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Morocco to Implement Euro 6-Equivalent Fuel Quality and Vehicle Emissions Standards in 2022-2023

Stratas Advisors

As part of Morocco's efforts for cleaner mobility and after several studies and rounds of discussion, Euro 6-equivalent fuel (with max 10 ppm sulfur) will be required in Morocco starting from January 2022. The new Euro 6b standard for new vehicle models will also come into force from January 2023.

The following two decrees have been issued:

- The first [Decree, n ° 1948.21](#) of the Ministry of Energy and Mines (promulgated on July 16, 2021 and published in the Official Bulletin of August 23, 2021), relating to the adoption of new characteristics of the components of super unleaded gasoline fuels and Gasoil 10 ppm, meeting the Euro 6-equivalent standard, the distribution of which will begin on Jan. 1, 2022, with 100% penetration by May 1, 2022 across the whole Kingdom; and
- The second [Decree, n ° 2251.21](#) of the Ministry of Equipment, Transport, Logistics and Water (promulgated on August 5, 2021 and published in

the Official Journal of Sept. 23, 2021), clarifying the regulatory mechanism of the implementation of the Euro 6b standard for homologations of new vehicles effective Jan. 1, 2023.

This was also announced by the Association of Vehicle Importers in Morocco (AIVAM) on Oct. 15, 2021. In addition, all vehicles in stock that do not meet the Euro 6b standard can be marketed until Dec. 31, 2023.

Thus, Morocco will be able to provide cleaner and more economical technologies, thereby reducing the impacts of air pollution on human health as well as the environment, according to AIVAM.

Fuel Specifications

It is worthwhile noting that since Jan. 1, 2016, the 10 ppm sulfur limit has already been in place for diesel through “Arrêté 3774-5 du ministère de l’Énergie et des mines”, but remained at 50 ppm for gasoline through “Decree 1546-07” since Jan. 1, 2009. The Moroccan Institute for Standardization (IMANOR) also sets separate technical standards for gasoline and diesel quality with a maximum sulfur limit of 10 ppm under NM EN 228:2016 and NM EN 590:2016 respectively, which have been in place since March 2016.

Besides sulfur, other spec changes to gasoline include:

- New limit for manganese to be set for the first time at 2 mg/l;
- The maximum permitted benzene will decrease from 5 vol% to 1 vol%;
- The maximum permitted aromatics will decrease from 60 vol% to 35 vol%;
- The maximum permitted olefins will increase from 14 vol% to 18 vol%;

- Limits for RVP will change from 64-78 kPa to 50-80 kPa during winter and 45-60 kPa during summer;
- New limit for other oxygenates to be set for the first time at 10 vol% max;
- New requirement for phosphorus to be set for the first time where no phosphorus component is permitted to be added to the super unleaded gasoline grade (i.e. RON 98); and
- The limit for color will change from green to light yellow.

Current and New Gasoline Specifications

	2021	2021 - 2022	2021 - 2022	2022
Spec Name	Decree 1546-07	NM EN 228:2016	NM EN 228:2016	Decree, n ° 1948.21
Grade	Unleaded Super	Unleaded petrol with maximum oxygen content of 2.7 wt%	Unleaded petrol with maximum oxygen content of 3.7 wt%	Super Unleaded Gasoline
Grade Category	On-road	On-road	On-road	On-road
Effective Date	Jan, 2009	Mar, 2016	Mar, 2016	Jan, 2022
Source	Samir Refinery	Moroccan Institute for Standardization (IMANOR)	Moroccan Institute for Standardization (IMANOR)	Bulletin Officiel 7022
Additional Comments	Essence Super sans plomb			
Properties				
RON, min	95	95 (1)	95 (1)	95
MON, min	85	85 (1)	85 (1)	85
Sulfur, ppm, max	50	10.0	10.0	10
Lead, g/l, max	0.005	0.005	0.005	0.005
Manganese, g/l, max		0.0020 (2)	0.0020 (2)	0.002

