INTRON

Gasoline detonation control Additives

INTRON® 1000 series

INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1000 series is a line of anti-knock additives and components that provide highly effective octane boost in gasoline fractions, traditional petroleum as well as alternative motor fuels with ethanol and alcohol content.

Usage benefits:

- At low concentrations (from 0,8% to 3%) provides extremely high flexibility in adjusting of octane values;
- Reduces the economic costs of production (low up direct production costs, reduces usage of other fuel components such as MTBE, ETBE, Ethanol etc.);
- Fully compatible with other fuel components (cleaning additives, stabilization components, corrosion inhibitors, oxygenates – bioethanol, MTBE, as well as other gasoline components);
- Can be used as an additional fuel component to adjust the octane number;
- Improve the completeness of fuel combustion.

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Motor Octane Rating test method ASTM D2700-22

CFR Engine ASTM D2700-22 test

This laboratory test method is more precise and covers the quantitative determination of the knock rating of liquid spark-ignition engine fuel in terms of Motor octane number, including fuels that contain up to 25 % v/v of ethanol. However, this test method may not be applicable to fuel and fuel components that are primarily oxygenates.2 The sample fuel is tested in a standardized single cylinder, four-stroke cycle, variable compression ratio, carbureted, CFR engine run in accordance with a defined set of operating conditions. The octane number scale is defined by the volumetric composition of primary reference fuel blends. The sample fuel knock intensity is compared to that of one or more primary reference fuel blends. The octane number of the primary reference fuel blend that matches the knock intensity of the sample fuel establishes the Motor octane number.

Using the ASTM D2700 (MON) test method we divided our research with all INTRON 1000 products in 2 parts:

1. MON test of standard mixture of n-heptane + isooctane (70) with various dosage of INTRON 1000 seires (+1%, +1,3%, +3%, +3,5%);
2. MON test of stable gasoline fraction (65) with various dosage of INTRON 1000 seires (+1%, +1,3%, +3%, +3,5%)

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1008

Ron improver **INTRON® 1008** specially developed for customers, taking into account the regulatory requirements of the European Union documents (EN 228, Directive 2009/30 / EC) for the tolerance of various components and the content of substances

ISO 9001
BUREAU VERITAS
Certification

SGS

ISO®

PETRONAX
Petrochemical company

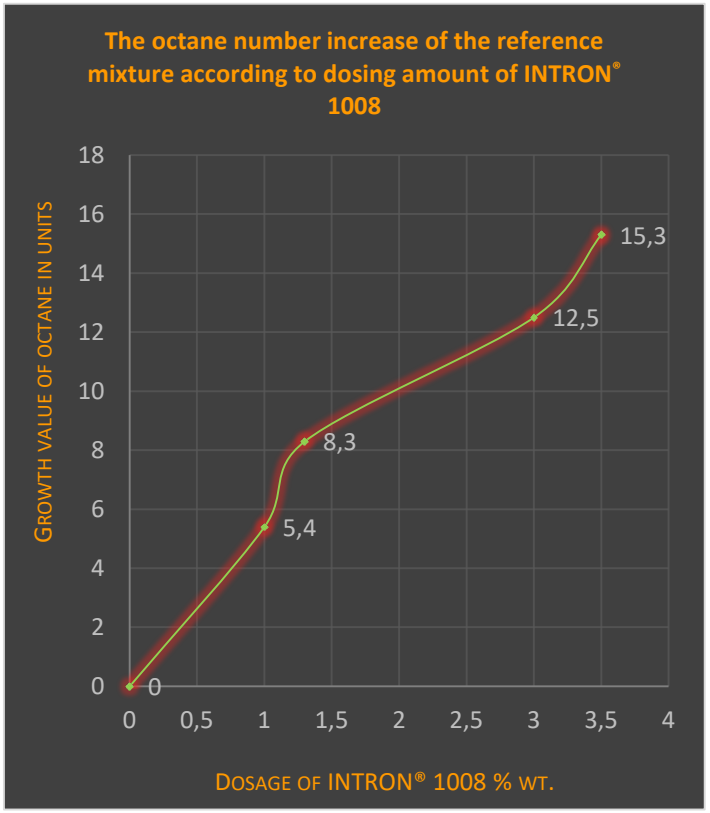
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1008

ASTM D2700-22 MON measurement results of **reference mixture** (n-heptane + isooctane) and adjusted with INTRON® 1008

#	Sample Name	MON sample result	Increase of octane units
1	Mixture of isooctane and n-heptane in the ratio 70:30	70,0	-
2	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1008 in amount of 1,0 % wt.	75,4	+ 5,4
3	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1008 in amount of 1,3 % wt.	78,3	+ 8,3
4	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1008 in amount of 3,0 % wt.	82,5	+ 12,5
5	Mixture of isooctane and n- heptane in the ratio 70:30+additive INTRON® 1008 In amount of 3,5 % wt.	85,3	+ 15,3



PETRONAX
Petrochemical company

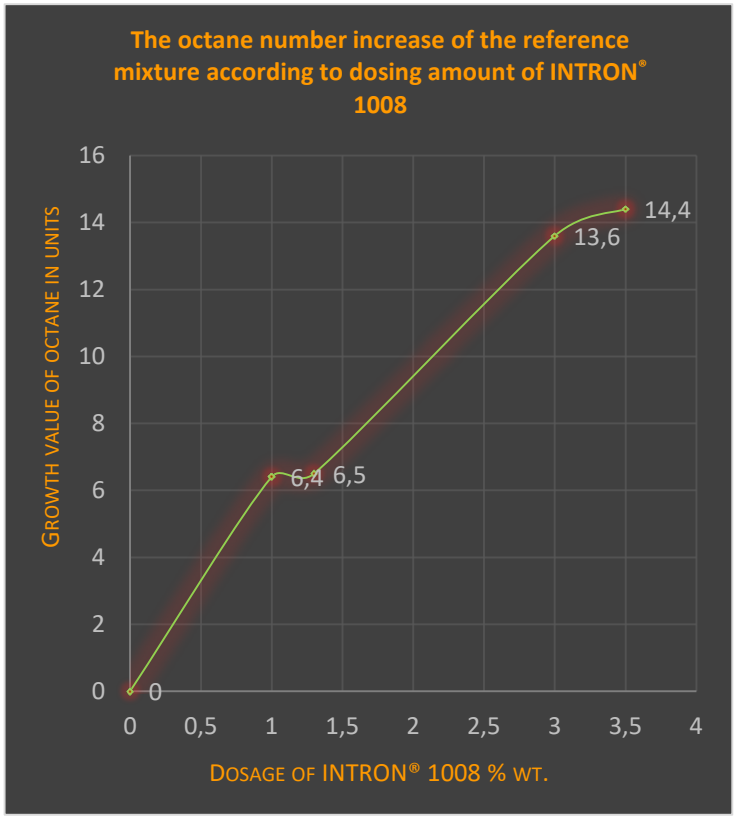
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1008

ASTM D2700-22 MON measurement results of stable gasoline **naphtha** adjusted with INTRON® 1008

