

**Boiler and ship fuel.
Systems to improve HFO quality
and lower operating costs.**

**fuel savings, emissions reduction,
competitive advantage for tank farms
and bunkering companies.**

all photos and diagrams in this presentation
(except for the photo on page N50 of this presentation)
we get on our equipment and from our customers.

www.energy-saving-technology.com

Why am I reading this presentation?

- 1. I am seeking new equipment for heavy fuel savings,** reliable, simple, proven and low-cost in operation .
- 2. I'm looking for equipment and projects that quickly pays for itself,** and work for a long time.
- 3. I work with consumers of liquid fuel** – boiler or bunkering company and using additives. I want to improve result or reduce quantity of additives. Fuel is too poor and demand more and more additives and it not solve my problem. **I want the best quality.**
- 4. I am a supplier of fuel and want to bind my key clients.**
- 5. I know a lot of boiler-houses that have constant problems with the HFO burning.** Smoke, sludge, permanent sticking soot and unburned coke on heat exchangers, boilers stopping, cleaning and repair of equipment ...
I want to offer a good solution and make money.



Why am I reading this presentation?

for oil company owners and staff

1. I am the **owner of bunkering company** and want to improve my product quality.

- remove clots and fuel stratification for get a homogeneous fuel ;
- dispersing all solids (resins, asphaltenes paraffin);
- reduce the amount and size of solids and coke;
- to reduce the viscosity of the final product;
- to reduce the freezing point and filterability limit temperature;
- increased caloric fuel. (**without using additives or with a minimum volume of additives**)

2. I want to reduce expenses for manufacturing fuel for ship or boiler by :

- reduce quantity diesel / boiler fuel for blending ;
- reduce volume of using additives or increase their efficiency;
- reduce the cost for heating fuel, and recycling condensate water, slurry residues in tanks;
- minimize the environmental damage from my enterprise.

3. I am the **owner oil-fired boilers** and I want to **reduce cost for fuel and sludge utilization**.

4. I am not the owner of bunkering (tank farm / boiler house) companies, but I want **offer to my boss right way to reduce manufacturing costs and increase our sales**.

5. I am interested in a **reliable, simple, proven and low-cost in operation equipment**.

Our technology for refinery, industrial boilers, furnaces, heat power plant, energy ship provides:

1. **Saving HFO.** Eliminate corrosion processes, smoke, smell, reduce CO, SO_x, watered oil sludge from storage, transportation, tank washing, clogging of heat exchangers, keep maximum boiler efficiency, increase repairs period. We solve it successfully and everywhere.
2. **Utilization liquid oil sludge at oil (fuel) terminals, tank farms and seaports** by turning into boiler fuel component with safe burning in boiler (without expensive chemical and bio-purification). Our **typical task** are solved successfully elsewhere.
3. **Utilization sediments in natural oil** (in the tanks of its temporary storage), by conversion one into an oil component. New topic.
4. Manufacture of **winter diesel fuel oil** from summer DFO, in stream, without its preliminary heating. Our **typical task** are solved successfully elsewhere.
5. **Increase extraction of light fractions from crude oil.** Average range increasing (gasoline or diesel, depending from crude oil type and technological regime) 3% - 7%. Detailed technology.
6. **Saving of ship fuel** - shipboard installations for improving fuel properties, saving fuel, reducing oil sludge and increasing engine's life. (the same for high power industrial generators). Detailed technology with the necessary tests and analyzes.

Industrial TEST RESULTS (our systems) prove **2.44 - 4.1%** fuel economy for **industrial boiler, oven** and on some types of ship engines and industrial diesel generators.

154 successful projects 2007 -2017, in Russia, Ukraine, Belarus, Syria, Kazakhstan, Croatia, Serbia, Belgium, Guinea, Jamaica ...

The same fuel, but more caloric and more energy.

The same boiler, but lower specific fuel consumption.

Economic effect \$60,000 - \$600,000 for one boiler* per year. (*depending on capacity from 1 up to 10 tons p/h)



Objects - industrial boilers and furnaces, cement plants, mines, dairy and sugar factories, power stations, refinery, heat power plant, energy ship...

The main difference - high reliability, long-term effective work with heavy fuels, high quality processing fuels with a viscosity up to 1200 cSt ..

Possibility of installation and maintenance works by customer staff, real experience of successful operation for **8** years, tests, analyzes, **certificates for use in Ukraine, EU and Russia.**

Works on the principle – - install and forget.



TRGA init, for power or boiler station. Working from 01.09.2009 to 10.02.2017.

For HFO economy, reduction of harmful emissions, recycling condensate water and sludge, increasing boiler efficiency. www.afuelsystems.com

Work time is 3-4 years.
Some models work 8 years.
Warranty - 1-2 years
Payback time- less than one year

We offer to You to increase your income on the basis of our equipment and practical knowledge.



Burning in industrial boiler - before, after, always.

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In bunker fuel manufacture always use additives (chemicals or light fuel) *.

This mixing problem is usually solved by using a pump or a static mixer at best ... Below - construction / operation principle of Spanish static mixer ..