	2021	2021 - 2022	2021 - 2022	2022
Benzene, vol%, max	5	1.00	1.00	1
Aromatics, vol%, max	60	35.0	35.0	35
Olefins, vol%, max	14	18.0	18.0	18
RVP @ 37.8°C (100°F), kPa, min	64		45.0 (class A) - 70.0 (class F1) (3)	50 (w) / 45 (s) (4)
RVP @ 37.8°C (100°F), kPa, max	78		60.0 (class A); 100.0 (class F1) (3)	80 (w) / 60 (s) (4)
VLI, calculated, max			1064 (class C1) - 1264 (class F1) (5)	
Density @ 15°C (60°F), kg/m ³ , max	775	775.0	775.0	775
Density @ 15°C (60°F), kg/m ³ , min	720	720.0	720.0	720
Distillation				
E70, vol%, max	50		50.0 (class A) - 52.0 (class F1) (6)	50
E70, vol%, min	20		22.0 (class A) - 24.0 (6)	20
E100, vol%, min	46		46.0	46
E100, vol%, max	71		72.0	71
E150, vol%, min	76		75.0	75
FBP, °C, max	210		210	210
Residue, vol%, max	2.0		2	2
Oxygen, wt%, max	2.7	2.7	3.7	2.7
Oxygenates				

	2021	2021 - 2022	2021 - 2022	2022
Methanol, vol%, max	3	3.0 (<u>7</u>)	3.0 (<u>7</u>)	3
Ethanol, vol%, max	5	10.0 (<u>8</u>)	10.0 (<u>8</u>)	5
Iso-butyl alcohol, vol%, max	10	Mixture of restricted volumes at a content maximum oxygen 2.7 wt%	15.0	10
Iso-propyl alcohol, vol%, max	10	Mixture of restricted volumes at a content maximum oxygen 2.7 wt%	12.0	10
Tert-butyl alcohol, vol%, max	7	Mixture of restricted volumes at a content maximum oxygen 2.7 wt%	15.0	7
Ethers (5 or more C atoms), vol%, max	15	Mixture of restricted volumes at a content maximum oxygen 2.7 wt%	22.0	15
Other oxygenates, vol%, max		Mixture of restricted volumes at a content maximum oxygen 2.7 wt% (<u>9</u>)	15.0 (<u>10</u>)	10
Phosphorus, g/l				no phosphorus component must be incorporated into the Super Unleaded gasoline
Phosphorus, g/l, max	0			
Oxidation stability (Induction period), minutes, min	360	360	360	360
Existent gum (solvent washed), mg/100ml, max	5	5	5	5

	2021	2021 - 2022	2021 - 2022	2022
Corrosion				
Copper corrosion, 3hr @ 50°C, merit (class)	class 1			
Copper corrosion, 3hr @ 50°C, merit (class), max		1	1	1
Color	green			light Yellow
Appearance	clear & bright	Clear and limpid (11)	Clear and limpid (11)	Clear

(1) A correction factor of 0.2 must be subtracted from the MON and the RON for the calculation of the final result before reporting the data in accordance with the requirements of European Directive 98/70 / EC [1], including Amendments subsequent [2] [3] and [4].

(2) Max 0.0060 until Dec 31, 2013; Max 0.0020 from Jan 1, 2014

(3) Class A: 45.0-60.0 kPa; Class B: 45.0-70.0 kPa; Class C/C1: 50.0-80.0 kPa; Class D/D1: 60.0-90.0 kPa; Class E/E1: 65.0-95.0 kPa; Class F/F1: 70.0-100.0 kPa. Depends on volatility classes determined by the country's seasonal and geographical conditions. To relevant countries, volatility class A shall apply during summer starting no later than May 1 and ending not before Sept. 30. In countries with arctic conditions class B shall apply during summer, starting no later than June 1 and ending not before Aug. 31.

(4) Summer: May 1 to Oct 14. Winter: Oct 15 to April 30.