#	Sample Name	MON sample results	Increase of octane units
1	Naphtha (stable gasoline fraction)	65,0	-
2	Mixture of naphtha + additive INTRON® 1008 in amount of 1,0 % wt.	71,4	+ 6,4
3	Mixture of naphtha + additive INTRON® 1008 in amount of 1,3 % wt.	71,5	+ 6,5
4	Mixture of naphtha + additive INTRON® 1008 in amount of 3,0 % wt.	78,6	+ 13,6
5	Mixture of naphtha + additive INTRON® 1008 in amount of 3,5 % wt.	79,4	+ 14,4

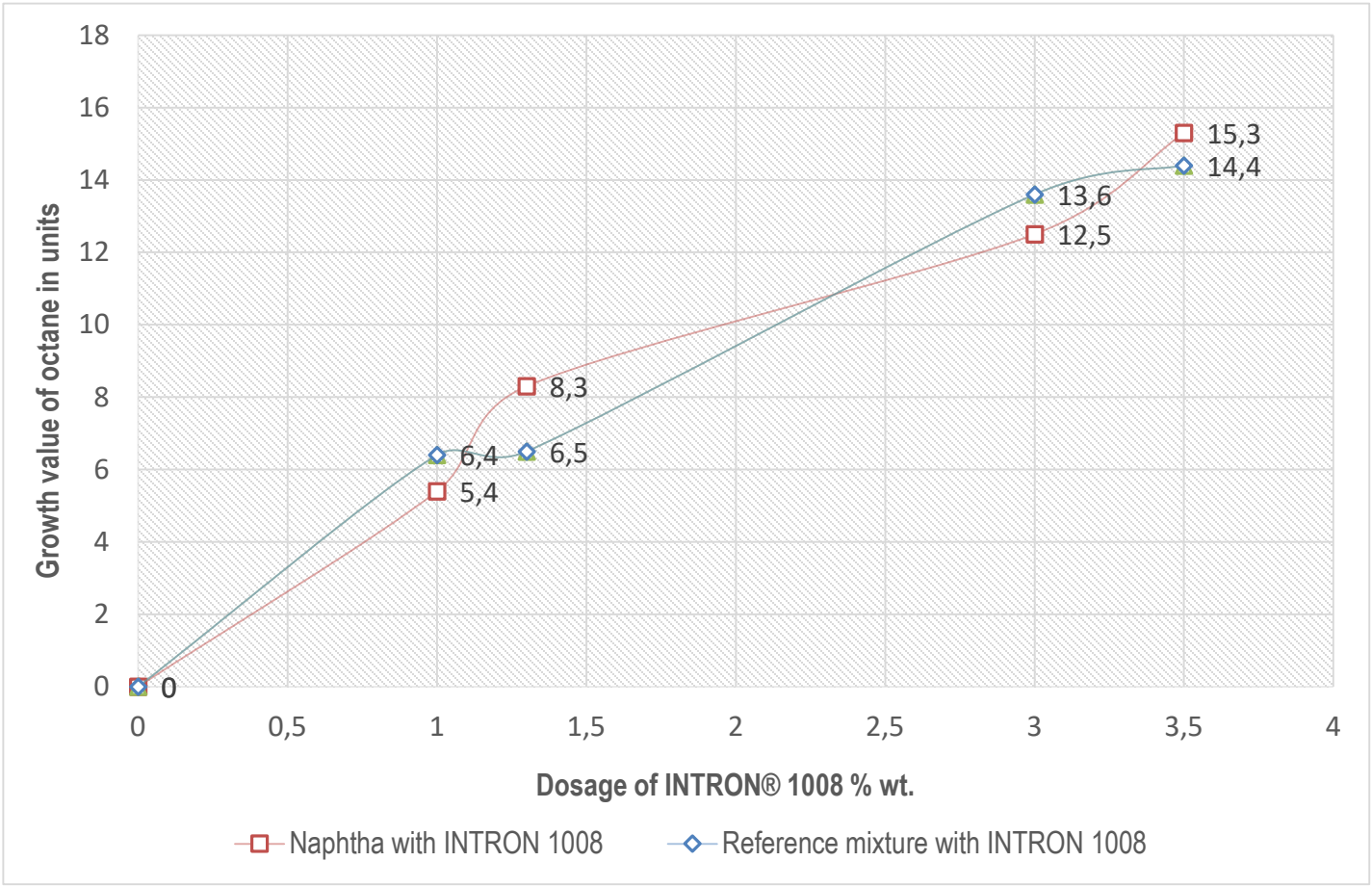


PETRONAX Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

General comparative plot of octane number growth of naphtha and reference mixtures with **INTRON® 1008**



PETRONAX
Petrochemical company

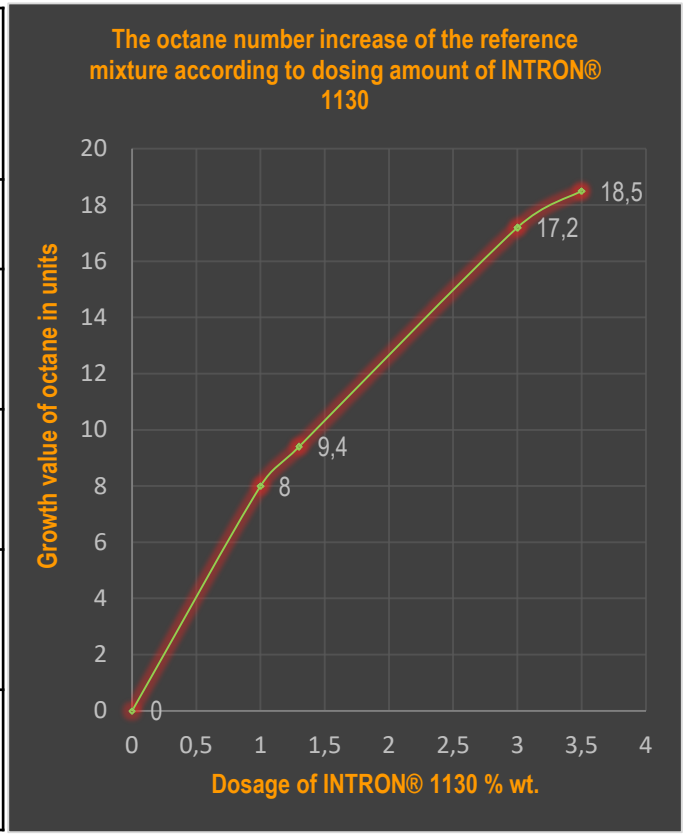
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1130

ASTM D2700-22 MON measurement results of **reference mixture** (n-heptane + isooctane) and adjusted with INTRON® 1130

№	Sample Name	MON sample results	Increase of octane units
1	Mixture of isooctane and n-heptane in the ratio 70:30	70,0	-
2	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1130 in amount of 1,0 % wt.	78,0	+8,0
3	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1130 in amount of 1,3 % wt.	79,4	+9,4
4	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1130 in amount of 3,0 % wt.	87,2	+17,2
5	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1130 In amount of 3,5 % wt.	88,5	+18,5



