPCA

### Engine Suppliers/Manufacturers:

CAMPI, AMMDA, MDPPA

### Consumer Sector/NGO:

FilCar Foundation, AWMA

### Academe:

UP-NCTS, AIPSI





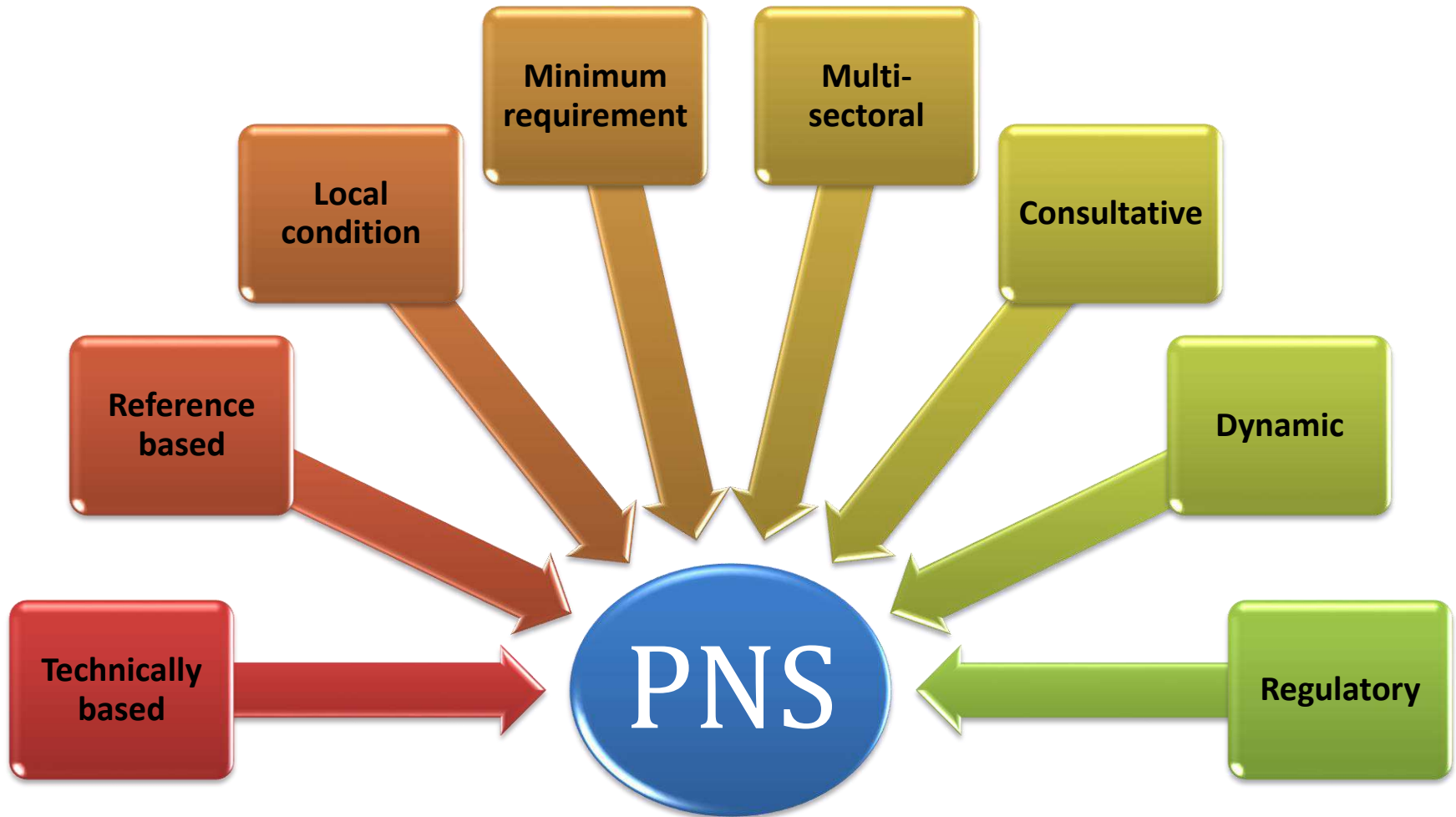


# Standard Development Process

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# Elements of PNS Development



# IMPACT OF FUEL QUALITY STANDARDS TO CONSUMERS



ENVIRONMENT PROTECTION

SAFETY PURPOSES

VEHICLE PERFORMANCE

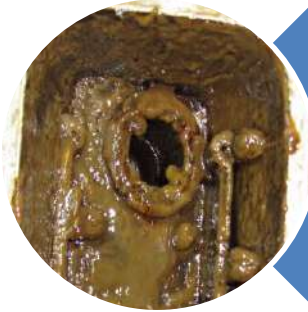
IDENTIFICATION



# VEHICLE PERFORMANCE



OCTANE  
RATING



EXISTENT  
GUM



WATER  
CONTENT



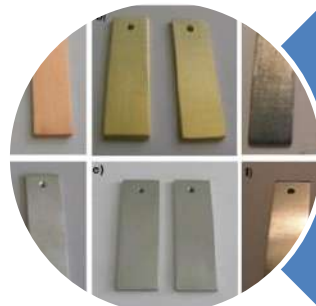
LUBRICITY



CETANE  
RATING



ASH  
CONTENT



COPPER  
CORROSION





# ENVIRONMENT PROTECTION



AROMATICS



BENZENE



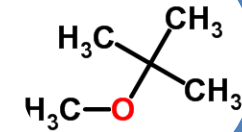
ETHANOL



LEAD  
CONTENT



CARBON  
RESIDUE



ETHER



SULFUR  
CONTENT



# ENVIRONMENT & PERFORMANCE



FAME CONTENT &  
METHYL LAURATE



DISTILLATION  
TEMPERATURE



KINEMATIC  
VISCOSITY



# SAFETY PURPOSES



VAPOR  
PRESSURE



FLASH  
POINT



# IDENTIFICATION



COLOR



APPEARANCE



DENSITY



# Fuel Quality Standard Development

CLEAN AIR ACT (CAA)  
BIOFUELS ACT

WORLD WIDE FUEL CHARTER (WWFC)  
Fuel Quality and Vehicle Regional Harmonization  
Alternative Fuels / Energy Security and Sufficiency

Why we work to

TCPPA: Review and Formulate Standards

Monitoring: Sampling & Testing

Int'l Fuel Quality Stds

Emission Stds /  
Regulations

How we

What we work for

R&D on Fuel Specs

Vehicle Technology  
Dev't

work by

Fuel Additives Dev't

IRR for Standards

Local Supply & Demand

Multi-lateral bodies:  
ERIA, JAMA, JPEC, etc.

