Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 10 **Volume:** 102

Published: 28.10.2021 **http://T-Science.org**

QR – Issue QR – Article

Ulugbek Rustamovich Hamroev
Customs Institute of the State Customs Committee of the Republic of Uzbekistan
Ph.D, Senior teacher, Tashkent, Republic of Uzbekistan
Tashkent city, Kazirabad street, 2nd narrow street, 118, 100071

Saidvali Yusupov
Customs Institute of the State Customs Committee of the Republic of Uzbekistan
Ph.D, Senior teacher, Tashkent, Republic of Uzbekistan
Tashkent city, Kazirabad street, 2nd narrow street, 118, 100071
тел: + 998-90-371-41-71
uzbekiston@inbox.ru

CLASSIFICATION OF AI-BRAND FUELS BASED ON FEA TN

Abstract: *This article examines motor gasoline in terms of international standards, environmental requirements, physicochemical properties, the trend of producing high-octane gasoline products that meet high environmental class, the reduction of lead concentration in the chemical composition properties.*

The number of octanes for AI-branded fuels in motor and research methods, the current TIF TN (Commodity Nomenclature of Foreign Economic Activity) code numbers (research method), the number of lead content, sulfur content and the chemical composition of more than 21 of the requirements for gasoline properties as the main criteria 3 Based on these criteria, a total of 6 new code numbers of goods under TIF TN, ie 271012410 11, 271012410 21, 271012410 31, 271012450 01, 271012490 01, 271012590 01 were developed and recommended for use in customs practice.

Key words: *motor gasoline, AI-branded fuels, motor and research methods, chemical composition of gasoline oxygen, sulfur, nitrogen, lead, TIF TN, brand code.*

Language: *English*

Citation: Hamroev, U. R., & Yusupov, S. (2021). Classification of AI-brand fuels based on FEA TN. *ISJ Theoretical & Applied Science, 10 (102),* 925-932.

Soi: http://s-o-i.org/1.1/TAS-10-102-104 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.10.102.104

Scopus ASCC: *2300.*

Introduction

In terms of composition, motor gasoline is a mixture of components obtained as a result of various technological processes: direct distillation of oil, catalytic recycling, hydrocracking of catalytic cracking and vacuum gas oil, isomerization of straight fractions, alkylation, aromatization of thermal cracking, visbreaking, delayed coking. The composition of gasoline depends mainly on its brand and is determined by the set of technological units at the oil refinery.

Gasoline contains carbon and hydrogen compounds. But it doesn't stop there. Popular fuels include other gasoline molecules. The chemical composition of gasoline is also supplemented with additives that improve the final product of oxygen, sulfur, nitrogen, lead and raw materials. Quantitative components of these microelements represent a specific type in 92, 95, 98, 100 brand fuels.

In addition, another key feature of motor fuels is their chemical stability and toxicity. Fuel stability properties (hydrocarbons, non-hydrocarbon compounds and additives) characterize the ability of the atmosphere to resist the oxidizing effects of oxygen, physical stability characterizes the propensity of fuel to evaporation, delamination, hygroscopicity, pollution, etc., biological stability protects bacteria from mold, fungi. Toxicity refers to the level of fuel harmful to the consumer and the environment, the impact of fuel quality on the composition of the engine exhaust gases, and so on.

Physicochemical and performance characteristics of motor gasoline

Literature review

Modernization and intensification of agriculture in the republic of Uzbekistan were investigated by Yuldashev, N. K. [15], empirical research on causal relationship between export and foreign investments in the economy of Uzbekistan based on granger test Mustafakulov S. I., Tursunov B. O. [16], issues of factors effecting net actives of investment funds were studied by Burkhanov A. U., Hudoykulov H. [17], Aspect of financial security of industrial enterprises under influence of global crisis were researched by ATursunov B. [13,14,18]

Analysis and results

The chemical composition of gasoline AI-80, AI-91, AI-92, AI-93, AI-95, AI-95 +, AI-96, AI-98, AI-100 contains various chemical elements and compounds: light hydrocarbons, sulfur, nitrogen, lead. Various additives are added to it to improve fuel quality. There are requirements for motor gasoline in the use and storage of these gasoline fuels, which include:

These include high energy and thermodynamics of combustion products, good pumping ability, optimal variability, minimal corrosion, high stability during storage and use, non-toxic properties.