PETRONAX Petrochemical company

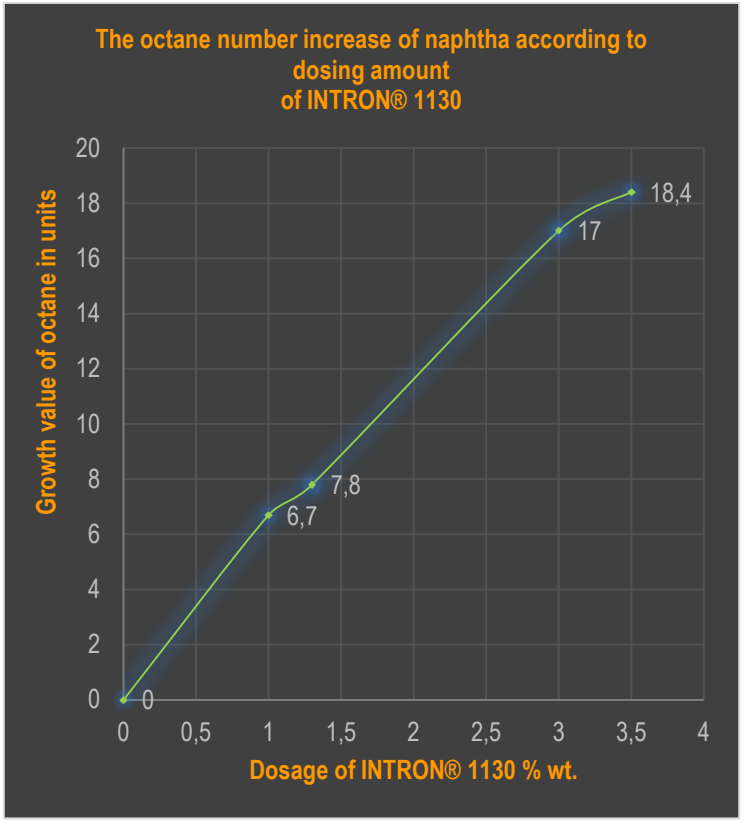
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1130

ASTM D2700-22 MON measurement results of stable gasoline **naphtha** adjusted with INTRON® 1130

#	Sample Name	MON sample results	Increase of octane units
1	Naphtha (stable gasoline fraction)	65,0	-
2	Mixture of naphtha + additive INTRON® 1130 in amount of 1,0 % wt.	71,7	+ 6,7
3	Mixture of naphtha + additive INTRON® 1130 in amount of 1,3 % wt.	72,8	+ 7,8
4	Mixture of naphtha + additive INTRON® 1130 in amount of 3,0 % wt.	82,0	+ 17,0
5	Mixture of naphtha + additive INTRON® 1130 in amount of 3,5 % wt.	83,4	+ 18,4

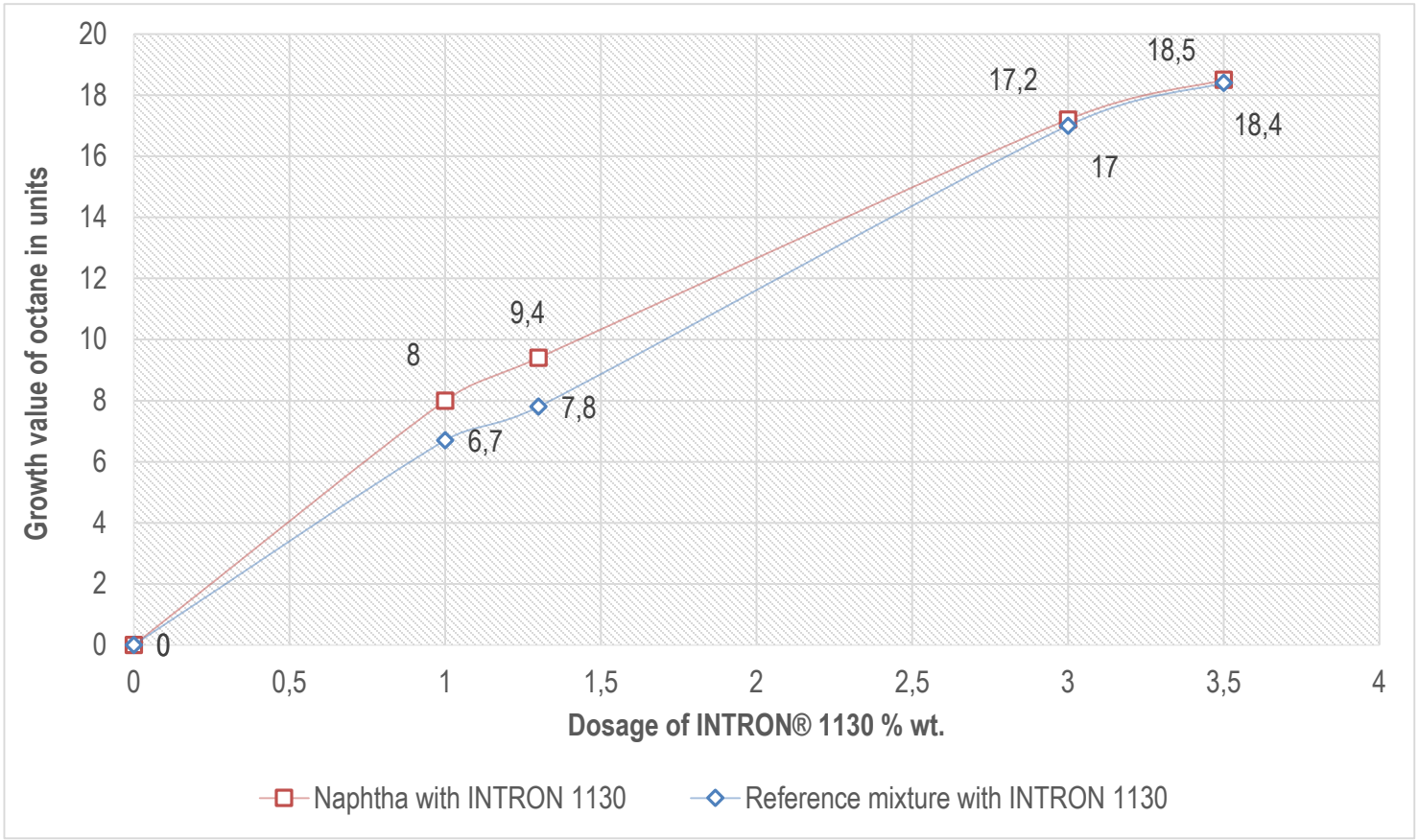


PETRONAX Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

General comparative plot of octane number growth of naphtha and reference mixtures with **INTRON® 1130**