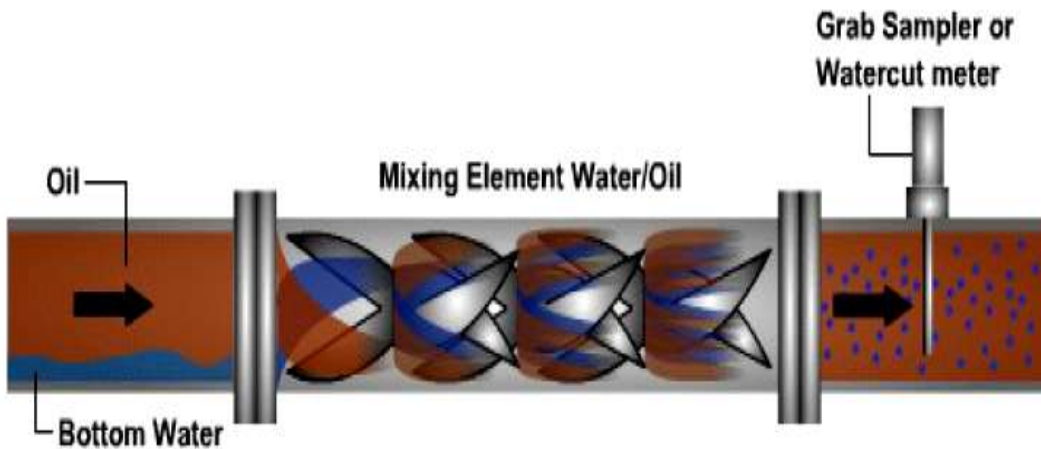
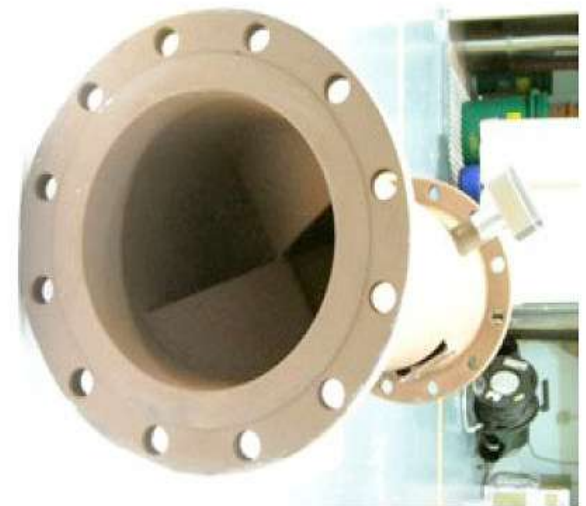
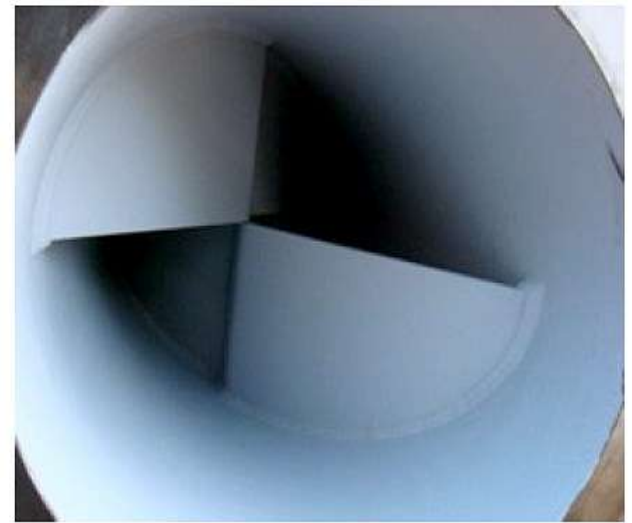


Fig 1.0 Bottom Water in Crude Oil

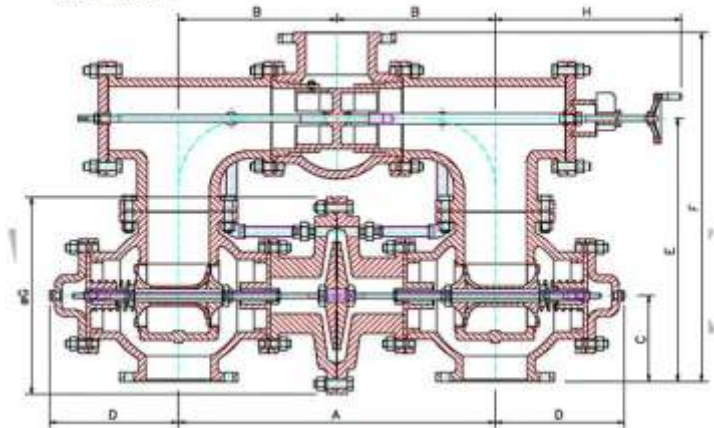


It useful for mixing coffee with sugar, but not grinding resins, asphaltenes, ash, water lenses and mechanical impurity ... **It works good only in the picture.**

Existing devices for production multicomponent or bunker fuels require pre-filtering, have low productivity, are not efficient, bulky, require a lot of energy, they are not reliable and do not disintegrate tar, asphaltenes, paraffin and do not change the viscosity of the fuel without additives.



Все размеры даны в мм



We offer our devices that reduce HFO viscosity, without additives, by 10-15% and require less energy, less additives and diluents if they are needed.