(5) Depends on volatility classes determined by the country's seasonal and geographical conditions. Class C1: 1064; Class D1: 1164; Class E1: 1214; Class F1: 1264.

(6) Depends on volatility classes determined by the country's seasonal and geographical conditions. Class A and B: 22.0-50.0 vol%; Class C/C1, D/D1, E/E1 and F/F1: 24.0-52.0 vol%. To relevant countries, volatility class A shall apply during summer starting no later than May 1 and ending not before Sept. 30. In countries with arctic conditions class B shall apply during summer, starting no later than June 1 and ending not before Aug. 31.

(7) Stabilizers must be added.

(8) Ethanol when used as a base for gasoline blending must comply with EN 15376. Stabilizers can be added.

(9) The oxygen content of the final unleaded gasoline should not exceed 2.7% (m / m). A CEN / TR on the mixing of oxygenates is being prepared. Other mono-alcohols and ethers with a boiling point which does not exceed that specified in SM EN 228 standard.

(10) Other mono-alcohols and ethers with a boiling point which does not exceed that specified in SM EN 228 standard.

(11) The appearance should be determined at room temperature.

As for diesel, the spec changes include:

- The minimum permitted cetane number will increase from 50 to 51;
- The limits for density will tighten from 820-860 kg/m³ to 820-845 kg/m³;
- The limits for viscosity @ 40°C will tighten from 2-6 cSt to 2-4.5 cSt;
- The maximum permitted T95 distillation will decrease from 380°C to 360°C;
- A new limit will be set for E180 distillation at 10 vol% max, similarly with NM EN 590;
- The maximum permitted Cold Filter Plugging Point (CFPP) will decrease from -3°C during winter and +3°C during summer to -10°C during winter and 0°C during summer;
- The maximum permitted Pour Point (PP) will decrease from -7°C during winter and -4°C during summer to -15°C during winter and -10°C during summer;
- A new limit will be set for total contamination at 24 ppm max;
- The maximum permitted color will be increase from 2.0 to 2.5; and
- A new limit for manganese to be set for the first time at 0.002 g/l max.

Current and New Diesel Specifications

	2021	2021 - 2022	2022
Spec Name	Arrêté 3774-5 du ministre de l'Énergie et des mines	NM EN 590:2016	Decree, n ° 1948.21
Grade	Diesel	Diesel	Gasoil 10 ppm
Grade Category	On-road	On-road	On-road
Effective Date	Jan, 2016	Mar, 2016	Jan, 2022

	2021	2021 - 2022	2022
Source	Arrêté 3774-5 du ministre de l'Énergie et des mines	Moroccan Institute for Standardization (IMNOR)	Bulletin Officiel 7022
Additional Comments	Automotive		
Properties			
Cetane number, min	50	51.0 (t); 47.0-49.0 (a & s)	51
Cetane index, min	46	46.0 (t); 43.0-46.0 (a & s) (1)	46
Sulfur, ppm, max	10	10.0	10
Polyaromatics, wt%, max		8.0 (2)	
Density @ 15°C (60°F), kg/m3, max	860 (3) (4)	845.0 (t); 840.0-845.0 (a & s) (5)	845
Density @ 15°C (60°F), kg/m3, min	820 (3) (4)	820.0 (t); 800.0 (a & s) (5)	820
Viscosity @ 40°C, cSt, max	6	4.500 (t); 4.000 (a & s) (6)	4.5
Viscosity @ 40°C, cSt, min	2	4.500 (t); 4.000 (a & s) (6)	2
Distillation			
T95, °C, max	380	360	360
E180, vol%, max		10.0 (a & s) (7)	10
E250, vol%, max	65	65	65
E340, vol%, min		95.0 (7)	
E350, vol%, min	85 (8) (9)	85	85
Flash Point, °C, min	55	55.0	55
Carbon residue 10%, wt%, max	0.3	0.30	0.3
Cold Filter Plugging Point (CFPP), °C, max	-3;+3 (10)	+5 (Grade A) to -20 (Grade F) (t); -20 (class 0) to -44 (class 4) (a & s) (11)	-10 (w) / 0 (s) (12)
Pour Point (PP), °C, max	-7;-4 (13)		-15 (w) / -10 (s) (12)