PETRONAX
Petrochemical company

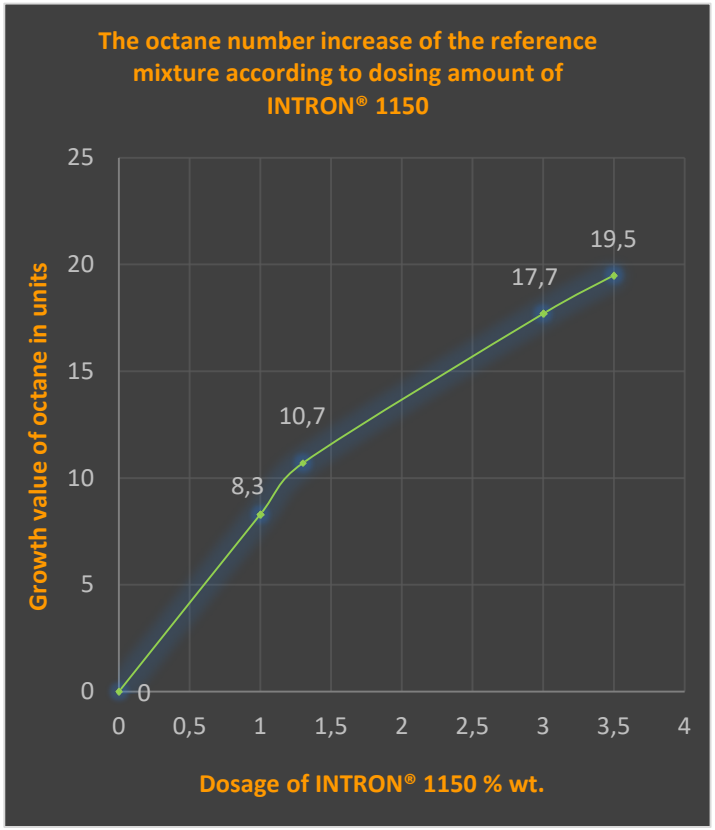
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1150

ASTM D2700-22 MON measurement results of **reference mixture** (n-heptane + isooctane) and adjusted with INTRON® 1150

№	Sample Name	MON sample results	Increase of octane units
1	Mixture of isooctane and n-heptane in the ratio 70:30	70,0	-
2	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1150 in amount of 1,0 % wt.	78,3	+8,3
3	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1150 in amount of 1,3 % wt.	80,7	+10,7
4	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1150 in amount of 3,0 % wt.	87,7	+17,7
5	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1150 In amount of 3,5 % wt.	89,5	+19,5



PETRONAX Petrochemical company

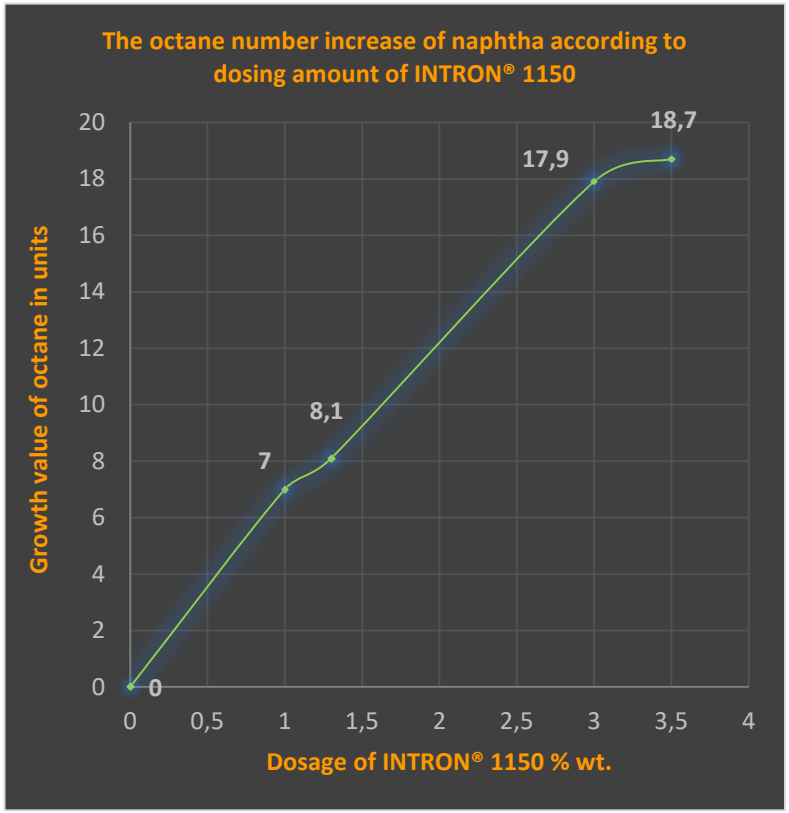
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1150

ASTM D2700-22 MON measurement results of stable gasoline **naphtha** adjusted with INTRON® 1150

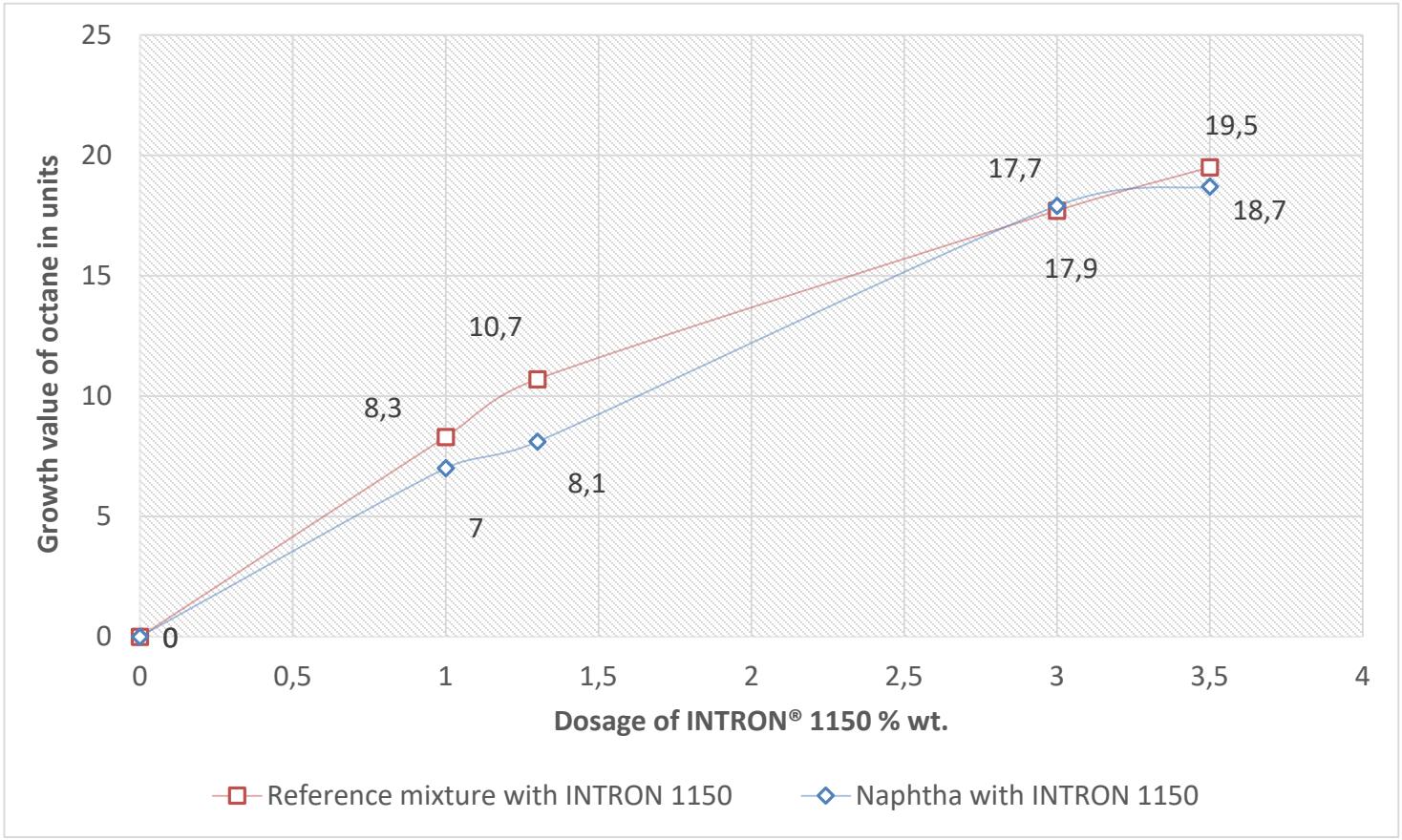
#	Sample Name	MON sample results	Increase of octane units
1	Naphtha (stable gasoline fraction)	65,0	-
2	Mixture of naphtha + additive INTRON® 1150 in amount of 1,0 % wt.	72,0	+ 7,0
3	Mixture of naphtha + additive INTRON® 1150 in amount of 1,3 % wt.	73,1	+ 8,1
4	Mixture of naphtha + additive INTRON® 1150 in amount of 3,0 % wt.	82,9	+ 17,9
5	Mixture of naphtha + additive INTRON® 1150 in amount of 3,5 % wt.	83,7	+ 18,7