Who we work with

Inter-agency cooperation: DOE,  
DPS, DEPR-EP, DTC, DTF,  
BIR, TC, DOST, etc.

Others: Industry –  
Oil/Car, NGOs,  
Academe





**PHILIPPINE NATIONAL  
STANDARD**

PNS/DOE QS 008:2012  
ICS 75.160.20

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Petroleum products – E-Gasoline fuel –  
Specification



**BUREAU OF PRODUCT STANDARDS**

Member to the International Organization for Standardization (ISO)  
Standards and Conformance Portal: [www.bps.dti.gov.ph](http://www.bps.dti.gov.ph)

**PHILIPPINE NATIONAL  
STANDARD**

PNS/DOE QS 004:2012  
ICS 75.160.20

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Petroleum products – FAME-blended diesel oils –  
Specification



**BUREAU OF PRODUCT STANDARDS**

Member to the International Organization for Standardization (ISO)  
Standards and Conformance Portal: [www.bps.dti.gov.ph](http://www.bps.dti.gov.ph)



PNS/DOE QS 008:2012

Table 1 – Chemical and physical requirements for E-Gasoline

Property	Regular	Premium	Premium plus	Euro 4-PH <sup>a</sup> gasoline	Test method
Appearance	Clear and bright, visibly free of suspended or precipitated contaminants				Visual
Color	Green	Red	Blue	91RON – Green 95RON – Red 97RON – Blue	Visual
Copper corrosion, 3 hr @ 50°C, max.	1	1	1	1	PNS ASTM D130
Density at 15 °C, kg/L, max.	0.725-0.783	0.725-0.783	0.725-0.783	0.725-0.783	PNS ASTM D1298 or PNS ASTM D4052
Distillation temperature, °C at: 10% recovered, max. 50% recovered 90% recovered, max. End point, max. Residue, % vol, max.	70 70-110 180 215 2	70 70-110 180 215 2	70 70-110 180 215 2	70 70-110 180 215 2	PNS ASTM D86
Existent gum, mg/100 mL, max.	4	4	4	4	PNS ASTM D381
Hydrocarbons <sup>b</sup> : Aromatics, % vol, max.	35	35	35	35	PNS ASTM D5443 or PNS ASTM D5980 or PNS ASTM D5769 or PNS ASTM D5986 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D6839
Benzene, % vol, max.	2	2	2	2	PNS ASTM D3605 or PNS ASTM D5443 or PNS ASTM D5980 or PNS ASTM D5769 or PNS ASTM D5986 or PNS ASTM D6277 or PNS ASTM D6729 or PNS ASTM D6730 or PNS/ASTM D6839
Ethanol (C2) <sup>c</sup> , % vol,	9.0 – 10	9.0 – 10	9.0 – 10	9.0 – 10	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
Ethers (e.g. MTBE) <sup>d, e</sup> % vol, max.	2	2	2	2	PNS ASTM D4815 or PNS ASTM D5599 or PNS ASTM D5845 or PNS ASTM D5986 or PNS ASTM D6729 or PNS/ASTM D 6730 or PNS/ASTM D 6839
Lead content (not added) <sup>f</sup> g/L, max.	0.005	0.005	0.005	0.005	PNS ASTM D3237 or PNS ASTM D3348 or PNS ASTM D5059
Octane rating, min. Research Octane Number (RON) Anti-knock Index (AKI) <sup>g</sup>	91 95 87.5	95 97 87.5	97 99 87.5	91/95/97	PNS ASTM D2699 PNS ASTM D4814

PNS/DOE QS 008:2012

Table 1 (concluded)

Sulfur, % mass max.	0.05	0.05	0.05	0.005	PNS ASTM D1266 or PNS ASTM D2622 or PNS ASTM D4294 or PNS ASTM D5453
Vapor Pressure at 37.8 °C, kPa, max.	68	62	62	68 (RON 91) 62 (RON 95/97)	PNS ASTM D4853 or PNS ASTM D5191 or PNS ASTM D5482
Water content, % w/w, max.	0.1	0.1	0.1	0.1	PNS ASTM E203 or PNS ASTM D6304

- <sup>a</sup> Based on certificate from production site. The product shall not contain methanol  
<sup>b</sup> As per specification for Fuel Bioethanol in the PNS of Anhydrous Bioethanol Fuel  
<sup>c</sup> Allowable contamination tolerance only. Intentional addition not permitted for both imported and locally-produced gasoline  
<sup>d</sup> Methyl Tertiary Butyl Ether  
<sup>e</sup> To be reported quarterly with Motor Octane Number (MON) using ASTM D-2700  
<sup>f</sup> Oxygen content to be reported preferably not to exceed 4.0% mass max.  
<sup>g</sup> Euro 4-PH (50 ppm sulfur) gasolines to be introduced not later than January 1, 2016.



**4.2 Industrial diesel oil (IDO) – Diesel oil used for off-road vehicles, marine vessels, direct driven equipment such as pumps and compressors, and stationary equipment such as power generators, boilers and furnaces.**

## 5 Requirements

FAME-blended diesel oils shall conform to the chemical and physical requirements specified in table 1.