	2021	2021 - 2022	2022
Cloud Point (CP), °C, max		-10 (class 0) to -34 (class 4) (a & s) (14)	
Water, vol%	(15)	(15)	(15)
Ash, wt%, max	0.01	0.010	0.01
Total contamination, ppm, max		24	24
Lubricity, HFRR wear scar diam @ 60°C, micron, max	460	460	460
Copper corrosion, 3hr @ 50°C, merit (class), max	Class1	1	1
Oxidation stability, mg/100ml, max	2.5 (16)		2.5 (17)
Stability			
Oxidation stability (Induction period), minutes, min		1,200 (18)	
Conductivity @ ambient temp, pS/m, min	150		150
Color, max	2.0		2.5
FAME content, vol%, max		7.0	
Metal content (Zn, Cu, Mn, Ca, Na, other), g/l		(19)	
Metal content (Zn, Cu, Mn, Ca, Na, other), g/l, max			0.002 (20)

(1) Depends on climate rating. For Arctic or severe winter climates: Class 0, 1 & 2: 46.0 - Class 3 & 4: 43.0 Calculation of the Cetane Index will also require distillation values at 10%, 50% and 90% (v/v) recovery points.

(2) For the purposes of this European Standard, polycyclic aromatic hydrocarbons are defined as the total content of aromatic hydrocarbons minus the content of mono-aromatic hydrocarbons, these two contents being determined by EN 12916.

(3) 0.820 Kg/l

(4) 0.860 Kg/l

(5) Depends on climate rating. For Arctic or severe winter climates; Class 0 & 1: 845.0 - Class 2, 3 & 4: 840.0

(6) Depends on climate rating. For Arctic or severe winter climates: Class 0, 1 & 2: 1.500 - Class 3: 1.400 - Class 4: 1.200

(7) Arctic climates and severe winters conditions.

(8) VALUE FOR : AT 355°C

(9) VALUE FOR AT 355 ° C

(10) Oct 1st to March 31th : -3 April 1st to Sept 30th : +3

(11) Depends on climate rating. For Temperate climates; Grade A: +5 / Grade B: 0 / Grade C: -5 / Grade D: -10 / Grade E: -15 / Grade F: -20. For Arctic or severe winter climates; Class 0: -20 / Class 1: -26 / Class 2: -32 / Class 3: -38 / Class 4: -44.

(12) Winter: From Oct 1 to Mar 31; Summer: From Apr 1 to Sep 30.

(13) Winter : -7 Summer : -4

(14) Only applicable for arctic or severe winter climates. Class 0: -10 / Class 1: -16 / Class 2: -22 / Class 3: -28 / Class 4: -34.

(15) Max 200 ppm

(16) 25 g/m³

(17) Max 25 g/m³

(18) Max 25 g/m³. When diesel fuel contains more than 2 vol% FAME, oxidation stability as determined by EN 15751 is the requirement

(19) Manganese : Max 6.0 mg/l until Dec 31, 2013; Max 2.0 mg/l from Jan 01, 2014

(20) Manganese

The new decree also includes fuel oil specs which are currently governed by Decree 1546-07, and the changes include:

- Specifications for the two grades of Heavy Fuel Oil Number 1 and Fuel Oil 20 centistokes under Decree 1546-07 will be phased out and will be replaced with a Marine Fuel Oil grade containing max 0.5 wt% sulfur along with other parameters such as viscosity, density, E250 distillation, flash point, pour point, carbon residue, total acid number, ash, water,

hydrogen sulfide, vanadium, aluminum & silicon, sodium, calcium, zinc, total sediments and CCAI;