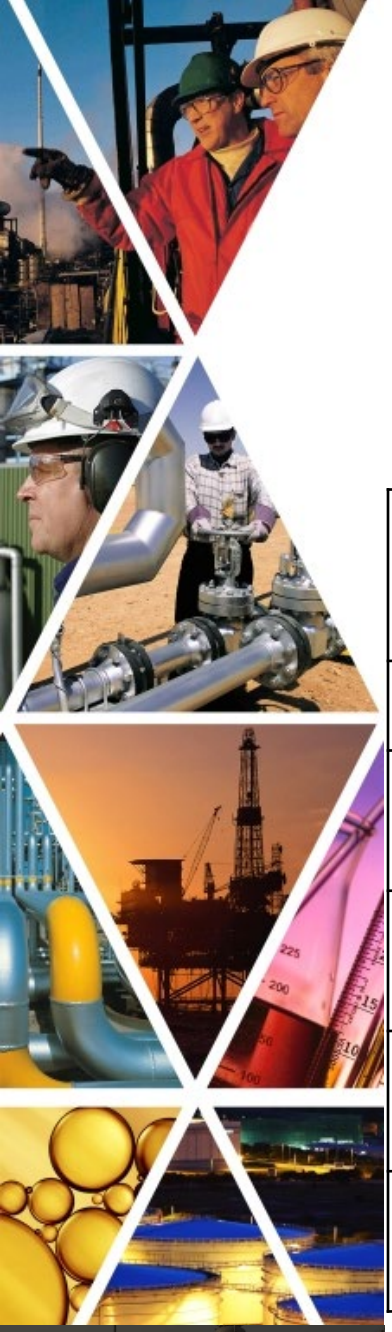
INTRON® 1000 series

Gasoline detonation control Additives

General comparative plot of octane number growth of naphtha and reference mixtures with **INTRON® 1150**



PETRONAX
Petrochemical company



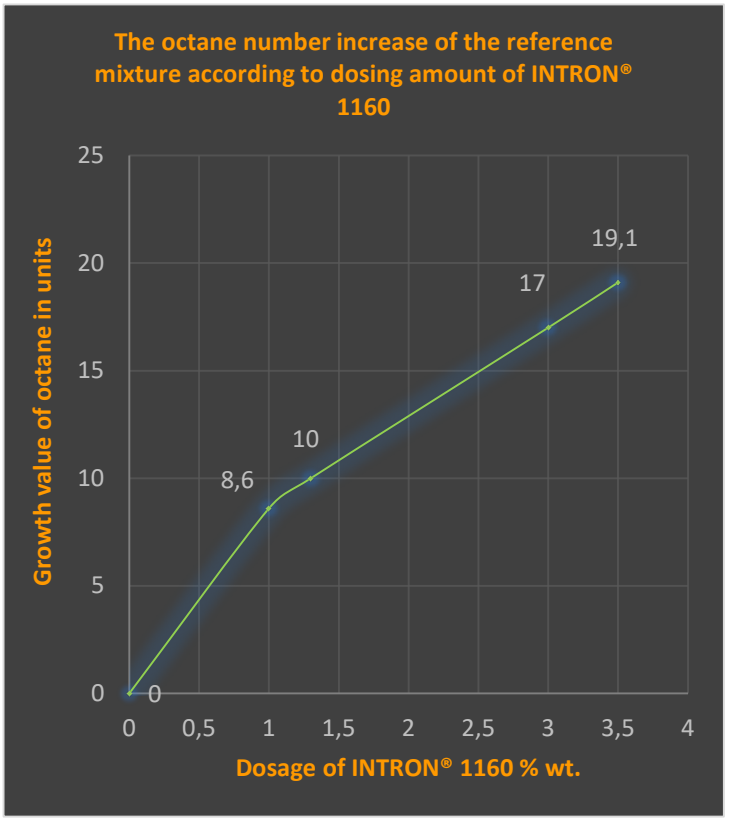
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1160

ASTM D2700-22 MON measurement results of **reference mixture** (n-heptane + isooctane) and adjusted with INTRON® 1160

№	Sample Name	MON sample results	Increase of octane units
1	Mixture of isooctane and n-heptane in the ratio 70:30	70,0	-
2	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1160 in amount of 1,0 % wt.	78,6	+8,6
3	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1160 in amount of 1,3 % wt.	80,0	+10,0
4	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1160 in amount of 3,0 % wt.	87,0	+17,0
5	Mixture of isooctane and n-heptane in the ratio 70:30+additive INTRON® 1160 In amount of 3,5 % wt.	89,1	+19,1