Annex 1 provides minimum reference specification for base diesel oils

Table 1 – Chemical and physical requirements for FAME-blended diesel oils

Property	ADO	IDO	Euro IV –PH <sup>a</sup> ADO	Test methods
Cetane number, min. or Derived cetane number, min.	50		50	PNS ASTM D 613 PNS ASTM D 6890 or PNS ASTM D 7170
Carbon residue on 10% Distillation residue, % mass, max.	0.15	0.35	0.15	
Conradson or Ramsbottoms or Micro				PNS ASTM D 189 or PNS ASTM D 524 or PNS ASTM D 4530
Color, ASTM	2.5 max.	5.0 min.	2.5 max.	PNS ASTM D 1500
Copper strip corrosion, 3 h at 50°C, max.	No.1	No. 1	No.1	PNS ASTM D 130 or PNS ISO 2160
Density at 15°C, kg/L	0.820 - 0.860	0.880 max.	0.820 - 0.860	PNS ASTM D 1298 or PNS ASTM D 4052
Distillation, 90% recovered, °C, max.	370	Report	370	PNS ASTM D 86
FAME <sup>b</sup> , content, % vol.	1.7 – 2.2	1.7 – 2.2	1.7 – 2.2	PNS EN 14078 or PNS/DOE TM 01 or PNS/DOE TM 02
Flash point, Pensky-Marten, °C, min.	55	55	55	PNS ASTM D 93
Kinematic viscosity, mm <sup>2</sup> /s at 40°C	2.0 – 4.5	1.7 – 5.5	2.0 – 4.5	PNS ASTM D 445 PNS ASTM D 7042
Lubricity, (HFRR), wear scar dia. @50°C, micron, max.	460		460	PNS ASTM D 6079
Methyl laurate (C12 ME), % mass, min.	0.8	0.8	0.8	PNS/DOE TM 01
Sulfur, %mass, max.	0.05	0.30	0.005	PNS ASTM D 4294 or PNS ASTM D 2622 or PNS ASTM D5453
Water, % volume, max.	0.05		0.05	PNS ASTM D 6304 or PNS ISO 12937 or PNS ASTM E 203
Water and sediment, % volume, max.	0.10	0.10	0.10	PNS ASTM D 2709

<sup>a</sup> As per PNS for B100  
<sup>b</sup> Euro IV-PH (50 ppm sulfur) automotive diesel oil (ADO) to be introduced not later than January 1, 2016.



# Fuel Quality Standards Development (Gasoline)

PROPERTY	GASOLINE (E0)					E-GASOLINE (E10)			
	CLEAN AIR ACT			POST CLEAN AIR ACT		BIOFUELS ACT			
	2000	2001 <sup>a</sup>	2003	2005	2009	2006	2009	E10	EURO 4-PH
Distillation temperature, 0C at:									
10% recovered, max	70	70	70	70	70	70	70	70	70
50% recovered	75-121	75-121	75-121	75-121	75-121	70-110	70-110	70-110	70-110
90% recovered, max	180	180	180	180	180	180	180	180	180
End point, max	221	221	221	221	221	215	215	215	215
Residue, % vol., max.	2	2	2	2	2	2	2	2	2
Hydrocarbons:									
Alcohols (C <sub>2</sub> to C <sub>4</sub> ), % vol., max. <sup>b</sup>	10	10	10	10	0.4	9.5-10	9.0-10	9.0-10	9.0-10
Aromatics, % vol., max.	45	45	35	35	35	35	35	35	35
Benzene, % vol., max.	4	4	2	2	2	2	2	2	2
Ethers (e.g. MTBE), % vol., max.	10	10	10	2 <sup>c</sup>	2 <sup>c</sup>			2 <sup>c</sup>	2 <sup>c</sup>
Lead Content, g/L, max.	0.013	0.013	0.013	0.005	0.005	0.005	0.005	0.005	0.005
Octane rating, min.									
Research Octane Number (RON)	93	81/87/ 93/95	81/87/ 93/95	81/93/ 95	81/93/ 95	93	93/95	91/95/ 97	91/95/97
Anti-Knock Index (AKI)	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
Vapor Pressure, @ 37.80C, kPa, max.	62	85/62	85/62	85/62	85/62	62	62	68/62	68/62
Sulfur, % mass, max.	0.10	0.2/0.1	0.2/0.1	0.05	0.05	0.5	0.05	0.05	0.005

<sup>a</sup> multi-grade gasoline <sup>b</sup> ethanol <sup>c</sup> allowable contamination tolerance only. Intentional addition not permitted for both imported and locally-produced gasoline

Note: E10 standards also provide minimum reference specifications for base gasoline.



# Fuel Quality Standards Development (Automotive Diesel)

PROPERTY	CLEAN AIR ACT				BIOFUELS ACT						
	DIESEL OILS				FAME BLENDED DIESEL OIL						
	2000		2003		2007 (B1)		2009 (B2)		2012 (B2)		EURO 4-PH
ADO	IDO	ADO	IDO	ADO	IDO	ADO	IDO	ADO	IDO		
Calculated cetane index min. Or	48		50		50	50	50		50		50
Cetane number, min. Or	48										
Derived cetane number, min.											
Carbon residue on 10% Distillation residue, % mass, max.	0.15	0.35	0.15	0.35	0.15	0.35	0.15	0.35	0.15	0.35	.015
Color, ASTM			2.5 max.	5.0 min.	2.5 max.	5.0 min.	2.5 max.	5.0 min.	2.5 max.	5.0 min.	2.5 max.
Copper strip corrosion, 3h at 50 °C, max.			No. 1	No, 1	No. 1	No. 1	No. 1	No. 1	No. 1	No. 1	No. 1
Density at 15 °C, kg/L	0.86 50	0.880	0.8600	0.8800	0.820- 0.860	0.880 max.	0.820- 0.860	0.880 max.	0.820- 0.860	0.880 max.	0.820- 0.860
Distillation, 90% recovered, °C, max	375	Report	370	Report	370	Report	370	Report	370	Report	370
FAME <sup>a</sup> , content, % volume.					0.7-1.2	0.7-1.2	1.7-2.2	1.7-2.2	1.7-2.2	1.7-2.2	1.7-2.2
Flash point, Pensky-Martens, °C, min.	52.0	52.0	55.0	55.0	55	55	55	55	55	55	55
Kinematic viscosity, mm <sup>2</sup> /s at 40°C	2.0- 4.5	2.0-4.5	2.0-4.5	1.7-5.5	2.0-4.5	1.7-5.5	2.0-4.5	1.7-5.5	2.0-4.5	1.7-5.5	2.0-4.5
Lubricity, (HRFF), wear scar dia. @ 60 °C, micron, max.			460		460		460		460		460
Methyl Laurate (C12 ME), % mass, min					0.4	0.4	0.8	0.8	0.8	0.8	0.8
Sulfur, % mass, max.			0.05	0.03	0.05	0.30	0.05	0.30	0.05	0.30	0.005
Water, % volume, max. <sup>b</sup>					0.05		0.05		0.05		0.05
Water and sediment, % volume, max.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Note: FAME blended diesel oils also provide minimum reference specifications for base diesel