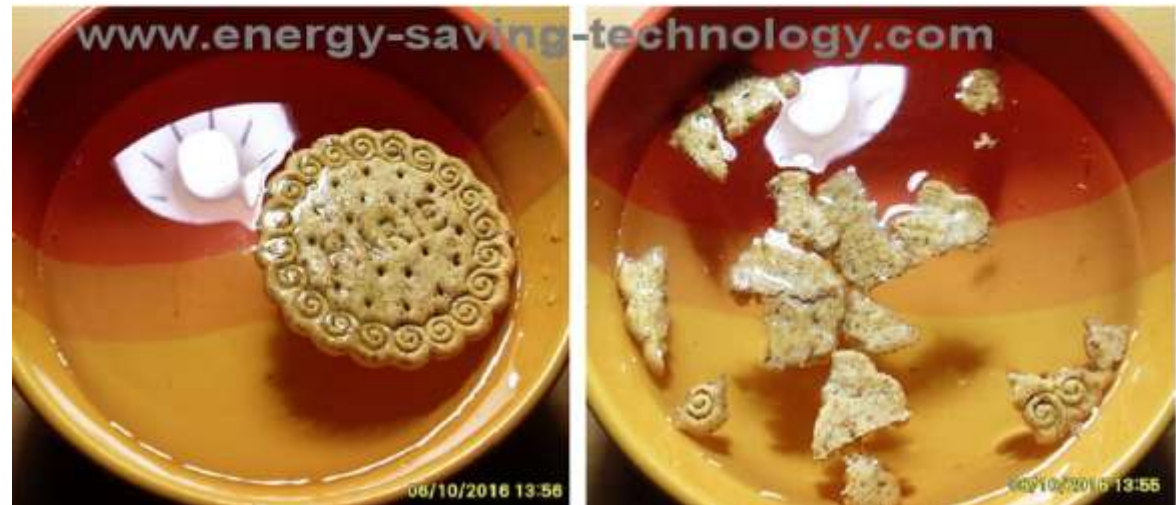
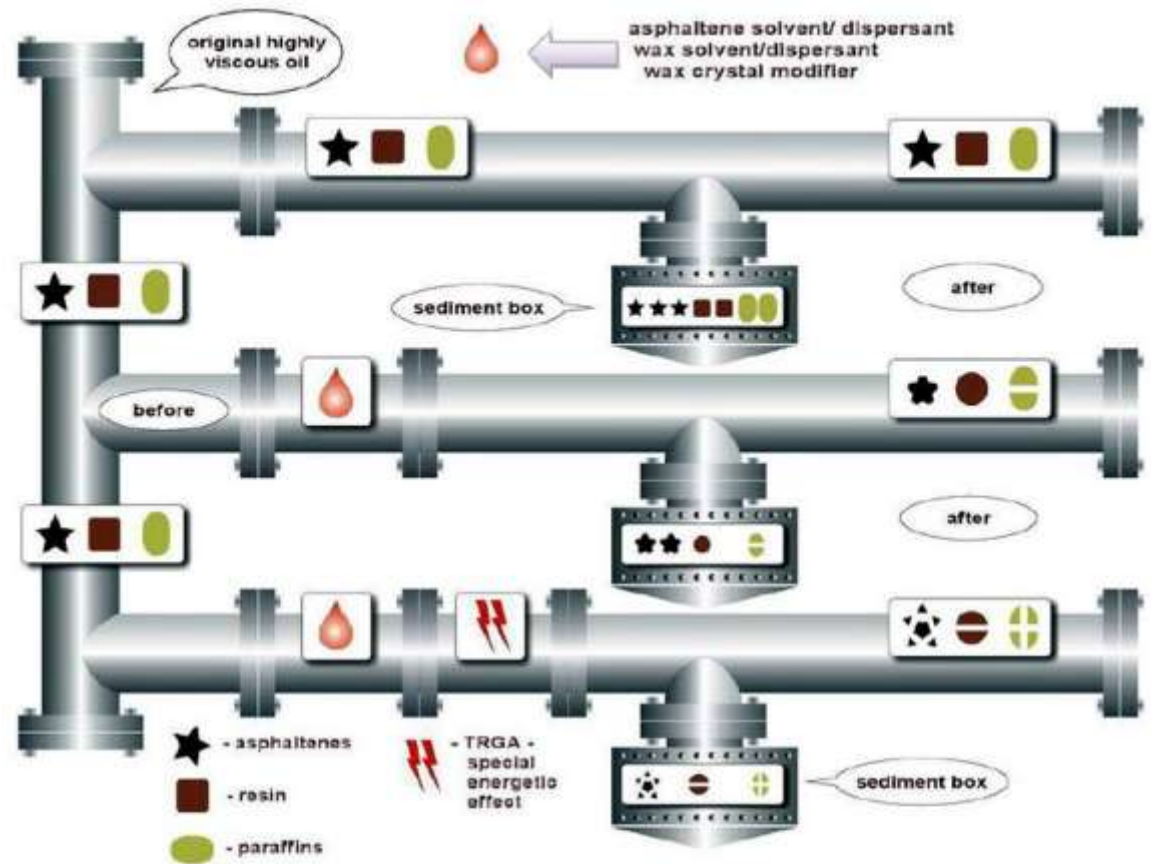


With our system You can grinding of resin, asphaltenes, paraffin and coke particles in the fuel allows additive* get to each molecule of fuel.

Quantity of required additives* - will be reduced or will be increases final product quality.

This effect is not achievable in the static blade mixer.

Term **additive*** - it is chemical fuel additive or other fuel component.



Fuel processed by our system – burning better, waste and smoke are less, **price for purchase/exploitation is lower.**

This is our significant competitive advantage.

Examples of the fuel processing by our system - **visual effects**



Examples of processing sludge from open storage by our system.
Test - oil sludge **visually** before and after treatment.

Исходное сырье - нефтешлам открытого хранения.