PETRONAX Petrochemical company

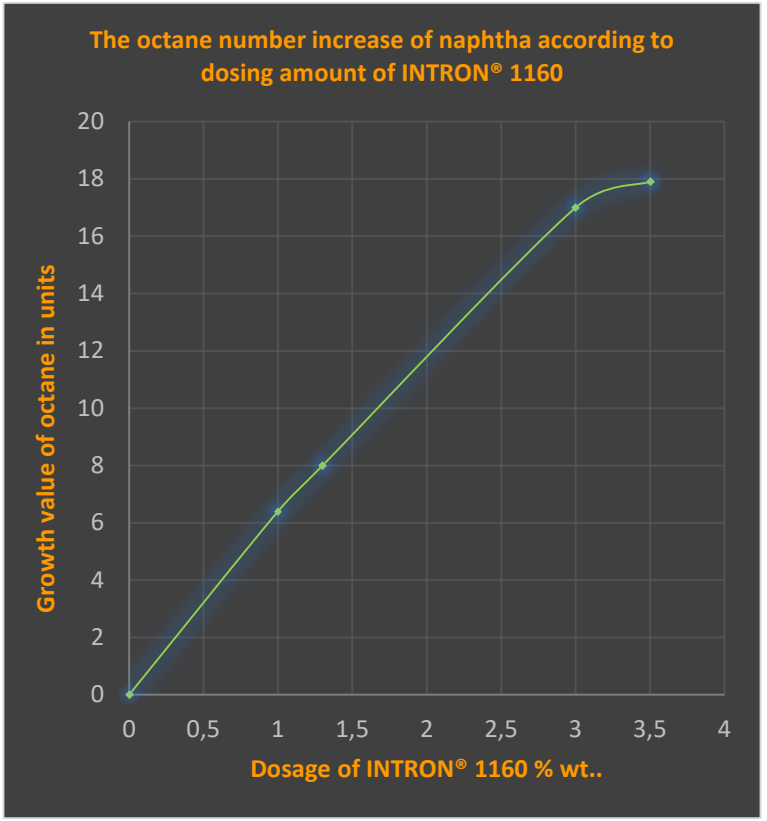
INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1160

ASTM D2700-22 MON measurement results of stable gasoline **naphtha** adjusted with INTRON® 1160

#	Sample Name	MON sample results	Increase of octane units
1	Naphtha (stable gasoline fraction)	65,0	-
2	Mixture of naphtha + additive INTRON® 1160 in amount of 1,0 % wt.	71,4	+ 6,4
3	Mixture of naphtha + additive INTRON® 1160 in amount of 1,3 % wt.	73,0	+ 8,0
4	Mixture of naphtha + additive INTRON® 1160 in amount of 3,0 % wt.	82,0	+ 17,0
5	Mixture of naphtha + additive INTRON® 1160 in amount of 3,5 % wt.	82,9	+ 17,9

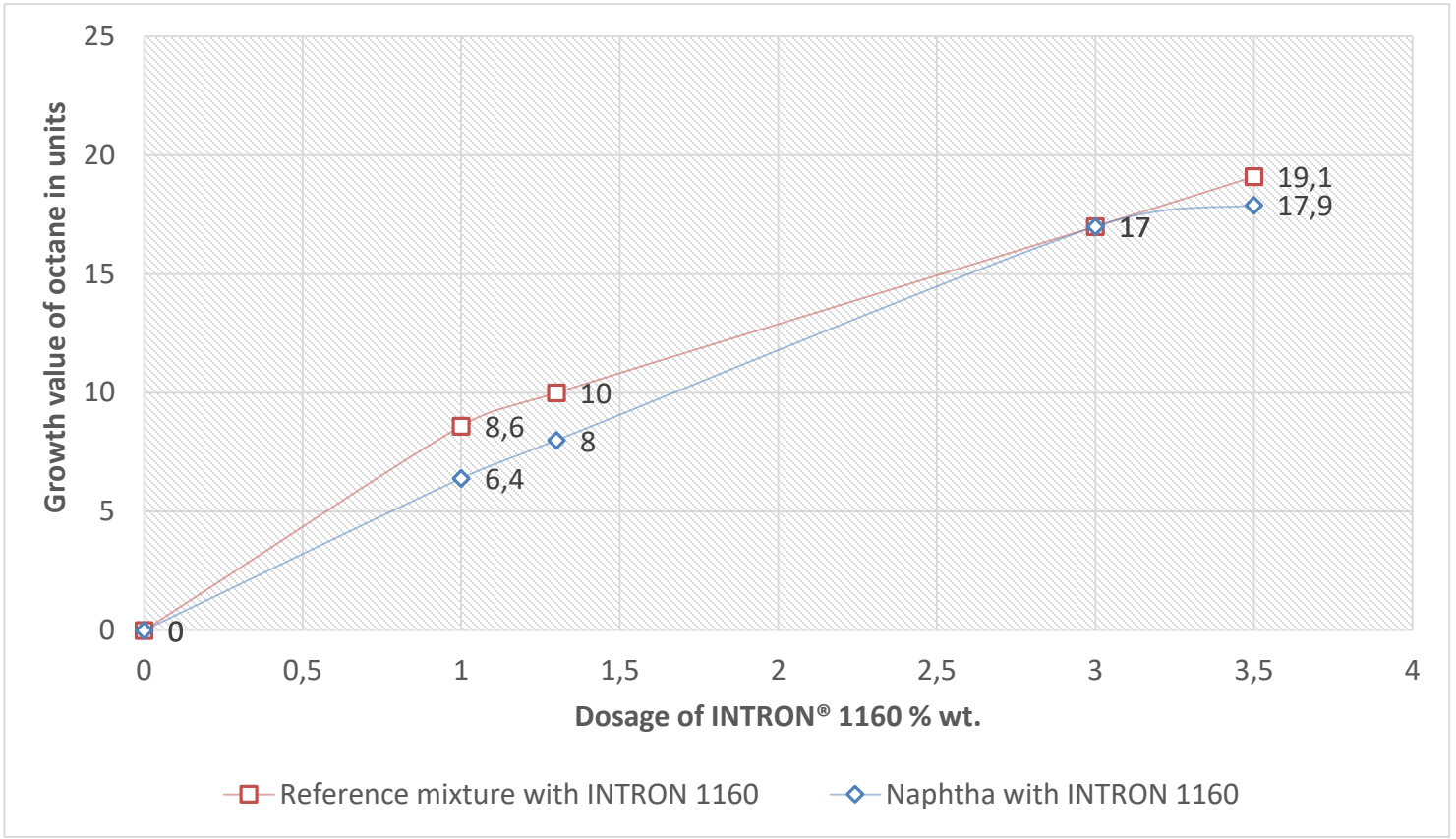


PETRONAX Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

General comparative plot of octane number growth of naphtha and reference mixtures with **INTRON® 1160**