# Fuel Quality Standards Developed

## Biofuels & Blends:

- **E-Gasoline (E10)**
  - *PNS/DOE QS 008:2012*
- **CME-Blended Automotive Diesel Oil (ADOB2)**
  - *PNS/DOE QS 004:2017*
- **CME-Blended Industrial Diesel Oil (IDOB2)**
  - *PNS/DOE QS 013:2017*
- **Anhydrous Bioethanol & Bioethanol Fuel (E100 E98)**
  - *PNS/DOE QS 007:2014*
- **Coconut Methyl Ester (B100)**
  - *PNS/DOE QS 002:2015*
- **High FAME-Blended Diesel Oils (B5)**
  - *PNS/DOE QS 010:2015*

## Conventional Petroleum , etc.

- **Unleaded Motor Gasoline**
  - *PNS/DOE QS 001:2009*
- **Two-stroke (2T) Lubricating Oils**
  - *PNS/DOE QS 003:2003*
- **LPG as Non-Motor Fuel**
  - *PNS/DOE QS 005:2016*
- **LPG as Motor Fuel**
  - *PNS/DOE QS 012:2016*
- **Fuel Oils (Bunker)**
  - *PNS/DOE QS 006:2005*
- **Kerosene**
  - *PNS/DOE QS 009:2007*
- **AvGas Grade 100**
  - *PNS/DOE ASTM D 910:2010*



# Fuel Quality Standards Developed

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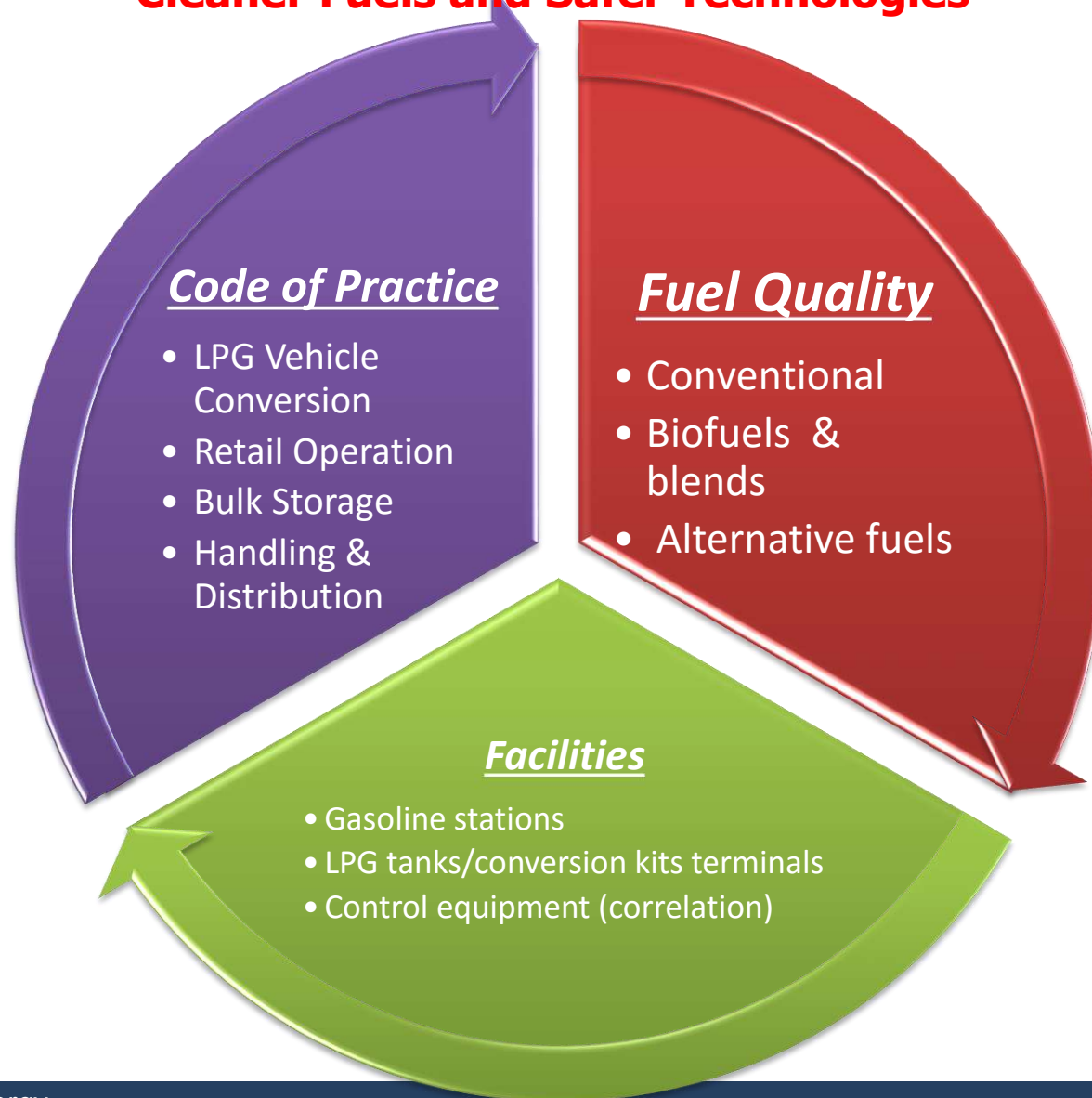
## Test Methods

- ***PNS/DOE TM 01:2015 (Updated 2009)***
  - **Determination of Ester and Lauric Acid Content in Fatty Acid Methyl Esters (FAME) by Gas Chromatography**
  
- ***PNS/DOE TM 02:2009***
  - **Separation of Fatty Acid Methyl Esters (FAME) Liquid Adsorption Chromatography and Blended Diesel Oils by Characterization by Gas Chromatography**



# Standards Harmonization in Downstream Petroleum Industry

## Cleaner Fuels and Safer Technologies



# Standardization Technical Committees

## Technical Committee on Petroleum Facilities and Processes (TCPPF)

- Chair : DOE
- Members

### Government:

DTI-BPS  
DENR-EMB  
DILG-BFP  
DOLE (BWC,  
OSHC)