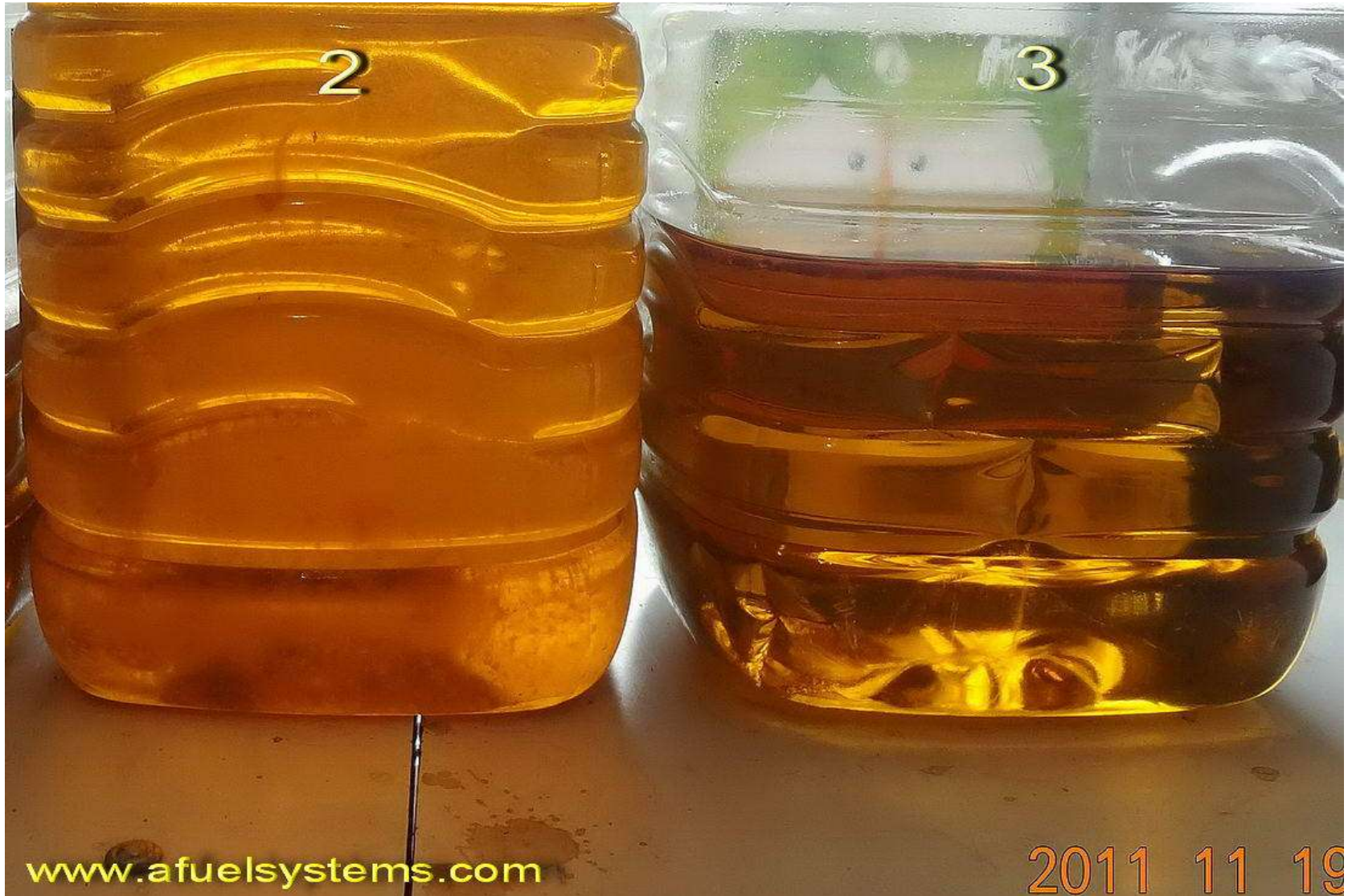
Обработанное сырье - нефтешлам после гомогенизации

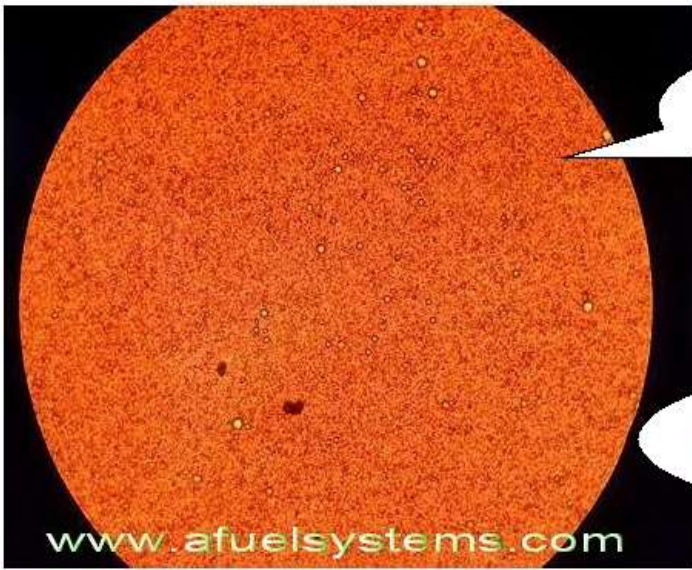


Examples of processing sludge open storage by our system.
Test - oil sludge **burning** before and after treatment.