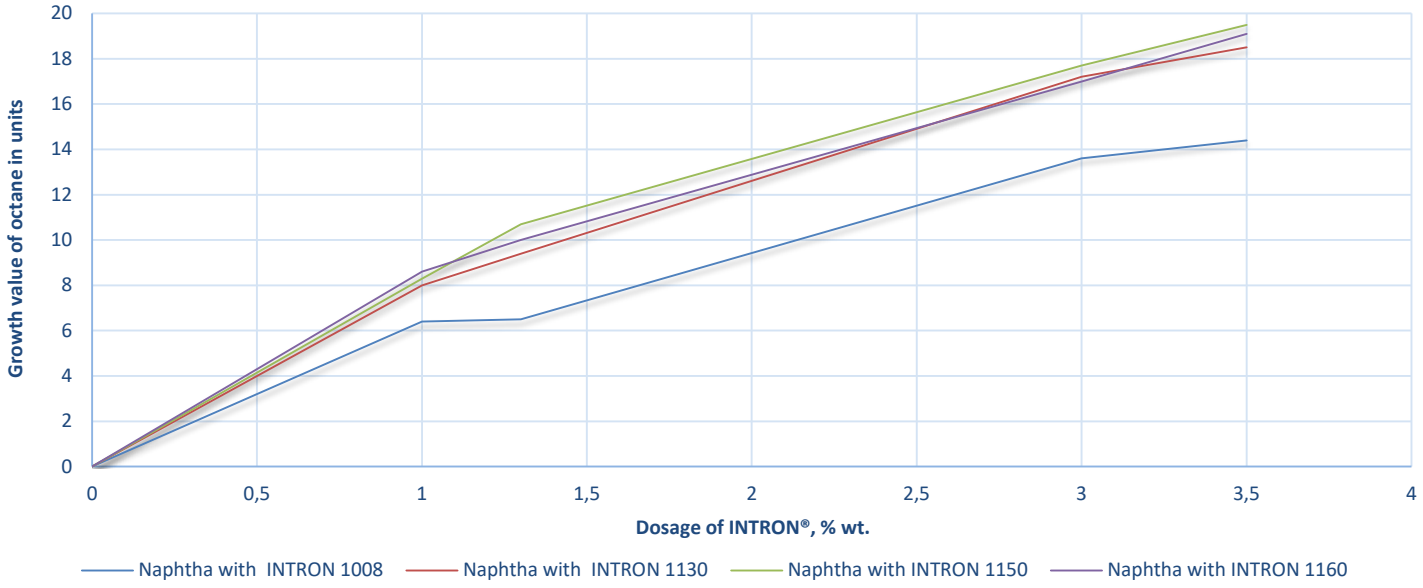
PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

General comparative plot of octane number growth of naphtha and reference mixtures with INTRON® 1000 series

Product / Dosage	0%		1,0%		1,3%		3,0%		3,5%	
INTRON® 1008	65,0	0,0	71,4	+6,4	71,5	+6,5	78,6	+13,6	79,4	+14,4
INTRON® 1130	65,0	0,0	71,7	+6,7	72,8	+7,8	82,0	+17,0	83,4	+18,4
INTRON® 1150	65,0	0,0	72,0	+7,0	73,1	+8,1	82,9	+17,9	83,7	+18,7
INTRON® 1160	65,0	0,0	71,4	+6,4	73,0	+8,0	82,0	+17,0	82,9	+17,9



PETRONAX Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

Stability test was conducted on naphtha with minimal (1% wt.) and maximum (3.5% wt.) concentration of INTRON® additives in **extremely** and **normal** storage conditions.

Extremely storage conditions included:

- Packaging – plastic transparent bottle (the worst option for storage of oil products on the assumption of the previous trials results);
- Exposure of natural light.

Normal storage conditions included:

- Packaging – glass opaque bottle (the best option for storage of oil products on the assumption of the previous trials results);
- Exclusion of natural light exposure (storage in a closed box)

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

Additive	INTRON® 1008							
Dosage	1%				3,5%			
Days of exposition	After preparation	1	10	30	After preparation	1	10	30
Normal storage conditions								
Hard storage conditions								

After one day of stability studies mixture of naphtha with **INTRON® 1008** that had been stored in plastic non-transparent bottle in amounts of 1% wt. and 3.5% wt. had changed their color to light brown and dark brown, and a solution with a concentration of **INTRON® 1008** in amount of 3.5% wt. precipitated; on the 10 day of the test colors of the solutions had become darker and in a solution with **INTRON® 1008** in amount of 3.5% wt. had created larger amounts of precipitations. After 30 day of stability test mixtures of naphtha with **INTRON® 1008** had been stored in a transparent plastic bottles in amounts of 1 % wt. and 3.5 % wt. had appearance similar to the 10 day of research. **Mixtures that had been stored in the glass bottles away from light hadn't changed their appearance**.

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

Additive	INTRON® 1130							
Dosage	1%				3,5%			
Days of exposition	After preparation	1	10	30	After preparation	1	10	30
Normal storage conditions								
Hard storage conditions								

After the 1 day of stability studies mixture of naphtha with **INTRON® 1130** that had been stored in non-transparent plastic bottle in amounts of 1% wt. and 3.5% wt. had changed their color to light brown and dark brown, and a solution with a concentration of **INTRON® 1130** in an amount of 3.5% wt. precipitated; on the 10 day of the test colors of the solutions had become darker and in a solution with **INTRON® 1130** in an amount of 3.5% wt. had created larger amounts of precipitations. Mixtures that had been stored in the glass bottles away from light hadn't changed their appearance. After 30 day of stability test mixtures of naphtha with **INTRON® 1130** that had been stored in a plastic transparent bottles in amounts of 1 % wt. and 3.5 % wt. had appearance similar to the 10 day of research.

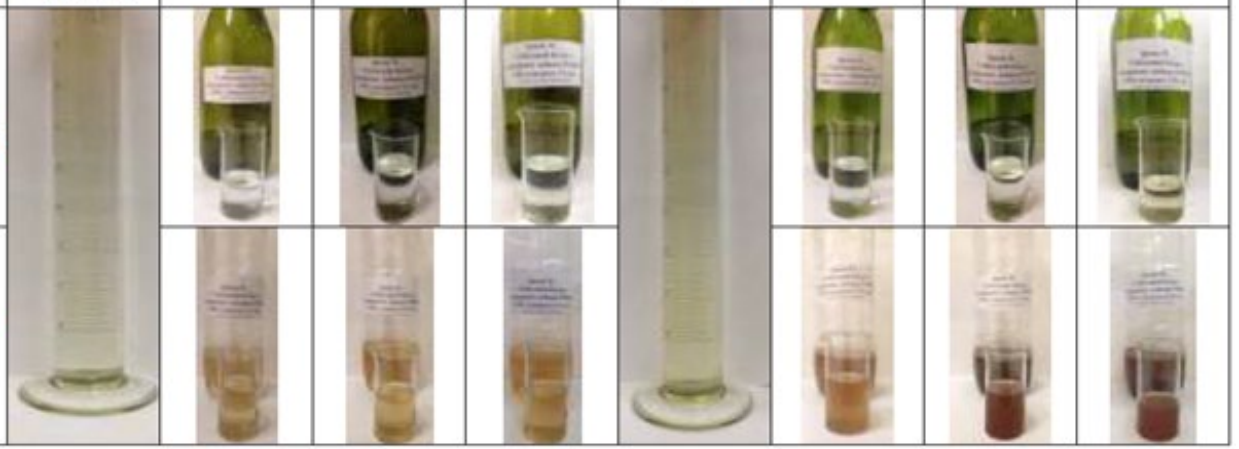
Mixtures that had been stored in the glass bottles away from light hadn't changed their appearance.