### Industry:

Petron  
Shell  
Chevron  
Total  
IPPCA

### Testing:

DOST-MIRDC, UP

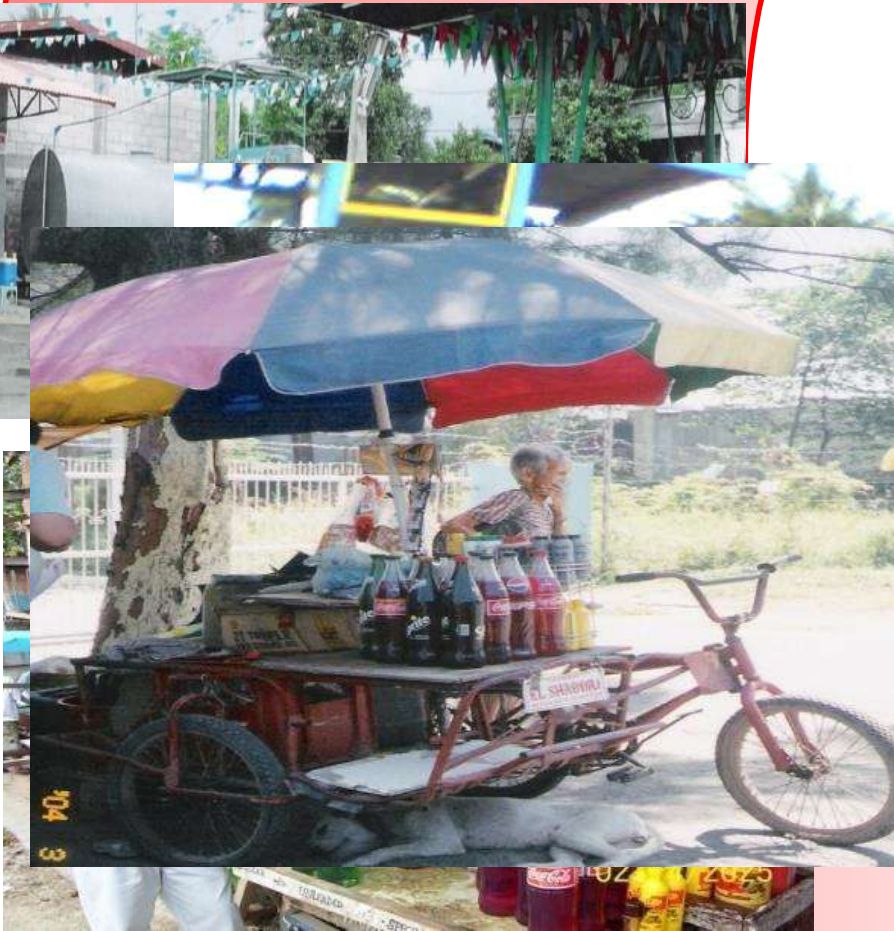
### Prof. Assoc.:

SOPI



# Facilities / Practice – Liquid Fuels

## Prohibited Acts



## Informational/Safety Signs





# Facilities/Practice- Auto LPG

illegal practice



correct practice





# Facilities Standards Developed

- **PNS/DOE FS 1-4 :2005** - **Retail Outlets**
  - ✓ **PNS/DOE FS 1-1: 2005** - **Health, Safety and Environment**
  - ✓ **PNS/DOE FS 1-2:2005** - **Underground Storage Tank**
  - ✓ **PNS/DOE FS 1-3:2005** - **Piping System**
  - ✓ **PNS/DOE FS 1-4:2005** - **Dispensing Pumps**
  
- **PNS/DOE FS 2:2006** - **LPG Refilling Plant - General Requirement**
  
- **PNS/DOE FS 3:2013 (update/review)** - **Auto-LPG Dispensing Station**
  - ✓ **PNS/DOE FS 3:2006** - **Auto-LPG Dispensing Stations**
  
- **PNS/DOE FS 4:2007** - **Liquid Petroleum Product (LPP) Depot**



# Facilities Standards Developed

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- **PNS/DOE FS 5:2009** - **Storing and Handling of CME and CME Blends Petroleum in LPP Depot**
- **PNS/DOE FS 6:2011** - **Storing and Handling of E-Gasoline in Retail Outlet**
- **PNS/DOE FS 7:2011** - **Storing and Handling of B5 in Retail Outlet**
- **PNS/DOE FS 8:2009** - **Transportation of Petroleum Product**  
**by**  
**Pipeline (on-going)**
- **PNS/DOE FS 9:2015** - **Code of Safety Practice in Auto-LPG Dispensing Station**



# On-going Standards Development (DPNS)

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## Fuel Quality Standards

- 1) **E-Gasoline Specification(E10) – DPNS/DOE QS 008:2017**
- 2) **PNS for Marine Fuels**
- 3) **PNS for Emulsified Fuel / Bunker Oil**
- 4) **PNS for Kerosene**



# On-going Standards Development (DPNS)

## Facilities Standards

### A. PNS/DOE FS 10:2017 - Code of Safety Practices for LPP in Retail Outlet (new)

*\*(endorsed to BPS and awaiting for adoption and promulgation as PNS)*

### B. Code of Safety Practices for an LPG Refilling Plant (new)

- Part 1 – Tank Truck & Lorry Entry Procedure
- Part 2 – Cylinder Refilling Procedure
- Part 3 – LPG Cylinders Housekeeping and Preventive Maintenance
- Part 4 – Fire Drill & Marshalls
- Part 5 – Personnel Training

*(Part 1, 2 & 3 – endorsed to office of the Secretary / Part 4 & 5 on-going deliberation)*

### C. DPNS/FS 2:2017 - LPG Refilling Plant (review/update of 2006)



# Implementation of PNS

Most PNS for fuel that is promulgated is being implemented through the issuance of a corresponding policy regulation in the form of **Department Circular (DC)**.

**Mandatory compliance by concerned industry players**

PNS for facilities at the moment is not mandatory, hence no DC is issued.