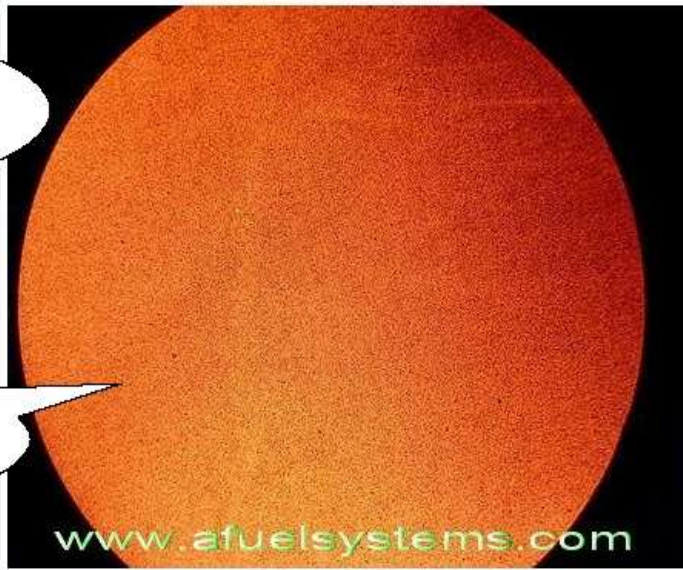


**Examples of low-viscosity marine fuel processing by our system.
Left - original fuel. Right - after treatment.**

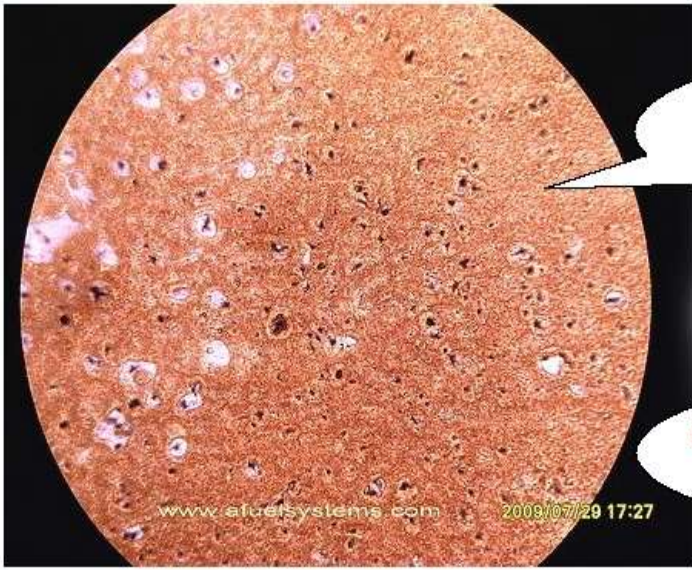




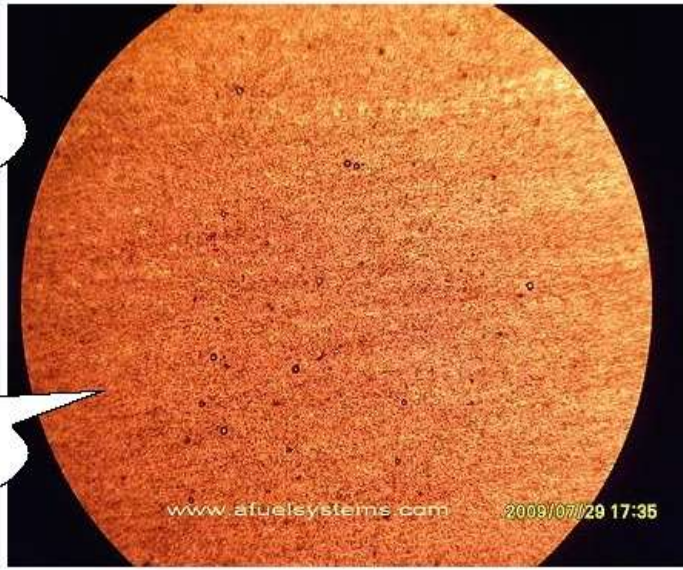
mazut M 100, a standard, before processing, focal ratio - 60