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

Additive	INTRON® 1150							
Dosage	1%				3,5%			
Days of exposition	After preparation	1	10	30	After preparation	1	10	30
Normal storage conditions								
Hard storage conditions								

After the 1 day of stability studies mixture of naphtha with **INTRON® 1150** that had been stored in plastic non-transparent bottle in amounts of 1% wt. and 3.5% wt. had changed their color to light brown and dark brown, and a solution with a concentration of **INTRON® 1150** in an amount of 3.5% wt. precipitated; on the 10 day of the test colors of the solutions had become darker and in a solution with **INTRON® 1150** in an amount of 3.5% wt. had created larger amounts of precipitations. Mixtures which had been stored in the glass bottles away from light hadn't changed their appearance. After 30 day of stability test mixtures of naphtha with **INTRON® 1150** that had been stored in a plastic transparent bottles in amounts of 1 % wt. and 3.5 % wt. had appearance similar to the 10 day of research.

Mixtures which had been stored in the glass bottles away from light hadn't changed their appearance.

PETRONAX Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

Additive	INTRON® 1160							
Dosage	1%				3,5%			
Days of exposition	After preparation	1	10	30	After preparation	1	10	30
Normal storage conditions								
Hard storage conditions								

Already after the 1 day of stability studies mixture of naphtha with **INTRON® 1160** that had been stored in plastic non-transparent bottle in amounts of 1% wt. and 3.5% wt. had changed their color to light brown and dark brown, and a solution with a concentration of **INTRON® 1160** in amount of 3.5% wt. precipitated; on the 10 day of the test colors of the solutions had become darker and in a solution with **INTRON® 1160** in amount of 3.5% wt. had created larger amounts of precipitations. Mixtures that had been stored in the glass bottles away from light hadn't changed their appearance. After 30 day of stability test mixtures of naphtha with **INTRON® 1160** that had been stored in a plastic transparent bottles in amounts of 1 % wt. and 3.5 % wt. had appearance similar to the 10 day of research.

Mixtures that had been stored in the glass bottles away from light hadn't changed their appearance.

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Stability test of finished mixtures with INTRON® 1000 series

MON sample test that had been stored in normal storage conditions after 30 days from preparation

№.	Sample name	Sample test after preparation		Sample test after 30 days of storage	
		MON sample results	The increase of octane number in units.	MON sample results	The increase of octane number in units.
1	Naphtha	65,0	-	65,0	-
2	Mixture of naphtha + additive INTRON® 1008 in amount of 1,0 % wt.	71,4	6,4	68,0	3,0
3	Mixture of naphtha + additive INTRON® 1008 in amount of 3,5 % wt.	79,4	14,4	79,7	**14,7**
4	Mixture of naphtha + additive INTRON® 1130 in amount of 1,0 % wt.	71,7	6,7	71,5	6,5
5	Mixture of naphtha + additive INTRON® 1130 in amount of 3,5 % wt.	83,4	18,4	83,0	18,0
6	Mixture of naphtha + additive INTRON® 1150 in amount of 1,0 % wt.	72,0	7,0	75,5	**10,5**
7	Mixture of naphtha + additive INTRON® 1150 in amount of 3,5 % wt.	83,7	18,7	85,1	**20,1**
8	Mixture of naphtha + additive INTRON® 1160 in amount of 1,0 % wt.	71,4	6,4	74,2	**9,2**
9	Mixture of naphtha + additive INTRON® 1160 in amount of 3,5 % wt.	82,9	17,9	85,2	**20,2**

The research found that the most effective package for mixtures of naphtha and **INTRON®** additives is glass opaque container without access to the sunlight. When those mixtures are stored in such conditions they retain their physical and chemical properties such as octane number. Mixture samples, which octane number values were measured after 30 days of storage, have a number of octane growth within the allowable error - 0.5 units with samples, which MON was examined after preparation. In addition, there is an increase of octane number in samples with **INTRON® 1150** and **INTRON® 1160** in the redistribution of 2 - 3 octane units because of passing the completeness of diffusion processes in the tested mixtures

PETRONAX
Petrochemical company

INTRON® 1000 series

Gasoline detonation control Additives

Physical and chemical properties of naphtha and mixture of naphtha with INTRON® 1160 in amount of 3.5 % wt.

№	The name of indicators	Measurement units	Norm	Test results	
				Naphtha	Naphtha with INTRON® 1160 in amount of 3.5 % wt.
1	Lead amount, not more than	mg/dm^3	5,0	absence	absence
2	Density at 15°C, within	kg/m^3	720-775	742,4	750,4
3	Sulphur content (type I), not more than - type I -type II	mg/kg	 10 50	 5	 6
4	Concentration of actual resin (washed with solvent), not more than	mg/100 cm^3	5,0	absence	absence
5	Test on copper plate	-	withstand	withstand	withstand
6	Appearance	-	-	Clear and bright with no content of impurities and water	Clear and bright with no content of impurities and water
7	Volume of the hydrocarbon: -olefin -aromatic	%	 18 35	 1,8 19,9	 0,9 19,3
8	Volume of the benzene, not more than	%	1,0	1,2	0,9
9	Vapour Pressure (Class B), within	kPa	45-70	26,5	61,1
10	Fractional composition - Initial boiling point - At 70 °C evaporates within - At 100 °C evaporates within - At 150 °C evaporates, at least - Final boiling point no t higher than - The residue in the flask , not more than	 °C % vol. % vol. % vol. °C %	 - 20-48 46-71 75 210 2	 45 10,0 33,0 81,0 240 1,8	 42 10,0 30,0 71,0 242 2,0
11	Volume of the organic oxygen-containing compounds , not more than - menthol - ethanol -izopropil alcohol -izobutil alcohol -tretbutil alcohol - simple esters - Other oxygenated compounds with final boiling point not higher than 210 °C	%	 3,0 5,0 10,0 10,0 7,0 15,0 10,0	 0 0 0 0 0 0 0	 0 0 0 0 0 0 0
12	Mass fraction of oxygen, not more than	%	2,7	0	0
13	Vapor lock index	-	-	265	681

INTRON® 1000 series

Gasoline detonation control Additives

INTRON® 1000 series are showing very effective work on octane number improving and additional benefit by using the optimal number of components and the flexibility of their selection for specific customer requirements (oxygenates and aromatic mixtures). Low dosage allows to low up transportation costs. High efficiency of the octane improver gives producers more flexibility with all production and blending processes.

Boosters **INTRON® 1000** have huge benefits compared with other octane raising additives. With correct transportation, storage and blending, raising opportunity of octane number up to **18 units** has extremely high potential for producers.

All **INTRON® 1000** additives could be used by manufacturers of both traditional and alternative fuels with ethanol content.

PETRONAX
Petrochemical company