# Enforcement of PNS

Product sampling and facility check



Sampling frequency:  
At least once a year  
inspected for major  
facilities nationwide



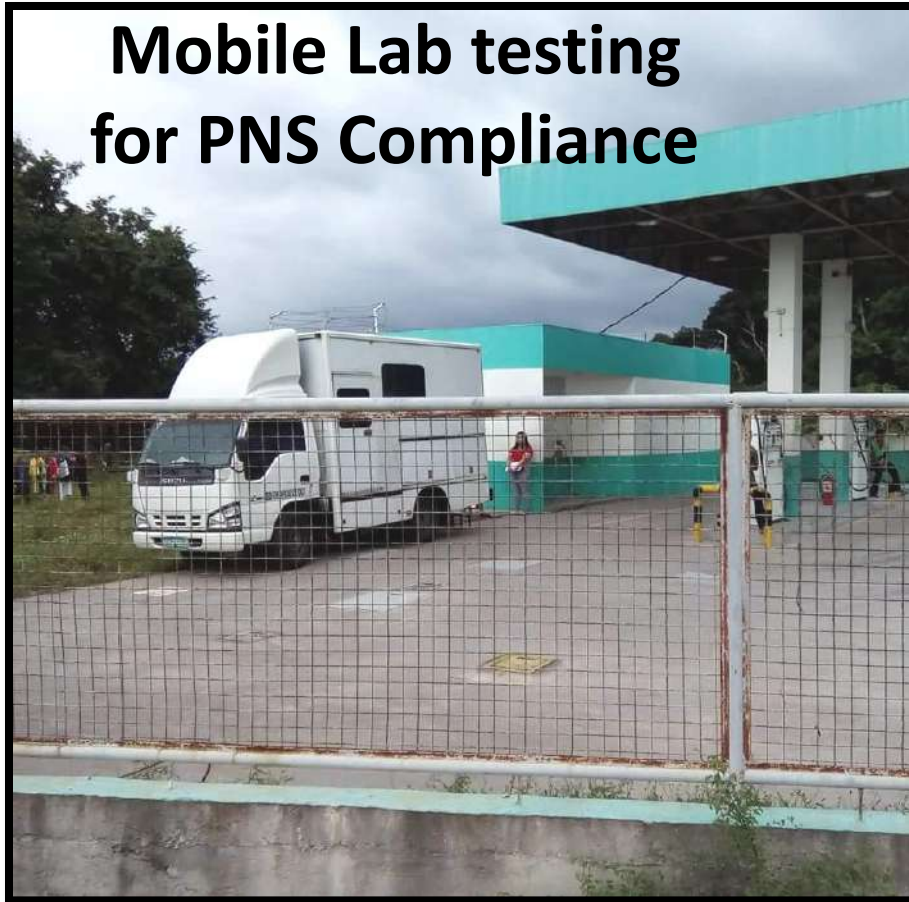


# Enforcement of PNS



# Enforcement of PNS

## Mobile Lab testing for PNS Compliance





# Enforcement of PNS

**Inter-lab correlation**

**Administrative actions**



Fines and penalties for violations

Feedback to companies

- with violations : requires corrective measures & reports.



# Enforcement of PNS

Instrument Based Sample Testing

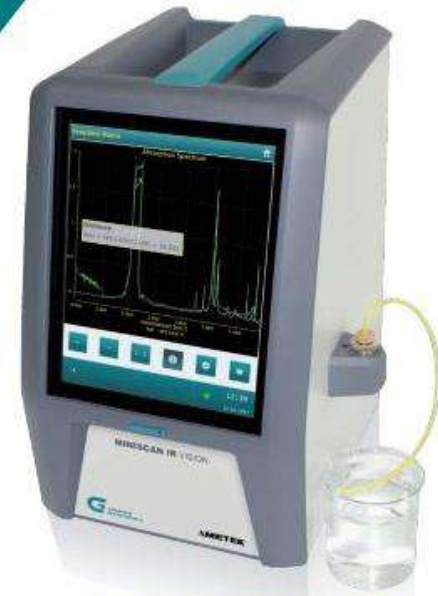
## Portable Fuel Analyzer



## MINISCAN IR VISION

Top Performer in Portable Fuel Analysis

The MINISCAN IR VISION is a high speed, compact and robust FTIR fuel analyzer for the comprehensive and automatic measurement of gasoline, jet and diesel fuels. The analyzer is configured to measure more than 100 fuel parameters and components for fuel blending, for quality inspection and to check compliance with fuel specifications directly at the point of sale.