Due to the increase in the existing fleet of cars, the production of motor gasoline, which is the largest and most useful product from oil refining, is constantly growing. The most noticeable trend in recent years has been the reduction in low-octane gasoline production compared to high-octane gasoline. To obtain high-octane gasoline, they include various antidetonant additives, the range of which includes more than 30 brands.[1].

Gasoline is a product obtained from the distillation of oil. These detonation components are reduced fuel. Fifty percent of gasoline is derived from crude oil for engines, specifically for internal combustion. There are two types: aviation and automobile. The physical and chemical properties of gasoline vary depending on the application.

Motor gasoline of the same brand produced by different companies may also have a different composition. This is inextricably linked with the technological processes used in manufacturing plants.

Motor gasoline is a distilled fuel with a boiling point of 30 to 180 ° C, a number of carbon atoms from 4 to 10 and an average molecular weight of 100, i.e. aromatic, naphthenic, paraffinic hydrocarbons and flammable volatile mixtures thereof. The most important requirements for them are sufficient variability and minimal content of volatile compounds.

Gasolines have a peculiar pungent odor. Without special additives, they are colorless or slightly yellowish in color. The color of gasoline is also reflected in the presence of resinous substances [2].

Gasolines must be produced in accordance with the requirements of GOST 51313-99. The main properties of motor gasoline include explosion resistance, octane number, fractional composition, saturated vapor pressure, chemical stability (KB), sulfur and aromatic content. It has limited the aromatic hydrocarbons and sulfur compounds in gasoline due to increasing environmental demands as petroleum fuels in recent years.

Each brand of gasoline must adhere to specific fuel specifications.

Today, gasoline must meet the following criteria:

• optimal evaporation of elements;

• group composition of hydrocarbons, which ensures explosion-free formation at each stage of engine operation;

• stability of the composition under long-term storage conditions;

• Side effects to parts.

An analysis of the literature shows that the main aspect of the environmental and usability properties of automotive fuels is that the world trend includes the use of multifunctional additives, mainly oxygen-containing compounds, i.e. oxygenates from ketones, alcohols, ethers and some other organic compounds [3, 4].

Numerous laboratory studies and industrial tests conducted in the U.S. and the EU have resulted in the enactment of laws providing for the introduction of oxygen for gasoline with an oxygen content of at least 2%, based on the gasoline produced and used meeting Euro-4 and Euro-5 standards. GOST 32513-2013 “Motor fuels. Lead-free gasoline limits the mass fraction of oxygen in AI-80, AI-92, AI-95 and AI-98 gasolines for environmental classes K3, K4, K5 in accordance with the European standard EN 228-2004, while the volume of oxygenates share: methanol - 1.0%; ethanol - 5.0%; isopropyl alcohol - 10.0%; tert-butyl alcohol - 7.0%; isobutyl alcohol - 10.0%; ethers (C5 and above) - 15.0%; as well as other oxygenates with a final temperature boiling point not exceeding 210 ° C - 10.0% [5].

In Russia, gasoline for cars is produced in accordance with the standards and specifications in accordance with state regulations. Depending on the octane number standards, there are seven brands of motor gasoline: A-72, A-76, AI-80, AI-91, AI-93 and AI-95. Due to the increase in the share of light vehicle fleet in the total volume of vehicles, the demand for low-octane gasoline will decrease and the growth trend will increase compared to high-octane gasoline.

Methods for determining the chemical composition of AI-brand fuels

There are several types of classification of motor gasoline. The main ones (the most commonly used):

by evaporation (volatility), fractional composition, by the value of octane number.

The octane number of gasoline can be determined in two ways: motor and research [6].

In the motor method, the octane number is determined by installing a UIT-65 device, which allows the compression ratio to be changed from 4 to 9. The device allows to compare the detonation of the gasoline under study with the reference samples when the temperature of the combustible mixture is 150 ° C and the rotational speed is 900 rpm. With the research method, the explosion resistance of the combustible mixture is determined at a temperature of 25 ... 35 ° C and a speed of 600 rpm. (the mixture is not heated). In this case, gasoline is marked with the letter "I". For example, AI-92 is a digital gasoline with an octane rating of not less than 92. (Table 1) [7].