- Heavy Fuel Oil Number 2 will be split into two grades of Standard and Special with maximum sulfur limit remaining at 4 wt% for both grades;
- The limits for viscosity @ 50°C will be set at 45-60cSt for Fuel Oil Number 7 and 110-380 cSt for Heavy Fuel Oil Number 2 Standard and Special grades;
- A new limit for E250 distillation will be set at 50 vol% max for the above three fuel oil grades, while it will be set at 65 vol% max for the Marine Fuel Oil grade; and
- New maximum limits for flash point, ash content, water content, asphaltene, vanadium and sodium will be set only for the Heavy Fuel Oil Number 2 Special grade at 190°C, 0.03 wt%, 1.5 vol%, 5 wt%, 80 ppm and 85 ppm respectively.

Current and New Fuel Oil Specifications

	2021	2021	2021	2021	2022	2022	2022	2022
Spec Name	Decree 1546-07	Decree 1546-07	Decree 1546-07	Decree 1546-07	Decree, n° 1948.21	Decree, n° 1948.21	Decree, n° 1948.21	Decree, n° 1948.21
Grade	Fuel Oil 20 Centistoke	Fuel Oil No. 1 (1)	Fuel Oil No. 2 (1)	Fuel Oil No. 7	Fuel Oil Marine	Fuel Oil Number 7	Heavy Fuel Oil Number 2 Special	Heavy Fuel Oil Number 2 Standard
Grade Category	Off-road	Off-road	Off-road	Off-road	Off-road	On-road	On-road	On-road
Effective Date	Oct, 2007	Jan, 2009	Jan, 2009	Jan, 2009	Jan, 2022	Jan, 2022	Jan, 2022	Jan, 2022

	2021	2021	2021	2021	2022	2022	2022	2022
Source	Ministry of Energy and Mines	Ministry of Energy and Mines	Ministry of Energy and Mines	Ministry of Energy and Mines	Bulletin Officiel 7022	Bulletin Officiel 7022	Bulletin Officiel 7022	Bulletin Officiel 7022
Additional Comments	Technical Specifications		Technical Specifications		Technical Specifications		Technical Specifications	
Properties								
Sulfur, ppm, max	20000	35000	40000	30000	5000	30000	40000	40000
Viscosity @ 50°C, cSt				(2)				
Viscosity @ 50°C, cSt, min	15				110	45	110	110
Viscosity @ 50°C, cSt, max	20	110	110		380	60	380	380
Density @ 15°C (60°F), kg/m ³ , max					991		975	
Distillation								
E250, vol%, max					65	50	50	50
Flash Point, °C, max							190	
Flash Point, °C, min	55	70 (3)	70	70	60	70	70	70
Pour Point (PP), °C, max				0	30	0		

	2021	2021	2021	2021	2022	2022	2022	2022
Carbon residue 10%, wt%, max					18		9	
Total acid number, mg KOH/g, max					2.5			
Ash, wt%, max	0.1				0.1		0.03	
Water, vol%, max		0.75	0.5	0.75	0.5	0.75	1.5	0,5
Water and sediment, vol%, max	0.5							
Asphaltene, wt%, max							5	
Hydrogen sulfide, ppm, max					2			
Vanadium, ppm, max					350		80	
Aluminum & silicon, ppm, max					60			
Sodium, ppm, max					115		85	
Calcium, ppm, max					30			
Zinc, ppm, max					15			

	2021	2021	2021	2021	2022	2022	2022	2022
Sediment, wt%, max					0.10			
Calculated Carbon Aromaticity Index (CCAI), max					870			

(1) Distillation, E270 = 50 vol%, max.

(2) ranging between 6.5 and 7.5 degrees

(3) 140°C max.

Vehicle Emission Standards

According to Decree, n ° 2251.21, new vehicles of categories M and N must be equipped with a self-onboard diagnostic system (OBD) and comply with the emission limits equivalent to Euro 6b as shown as in the tables below.