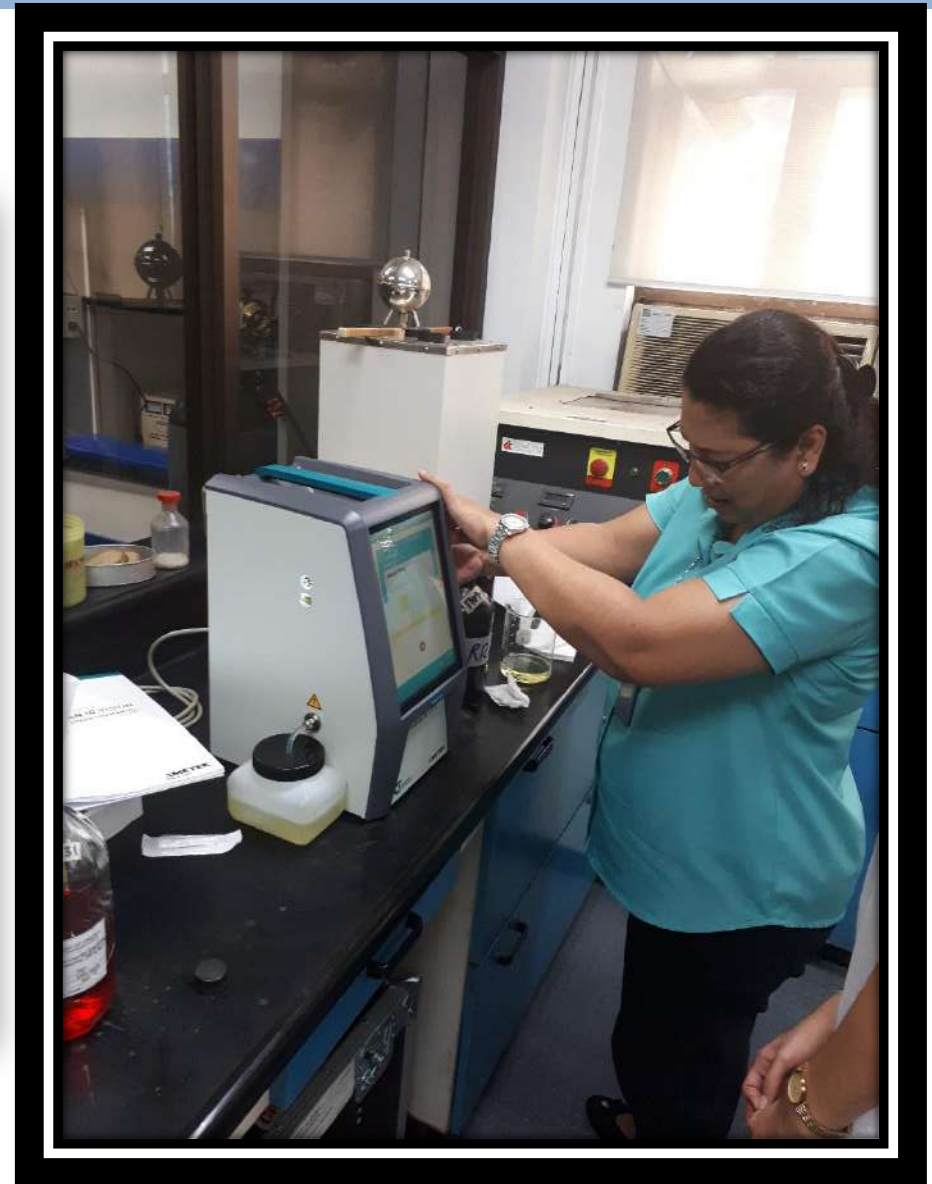
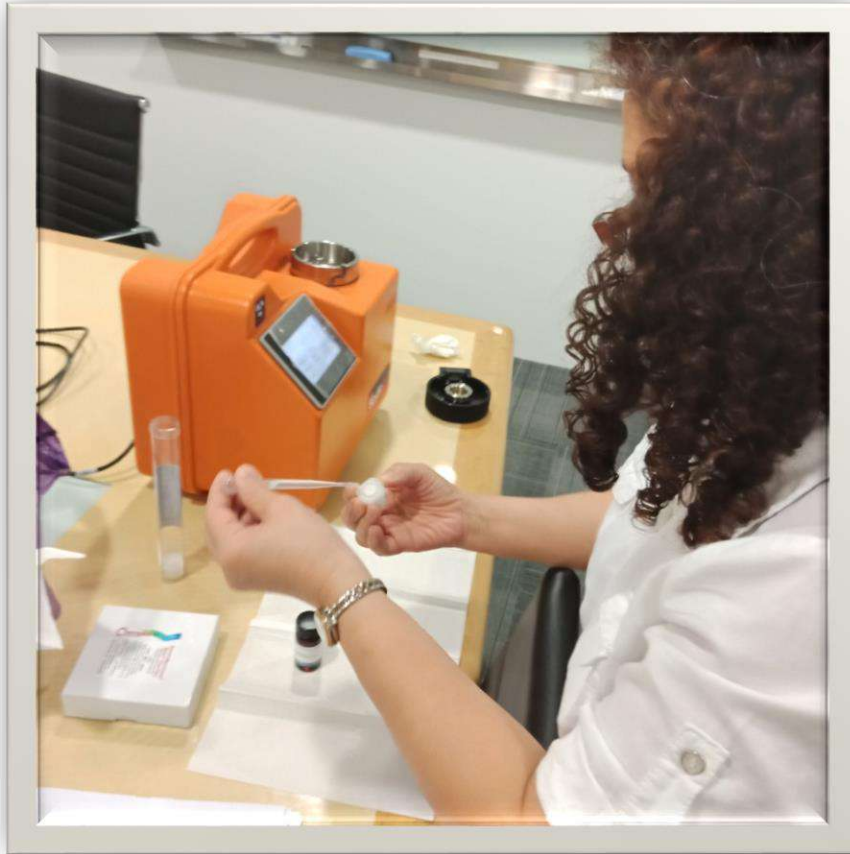
Data based on real samples collected and analyzed by SGS®!