Table 1. Numerous laboratory studies and industrial tests conducted in the U.S. and the EU

Methods for determining the number of octane	А-76	АИ-80	АИ-91	АИ-92	АИ-93	АИ-95	АИ-96	АИ-98
Motorized	76	76	82,5	83	85	85	85	88
Research	-	80	91	92	93	95	96	98

Since the detection of detonation resistance by the motor method is carried out under more stringent conditions, it will have a slightly lower value than the results obtained by the research method.

Classification of evaporation Depending on the climatic zone, motor gasoline is divided into five classes (see Table 2). In addition to determining the distillation temperature at a given volume, it is also provided to determine the volume of gasoline evaporated at a given temperature. The “Evaporation Index” (VC) was also introduced as the main indicator determining the chemical composition of gasoline. BK describes the variability of gasoline and its tendency to form vapor barriers at a certain combination of saturated vapor pressure and volume of gasoline evaporated at a temperature of 70 0S. BK is calculated according to the following formula:

$$BK = 10 * TBB + 7 * V_{70}$$

where, BK is the evaporation index, TBB is the saturated vapor pressure, kPa; V70 - Volume of gasoline evaporated at a temperature of 70 0S,%. The classification of motor gasoline by evaporation is given in Table 2 below.

Different brands of motor gasoline are used in different regions of the world. In Europe, "superplus" or "super" (summer and winter), "premium" or "Europe" (summer and winter), "German" (summer and winter), "Italian" (summer and winter), "regular" (summer) and winter). In the United States, Regular, Midgrade, Premium and SuperPremium gasoline are used (both summer and winter). In the U.S., gasoline with a lead content of less than 0.0026 g / l is used.

Table 2. Classification of motor gasoline by evaporation

Index	CLASS				
	1	2	3	4	5
Saturated vapor pressure, kPa	35-70	45-80	55-90	60-95	80-100
Fractional composition:					
Boiling start, 0S, not low	35	35	not standardized		
10%, 0S, not high	75	70	65	60	55
50%, 0S, not high	120	115	110	105	100
90%, 0S, not high	190	185	180	170	160
The end of boiling, 0S, is not high	215	215	215	215	215

The amount of gasoline evaporated,% (ob.) At 70 0S	10-45	15-45	15-47	15-50	15-50
The variability index is not high	900	1000	1100	1200	1300

In the Asia-Pacific region, motor gasolines of 91RON, 92 RON, 95 RON, 97 RON are used. For all of them, the lead content is up to 0.01 g / l. The abbreviation RON is derived from the English word research octane number, which in the research method means octane number. [5].

Table 3 shows the quality requirements for motor gasoline (motor gasoline) consumed abroad.

It is clear from the data provided that in Europe, the transition to the Euro-5 environmental class to Euro-6 has not strengthened the requirements for the quality of gasoline, but rather softened it. Thus, the allowable amount of oxygenates in gasoline increases to 3.7% in terms of oxygen. This allows to increase the concentration of MTBE (methyl tert-butyl ether) to 22% or ethanol to 10%.

Table 3. Quality requirements for motor gasoline (motor gasoline) consumed abroad

Gasoline quality indicator	Europe		USA	Japan	China	
	For Euro-5 cars	For Euro-6 cars			Class 4	Class 5
The amount of hydrocarbons,% total, not more than: aromatic benzene olefinic	35,0 1,0 18,0	35,0 1,0 18,0	35,0 1,1 18,0	- 1,0 -	40,0 1,0 28,0	40,0 1,0 25,0
The amount of oxygen,% by mass, not more	2,7	3,7	4,0	1,3	2,7	2,7
Sulfur content, rrm, not more	10,0	10,0	80,0	10,0	50,0	10,0
Saturated vapor pressure, kPa	45,0-100,0	45,0-100,0	54,0-103,0	93,0	40,0-85,0	40,0-85,0
Manganese concentration, mg / dm3, not more	6,0	2,0	-	-	8,0	2,0

Another key regulatory document regulating the environmental performance of gasoline and diesel fuel is the Technical Regulation of the Customs Union TR TS 013/2011 "Requirements for motor and aviation gasoline, diesel and marine fuel, jet fuel and fuel oil" (analogue of European standards). Basic environmental and performance indicators of gasoline by grades4-жадвалда келтирилган [6].