mazut M 100, after processing at TRGA, focal ratio - 60

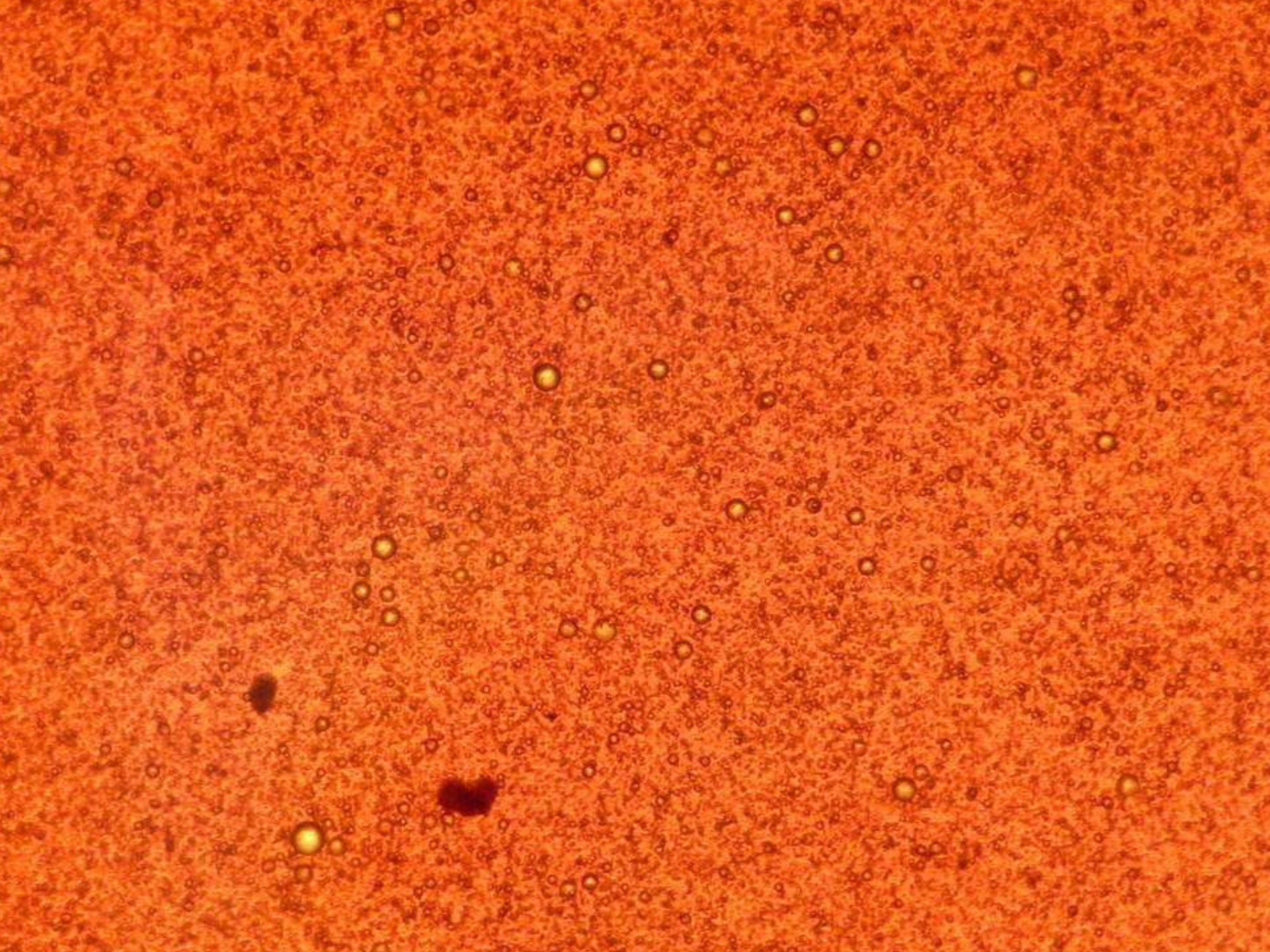


Coal tar, the original standard, focal ratio - 60

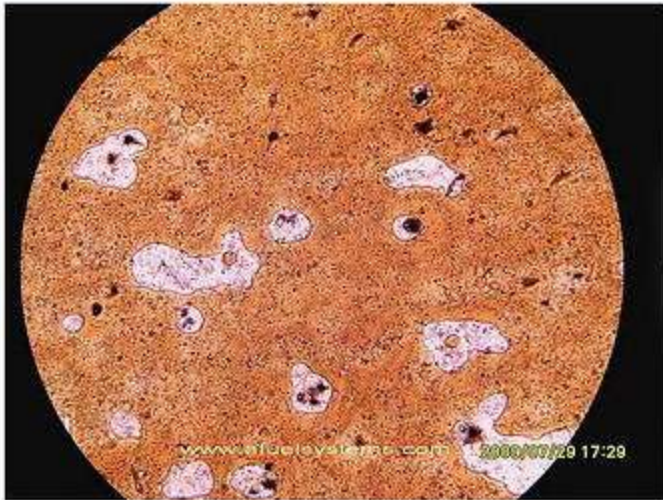


Coal tar, after treatment for TRGA, focal ratio - 60

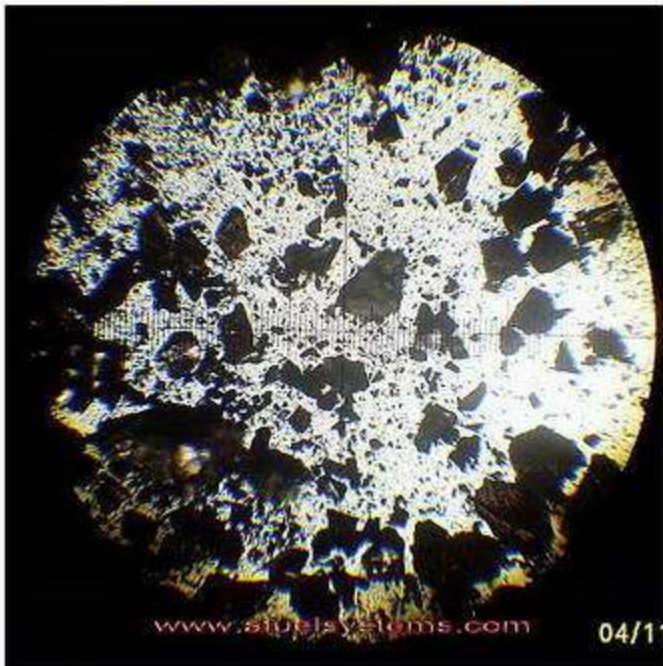
Examples of heavy fuel processing by PSSF system - M100 black oil, coal tar



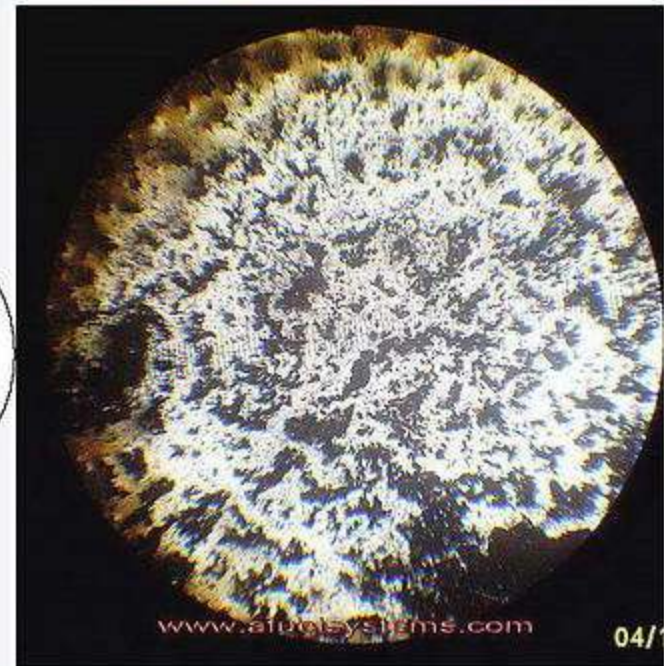




flooding
coal tar
before and
after
treatment
ratio - 60



coal-water
emulsion -
before and
after
treatment
ratio - 60



Examples of the fuel processing by our system - coal tar, hydrocarbon fuel

Two civilizations - the result of one - fuel, after our systems, burns better.



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Analiza plina

Ursta goriva		
Kurilno olje		
T-zraka	22 °C	
T-plina	225 °C	
O2	4.8 %	
CO	113ms/m ³	●
NO	352ms/m ³	
NOx	565ms/m ³	
CO2	11.9 %	
Eta	88.3 %	
Izsebe	11.7 %	
Lambda	1.30	
Toc. ros.	46 °C	

before
CO =
113

After
CO =
76

TOPLANE d. o. o. RIJEKA
Kozala 87
Tel.: 051 54 50 60
Fax.: 051 50 03 08

rbr-ecom JN

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Analiza plina

Ursta goriva		
Kurilno olje		
T-zraka	20 °C	
T-plina	221 °C	
O2	4.9 %	
CO	76ms/m ³	●
NO	361ms/m ³	
NOx	582ms/m ³	
CO2	11.8 %	
Eta	88.3 %	
Izsebe	11.7 %	
Lambda	1.30	
Toc. ros.	46 °C	

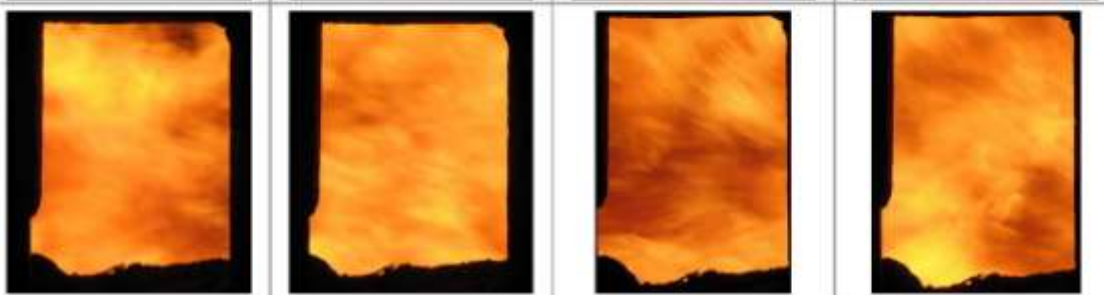
TOPLANE d. o. o. RIJEKA
Kozala 87
Tel.: 051 54 50 60
Fax.: 051 50 03 08

**It was our first test in Croatia
in November 2008**
(fuel type - **light heating oil**, ideal of purity,
25 kilometers to the refinery)



Two civilizations – the result of one - fuel, after our systems, burns better.