## Portable Sulfur Analyzer



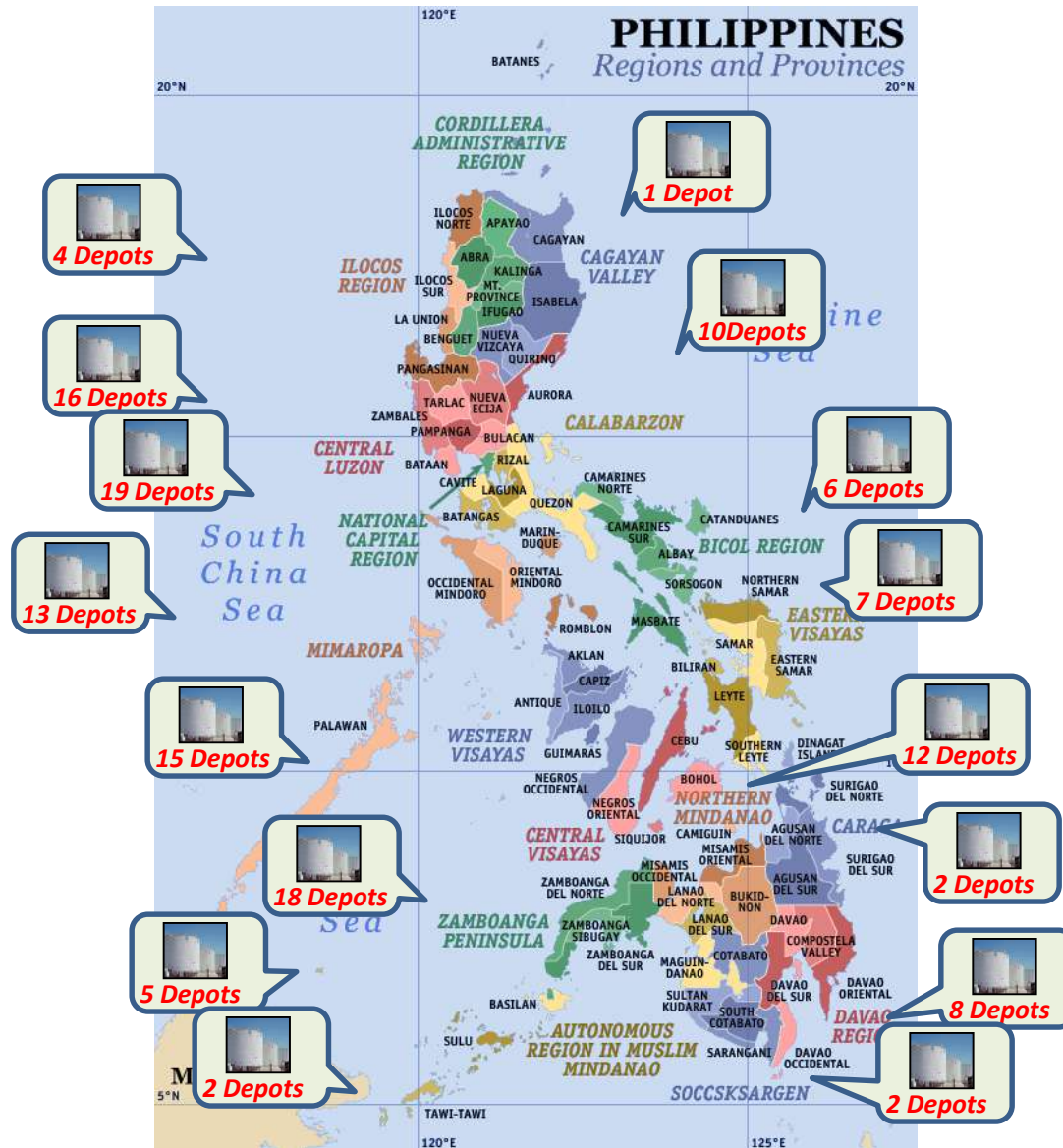
# Enforcement of PNS

## Instrument Based Sample Testing





# Regional Distribution of Downstream Facilities



**Total  
Number of  
Depots:  
(as of  
2017)**

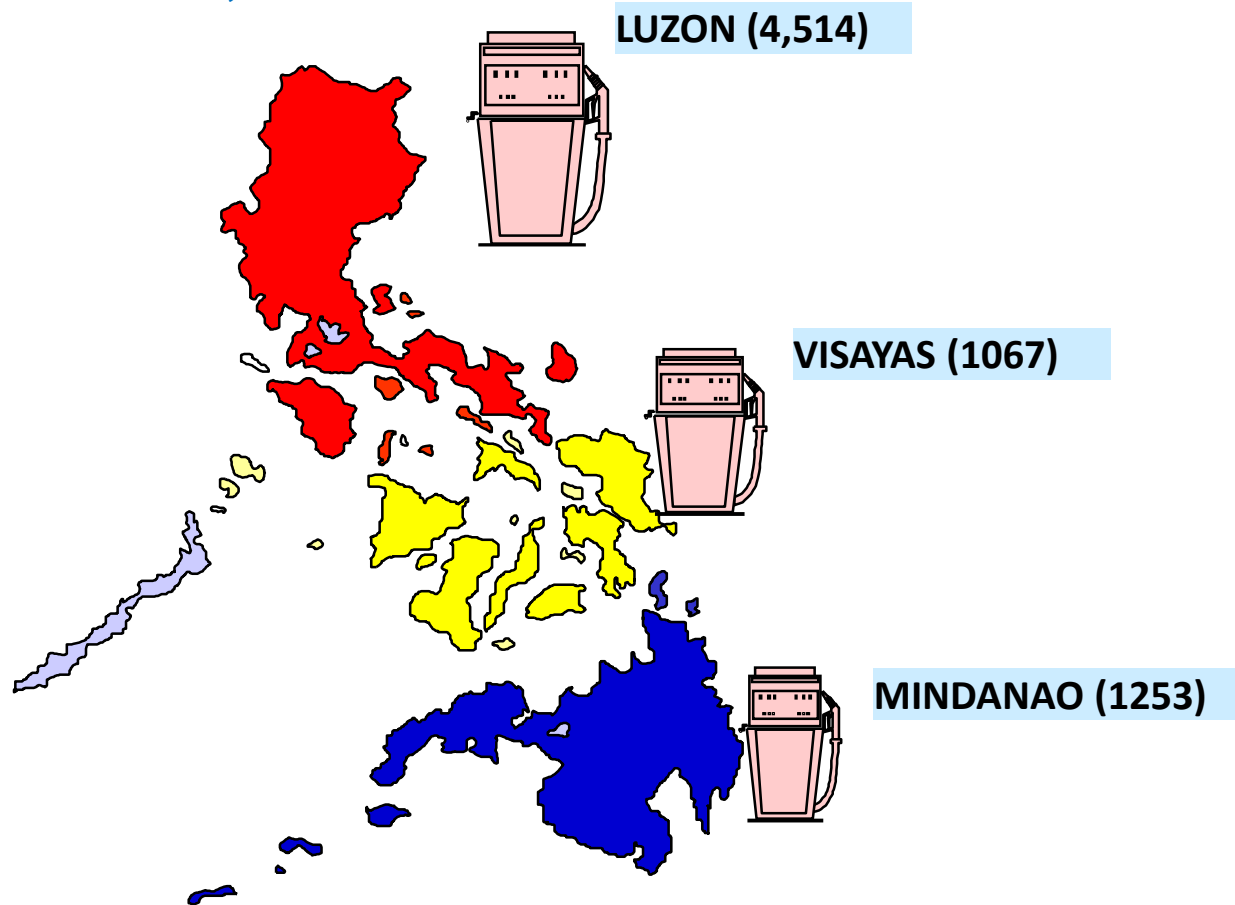
**143**





# Number of Gas Stations 2016

Total Gas Stations = 6,834



# Based on issued COC



# Fuel Quality Roadmap

**Short-Term  
(2016-2017)**

**Medium-Term  
(2018-2020)**

**Long-Term  
(2021-2030)**

**STANDARD  
DEVELOPMENT**



- Sulfur reduction from 500ppm to 50ppm
- Application of modern emulsion
- Introduction of higher biodiesel level (B5)

- Olefin & aromatic content limits
- Additional composition controls
- Prohibition of more metallic additives
- Introduction of non-coconut biodiesel feedstocks

- Further Benzene reduction
- Introduction of hydrolyzed fuel and higher bioethanol level (E20)
- Introduction of ultra-low sulfur
- Low carbon fuel standard



**Improved policy governing the oil downstream sector to ensure a vibrant industry ; Control emissions of traditional air pollutants; and Energy security & CO<sub>2</sub> reduction**



# Thank You!



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