Table 4. Operational and technical characteristics of the produced gasoline brands in LLP "PNXZ"

Markas	Motor method	Research method	Benzene content,% ayl	Area content,% ayl	Composition of olefin hydrocarbons,% ayl.	Sulfur content, ppm
AI-92-K4	93,7	84,9	0,9	31,9	7,5	39
AI-95-K4	95,6	85,9	0,9	30,9	7,7	40
AI-98-K4	98,3	88,2	0,8	30,1	6,1	44

As can be seen from Table 4, the total amount of sulfur is the main single indicator, but does not allow K5 to be classified as an environmental class fuel. However, the amount of sulfur in AI-98-K4 fuel increases, in particular, with a decrease in arena and benzene content, which may indicate an increase in the share of isomerates in catalytically cracked gasoline and commercial fuel. [7].

Brands of AI-branded gasoline and their compositional properties

GOST 2084 77 provides for the production of five brands of motor gasoline: A-72, A-76, AI-91, AI-93, AI-95. The brand's "A" index indicates that gasoline is intended for automobile engines. The “I” index indicates that the octane number for this brand of gasoline was determined by the research method. In the absence of "I", the octane number of gasoline is determined by the engine method. The numbers indicate the magnitude of the octane number.

Today, A-72 gasoline is almost never used because there is no equipment to run on it.

In accordance with the GOST standard, the launch of the following brands of gasoline AI-80, AI-92, AI-95, AI-98, in terms of their compliance with the environmental classes K2, K3, K4 and K5. However, we can now encounter several types of fuels (Table 5).

Table 5. The octane classification of gasoline is given according to GOST R 51105-97 [8, 9]

№	Gasoline brand	Number of octans	
		Number of octans	Research method
1	A-76	76	-
2	Normal-80	76	80
3	Regular -91	82,5	91
4	Regular-92	83	92
5	AI-93	85	93
6	Premium-95	85	95
7	AI-96	85	96
8	Super-98	88	98
9	EKTO-100	100 each	100,4 [10]

Looking at Table 5, it is easy to see that the use of 9 types of AI-branded gasoline products typically has an immediate effect on engine performance and the overall driving characteristics of the vehicle. But the right choice of fuel depends not only on speed, but also on the reliability, safety and durability of fuel and other systems.

The characteristics of motor gasoline produced in accordance with GOST 2084-77 differ significantly from accepted international standards in terms of environmental requirements. In order to increase the competitiveness of Russian gasoline and bring their quality to the level of European standards, GOST R 51105-97 “Fuel for internal combustion engines. Lead-free gasoline. Specifications ”will come into force on 01.01.99. This standard does not replace GOST 2084-77, which provides for the production of lead and lead-free gasoline. In accordance with GOST R 51105-97, only lead-free gasoline is produced (maximum amount of lead does not exceed 0.01 g / dm3).

Sulfur content in gasoline ranges from 0.05 to 0.1% [7].

Norms and requirements for the quality and evaporation properties of motor gasoline in accordance with GOST R 51105-97 are given in Table 6.

Table 6. Norms and requirements for the quality of gasoline [10]

Indicators	Brand			
OCH (MM), not less	76	82,5	85	88
OCH (IM), not less	80	91	95	98
The amount of lead, g / dm3, is not high	0,01			
The amount of manganese is mg / dm3, not high	50	18	-	-
The actual resin content, mg / 100 cm3, is not high	5			
Gasoline induction period, min, not less	360			
Mass fraction of sulfur,%, not high	0,05			
The volume fraction of benzene,%, is not high	5			

Copper plate test	folds, class 1			
Appearance	соф, тоза			
Density at 15 ° C, kg / m3	700-750	725-780	725-780	725-780

Since 2003, the Russian Federation has officially banned the production of leaded gasoline, which is considered harmful. Therefore, all fuels today are lead-free and are not listed on this label.