Less smoke, less carbon, less corrosion, less sludge, less slag, less harmful emissions (Benzopyrene, CO, SO₂, Nox) less costs to recycle fuel residues and oily water – it is our standard results for the past 10 years.



**Burning black oil
after processing**



Burning standard HFO



**Суточные объемы производства перегретого пара и
потребления мазута на котле №5**

DEN/service technique et production
Suivi rendement activateur de mazout

Показатели до установки гомогенизатора TRGA-2-15G				
Date / дата	CHAUD-5 / котел №5			
	mazout / мазут		vapeur/ пар (t)	cons.spécifique / удельный расход мазута (кг/t)
	(m3)	(t)		
01.08.2010	206	198,8	2739	72,578
02.08.2010	205	197,8	2733	72,384
03.08.2010	206	198,8	2743	72,472
04.08.2010	206	198,8	2748	72,340
05.08.2010	205	197,8	2708	73,052
06.08.2010	205	197,8	2711	72,971
07.08.2010	208	200,7	2752	72,936
08.08.2010	212	204,6	2734	74,828
09.08.2010	228	220,0	2848	77,254
10.08.2010	214	206,5	2780	74,284
11.08.2010	212	204,6	2730	74,938
12.08.2010	203	195,9	2623	74,684
13.08.2010	205	197,8	2692	73,486
14.08.2010	211	203,6	2780	73,243
15.08.2010	208	200,7	2742	73,202
16.08.2010	197	190,1	2480	76,655
17.08.2010	205	197,8	2675	73,953
18.08.2010	214	206,5	2782	74,231
19.08.2010	216	208,4	2824	73,810
20.08.2010	198	191,1	2594	73,658
21.08.2010	216	208,4	2868	72,678
22.08.2010	215	207,5	2834	73,209
23.08.2010	214	206,5	2821	73,205
24.08.2010	148	142,8	1947	73,354
25.08.2010	Остановка котла и монтаж гомогенизатора			
26.08.2010				
27.08.2010				
28.08.2010				
29.08.2010				
30.08.2010				
31.08.2010				
Mois /месяц	4957,0	4783,5	64888,0	73,719

Показатели после установки гомогенизатора TRGA-2-15G				
Date / дата	CHAUD-5 / котел №5			
	mazout / мазут		vapeur/ пар (t)	cons.spécifique / удельный расход (кг/t)
	(m3)	(t)		
01.09.2010				
02.09.2010	84	81,1	1006	80,577
03.09.2010	207	199,8	2866	69,698
04.09.2010	211	203,6	2904	70,115
05.09.2010	214	206,5	2939	70,265
06.09.2010	221	213,3	2954	72,195
07.09.2010	221	213,3	3025	70,501
08.09.2010	220	212,3	3016	70,391
09.09.2010	219	211,3	3003	70,375
10.09.2010	219	211,3	3017	70,048
11.09.2010	217	209,4	2997	69,872
12.09.2010	220	212,3	3014	70,438
13.09.2010	221	213,3	3030	70,384
14.09.2010	221	213,3	3026	70,478
15.09.2010	219	211,3	2998	70,492
16.09.2010	209	201,7	2784	72,444
17.09.2010	145	139,9	1957	71,500
18.09.2010	Аварийная остановка котла из за порыва экранной трубы заднего экрана топки			
19.09.2010				
20.09.2010				
21.09.2010				
22.09.2010	172	166,0	2270	73,119
23.09.2010	201	194,0	2778	69,822
24.09.2010	202	194,9	2798	69,668
25.09.2010	200	193,0	2764	69,826
26.09.2010	199	192,0	2733	70,265
27.09.2010	200	193,0	2714	71,113
28.09.2010	201	194,0	2749	70,558
29.09.2010	203	195,9	2684	72,986
30.09.2010	200	193,0	2703	71,402
Mois /месяц	4242,0	4093,5	57879,0	70,726



Before and after



Средне	лучший режим сжигания топлива и экономия топлива на 4,1% в котле	Средний расход мазута на котле	2,994 кг/t
Фактически		до установки гомогенизатора	4,1 %
- расход		после установки гомогенизатора	
- расход		в нижнем уровне АСУТП котла:	
Расчет		АСУТП котла " Honeywell".	

Burning black oil after processing



Burning a standard fuel oil

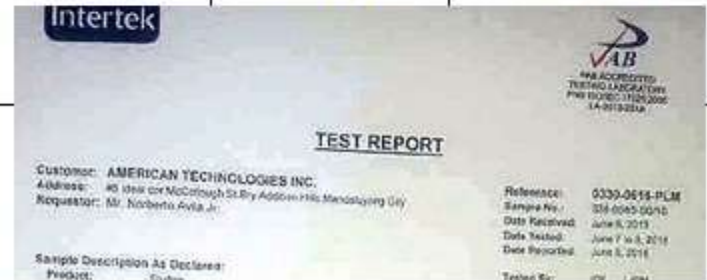


Qualitative changes in the fuel before and after treatment - comparison table - increased caloric reduction in viscosity, partial binding of sulfur

And some results that require additional research to determine borders of effect of, but can be explained. **This is the sulfur content.**

The first results summary:

	sulfur content	viscosity (cSt)	Calorific (BTU/lb)	density
Samp. No. 3 - original fuel	0.531	94.33	8,875	0.9822
Samp. No. 2 - original fuel processing by TRGA gomogeniztore 1 times.	0.458	77.84	10,786	0.9722
Percentage comparison	(-13.74%)	(-17.48%)	(+21.53%)	(-1%)
Samp. No. 1 - the starting fuel (HFO) + Diesel 10% + processing by TRGA homogenizer	0.3	9	15.179	0.9103



Look analyzes below ...