Euro 6b Emission Limits

Vehicle Category	Reference Mass (empty weight + 100 kg)	Fuel	Limit Thresholds (Type I Test)		
			CO(mg/km)	HCT(mg/km)	NMHC(mg/kn)

M1,M2	≤2,610 kg	Diesel	500	-	-
		Gasoline	1000	100	68
N1	≤1,305	Diesel	500	-	-
		Gasoline	1000	100	68
	>1,305 &≤1,760	Diesel	630	-	-
		Gasoline	1810	130	90
	> 1,760	Diesel	740	-	-
		Gasoline	2270	160	108
N2		Diesel	740	-	-
		Gasoline	2270	160	108

Note: (1) The limits relating to the mass and number of particles for positive ignition (gasoline) apply only to vehicles equipped with a direct injection engine.

Source: Moroccan Official Bulletin 7024

Euro 6b Emission Limits Based on Driving Cycles

Limit Thresholds(Type I Test)

	CO (mg/kWh)	HCT (mg/kWh)	NMHC (mg/kWh)	CH4 (mg/kWh)	NOx (mg/kWh)	NH3 (ppm)
WHSC (CI)	1500	130			400	10
WHTC (CI)	4000	160			460	10
WHTC (PI)	4000		160	500	460	10

Notes: PI - positive ignition; CI - compression ignition; WHSC: World Harmonized Stationary

Cycle; WHTC: World Harmonized Transient Cycle

Source: Moroccan Official Bulletin 7024

In addition, the maximum content of CO must not exceed 0.3% for gasoline engines (Type II test) at normal idling speed. The maximum volume content of CO must also not exceed 0.2% at fast engine speed of least 2000 min⁻¹.

Stratas Advisors' Views

The announcement follows the efforts that Morocco has put in place to control the quality of fuel, which, according to the Ministry of Energy, was the preliminary step before the introduction of the Euro 6-equivalent standard (see [Morocco's Gasoline Specifications](#)). As the project was already pending at the Ministry of Energy, there were no major obstacles for Leila Benali, the new Minister of Energy, to sign and pass the decree. This means that from 2022, Morocco will officially become the first country in Africa with a limit of 10 ppm in place for both diesel and gasoline.

Stratas Advisors expects that it is likely for Morocco to already have 10 ppm sulfur gasoline available on the market as fuel is imported mainly from Europe. 50% of Morocco's fuel imports come from the EU, mainly from Spain (24.2%), and 30% coming from Asia and the Middle East, mainly from Saudi Arabia (14.9%). Morocco also imports fuel from the U.S. at about 13.7% of total imports. Since all of Morocco's international trading partners are producing and supplying 10 ppm sulfur gasoline, it is likely that there will be no issues for Morocco to switch to 10 ppm from 2022.

As previously reported on Morocco's fuel quality monitoring system

(see [Morocco's Conventional Fuels Policy](#)), the Ministry of Energy set up a new fuel quality control

laboratory in 2020 for MAD 10 million (US\$1.1 million). Aziz Rabbah, former Minister of Energy, indicated that

3,400 operations were carried out at retail stations during 2020, stressing that 61 stations were referred to the

King's public prosecutor due to the non-conformity of the fuel qualities distributed. Regarding the issue on

irregularities with octane levels found in gasoline at retail stations last year, so far in 2021, there are no

related incidents conveyed by the Ministry or the press.

As an additional example of awareness of the fuel suppliers regarding the importance of quality certifications in the fuel sector, the OilLibya group has also partnered with an independent body in the certification of hydrocarbons, with the aim of putting its fuel products to the test by subjecting them to quality controls at all of its service stations. This partnership consists of the commissioning of a mobile laboratory, intended to control the quality of fuels at OilLibya service stations. Experts therefore set out to test the gasoline pumps and issue certifications relating to the quality control of fuels and to raise awareness among the public as to the importance of the choice of fuel for the proper functioning of the engine and therefore the longevity of the vehicle.