The fifth section of automotive fuels in accordance with TIF TN,

Starting with 2710 commodity positions in 27 commodity groups, our research object consists of a total of 43 subheadings, in which AI-brand fuels make up a total of 6 subheadings. When we analyze the goods of this group, we can see that the main criteria are automotive fuels, its composition, 4 chemical properties, which have a number of specific characteristics.

Distilled into parts by type, type of gasoline, brand index by seasonal use, chemical composition and quantity.

1. Types of distillates - divided into "general light", "medium", "hard" and "other types of distillates".

2. According to the areas of use of gasoline types - for special processing processes, we can see that they are divided into special gasoline, gasoline engines, aviation gasoline, jet gasoline, kerosene.

3. By seasonal use - classified by summer, winter, arctic, seasonal and other seasonal use [11].

4. The chemical composition of gasoline is related to the number of lead, octane, gaseous oils, sulfur and their quantitative dimensions.

Classification by automotive fuel brand index is not provided.

In our research, when we study gasoline in terms of international standards, environmental requirements, physicochemical properties, we can see that the trend is to produce high-octane gasoline products that meet the highest environmental class, reducing the concentration of lead in the chemical composition. In doing so, we focus on a number of key criteria in the classification of gasoline by chemical composition in TIF TN and propose their classification for customs purposes, the characteristics of which are summarized in Table 7 below. The following table shows the number of octanes for AI-branded gasoline in motor and research methods, the current TIF TN code numbers (research method), the number of lead content, the sulfur content, and the sequence of TIF TN codes proposed by us. The requirements for the properties of motor gasoline in Table 7 above will be the basis for us to define and recommend the exact code of the product according to TIF TN with only 3 basic characteristic values from more than 21 chemical compositions [12].

Table 7. Recommended TIFTN code numbers for AI-branded fuels for light vehicles

№	Types of AI-branded gasoline	Number of octans		Current TIF TN code numbers (research method)	Contains amount of lead	Sulfur amount	Proposed TIF TN code (engine method)
		Motorized method	Research method				
1.	Normal - AI-80 (AI-80-Low octane engine gasoline)	76	-		Not more than 0.013 g / l	Not more than 0.05%	27101241 11
			80	1. 2710 12 41 10 - Benzin avtomobilnyy neetilirovannyy AI-80 letniy			-
				2. 2710124120 - Gasoline car "AI-80-K2-L", UzDSt 3031: 2015	Not more than 6.50 mg / dm		
				3.2710125100 - Gasoline grade ai-80 gost 39.3-203.2004 with specific gravity	Not more than 5 mg / dm		
2.	Regular - AI-91 (AI-regular motor gasoline)	82,5			Not more than 0.013 g / l	Not more than 0.1%	27101241 21
			91	2710 12 41 20			-

№	Types of AI-branded gasoline	Number of octans		Current TIF TN code numbers (research method)	Contains amount of lead	Sulfur amount	Proposed TIF TN code (engine method)
		Motorized method	Research method				
3.	Premium - AI-92 (AI-Regular motor gasoline)	83			Not more than 0.013 g / l		27101241 31
			92	1. 2710 12 41 00 - (АИ-92 К2)	Not more than 0.013 g / l; Not more than 0.24 g / l	Not more than 0.05%	-
				2. 2710 12 41 30 - (АИ-92-К5)	0.010 g / dm3; Not more than 5 mg / dm		
4.	AI-93 (AI-93 regular motor gasoline)	-	93	2710124190	Not more than 0.013 g / l; Not more than 0.37 g / l	Not more than 0.1%	-
5.	Super - AI-95 (AI-95-premium engine gasoline)	85					
			95	2710 12 45 00	Not more than 0.013 g / l		-
6.	Super - AI-95 (AI-95-Exrta engine gasoline)	85					
			95	2710 12 45 00	-	Not more than 0.05%	
7.	AI-96 (Premium Euro-95/4)	85	96				27101245 01
8.	Extra - AI-98	88			Not more than 0.50		27101249 01
			98	2710 12 49 00			-
9.	EKTO - AI-100	100 each		271012 49 00			-
			100,4	Others			27101259 01

References:

1. Sereda, A.V. (2005). Basic trends of producing automobile petrol with new antiknock additives in Russia. *The world of petroleum products*, № 5, pp.27-30.
2. Boyko, E.V. (2007). *Chemistry of oil and fuels. Tutorial*. (p.60). Ulyanovsk: UlSTU. - ISBN 978-5-89146-900-0.
3. Tsyganov, D.V. (2006). *Processing of waste and intermediate products of chemical industries into oxygenate additives to motor gasolines*: Author's abstract. diss. Cand. chem. sciences. (p.18). Kemerovo.
4. Danilov, A.M. (2000). *The use of additives in fuels for cars:* Ref. ed. (p.232). Moscow: Chemistry.
5. (n.d.). Retrieved from https://neftegaz.ru/tech-library/petroleum/150257-gost-r-51105-97-topliva-dlya-dvigateley-vnutrennego-sgoraniya-neetilirovannyy-benzin-tekhnicheskie-u/
6. Khairutdinov, O.I., & Sidorov, G.M. (2018). Ways to solve the problem of the production of environmentally friendly gasoline in the modern fuel and energy complex of the Republic of Kazakhstan. *Network edition "Oil and Gas Business"*, No. 5. http://ogbus.ru

7. Karimkulov, K.M., & Hamroev, U.R. (2021). *Determination and classification of AI-brand fuels for passenger cars*. Proceedings of the Republican scientific-practical conference (with the participation of international scientists) on "Actual problems of chemical and technological sciences" dedicated to the 85th anniversary of Prof., Ph.D., Makhsumov Abdukhamid Gafurovich and the 65th anniversary of labor and scientific activity. (pp.171-173). Tashkent, TKTI, (March 10-11, 2021).
8. (2013). *GOST 32513-2013 "Motor fuels. Unleaded petrol. Specifications "/ [Electronic resource]*. - Retrieved from http://vsegost.com/
9. (2002). *GOST R 51866-2002 "Motor fuels. Unleaded petrol. Specifications "/ [Electronic resource]*. - Retrieved from http://vsegost.com/
10. (n.d.). Retrieved from http://neftianka.ru/components-of-gasoline/
11. Dorogochinskaya, V. A, Kilyakova, A.Yu., & Efanova, O. Yu. (2016). *Main indicators of the quality of petroleum products, fuel, lubricating oils and greases*. Study guide. Department of Chemistry and Technology of Lubricants and Chemotology. Russian State University of Oil and Gas (National Research University). I.M. Gubkina. (pp.30-35). Moscow.
12. Karimqulov, K.M., & Hamroev, U.R. (2020). *Classification of AI-brand fuels for light vehicles. Current issues and innovative technologies in the field of natural sciences*. Proceedings of the International scientific-practical online conference. Volume 1. (pp.449-453). Tashkent: ToshDTU, (November 20-21, 2020).
13. Tursunov, B. O. (2020). Aspect of financial security of industrial enterprises under influence of global crisis. *Asian Journal of Technology & Management Research [ISSN: 2249–0892]*, *10*(01).
14. Tursunov, B. (2017). Ways of increasing the efficiency of usage the production capacity of textile enterprises. *Bulleten` nauki i praktiki.*, (8), 232-242.
15. Yuldashev, N. K., Nabokov, V. I., Nekrasov, K. V., & Tursunov, B. O. (2020). Modernization and intensification of agriculture in the republic of Uzbekistan. In *E3S Web of Conferences* (Vol. 222, p. 06033). EDP Sciences.
16. Mustafakulov, S. I., Tursunov, B. O., & Tursunov, U. A. (2019). The empirical research on causal relationship between export and foreign investments in the economy of Uzbekistan based on granger test. *International Journal of Engineering and Advanced Technology*, *9*(1), 4631-4635.
17. Burkhanov, A. U., Hudoykulov, H. H., & Tursunov, B. O. (2019). The factors effecting net actives of investment funds. *Economics and Innovative Technologies*, *2019*(2), 6.
18. Ortikmirzaevich, T. B. (2019). Econometric model of production capacity usage of textile enterprises in namangan region. *Advance and Innovative Research*, *86*.