Протокол № 2913

Результатов анализа мазута *по условиям*

Протокол № 2914

Результатов анализа мазута *после установки*

№ п/п	Наименование показателя	Норма по ТУ				Фактически	Исп
		Марка мазута					
		Ф5	Ф12	40	100		
1.	Вязкость кинематическая при 50 °С, сСт, не более	36,2	89,0	-	-	14,45	ГОС
	Вязкость кинематическая при 80 °С, мм ² /с, не более	-	-	59,0	118,0		
	Вязкость кинематическая при 100 ОС, мм ² /с, не более	-	-	-	50,0		
2.	Зольность, %, не более - малозольный - зольный	-	-	0,04	0,05	0,08	ГО
		0,05	0,10	0,12	0,14		
3.	Массовая доля механических примесей, %, не более	0,10	0,12	0,5	1,0	0,595	ГОС
4.	Массовая доля воды, %, не более	0,3	0,3	1,0	1,0	2,8	ГОС
5.	Содержание водорастворимых кислот и щелочей	Отсутствие				отсут	ГОС
6.	Массовая доля серы, %, не более	2,0	0,6	3,5	3,5	1,98	ГО
7.	Температура вспышки, определяемая в открытом тигле, °С, не ниже	-	-	90	110	153	ГОС
8.	Температура вспышки в закрытом тигле, °С, не ниже	80	90	-	-		ГОС
9.	Температура застывания, ОС, не выше	-5	-8	10	25		ГОС
10.	Плотность при 20°С, г/см ³ , не более	0,955	0,966	Не нормируется, определение обязательно		0,925	ГО
11.	Теплота сгорания, Дж/кг, не менее	41454	41454	39900	39900	39090	ГОС

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Заключение: мазут марки 100 ГОСТ10585-99 *не соответствует*

№ п/п	Наименование показателя	Норма по ТУ				Фактически	Метод Испытания
		Марка мазута					
		Ф5	Ф12	40	100		
1.	Вязкость кинематическая при 50 °С, сСт, не более	36,2	89,0	-	-	15,20	ГОСТ 33
	Вязкость кинематическая при 80 °С, мм ² /с, не более	-	-	59,0	118,0		
	Вязкость кинематическая при 100 ОС, мм ² /с, не более	-	-	-	50,0		
2.	Зольность, %, не более - малозольный - зольный	-	-	0,04	0,05	0,08	ГОСТ 1461
		0,05	0,10	0,12	0,14		
3.	Массовая доля механических примесей, %, не более	0,10	0,12	0,5	1,0	0,574	ГОСТ 6370
4.	Массовая доля воды, %, не более	0,3	0,3	1,0	1,0	6,9	ГОСТ 2477
5.	Содержание водорастворимых кислот и щелочей	Отсутствие				отсут	ГОСТ 6307
6.	Массовая доля серы, %, не более	2,0	0,6	3,5	3,5	1,96	ГОСТ 1437
7.	Температура вспышки, определяемая в открытом тигле, °С, не ниже	-	-	90	110	155	ГОСТ4333
8.	Температура вспышки в закрытом тигле, °С, не ниже	80	90	-	-		ГОСТ 6356
9.	Температура застывания, ОС, не выше	-5	-8	10	25		ГОСТ 20287
10.	Плотность при 20°С, г/см ³ , не более	0,955	0,966	Не нормируется, определение обязательно		0,926	ГОСТ 3900
11.	Теплота сгорания, Дж/кг, не менее	41454	41454	39900	39900	38050	ГОСТ 21261

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Заключение: мазут марки 100 ГОСТ10585-99 *не соответствует*

Effect of increased caloric content of fuel oil is confirmed by analysis of Russian Railways in 2013 - the original HFO - water - 2.8%, processed HFO - 6.9%, but the calorie content is almost equal. Recalculation shows an increase of 4.29% in the caloric content.



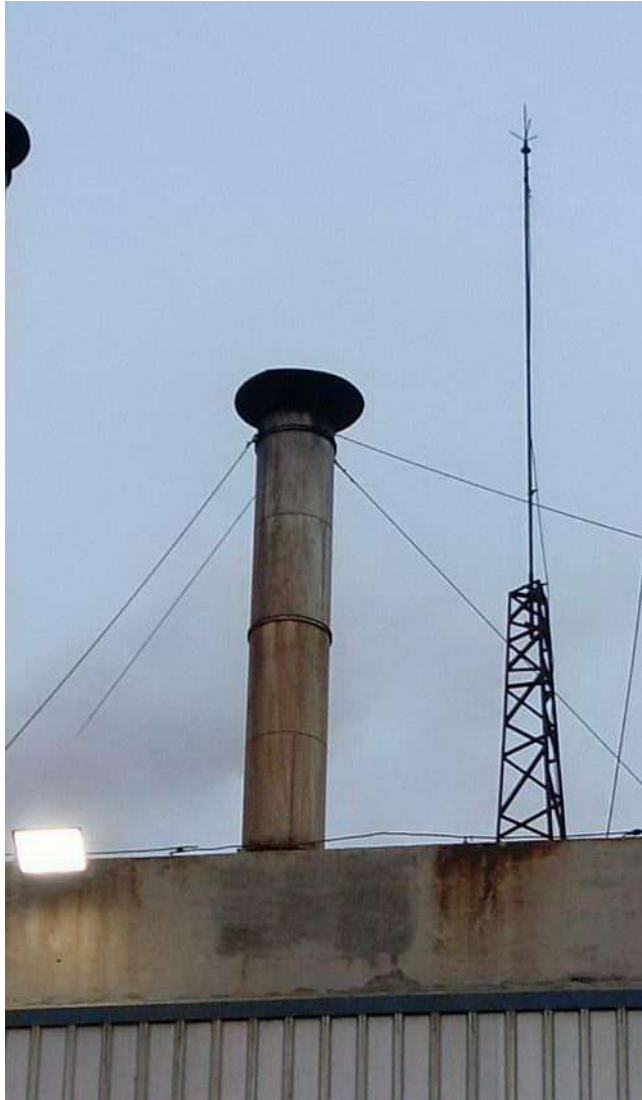
How it works

Optimization HFO burning in Syria...

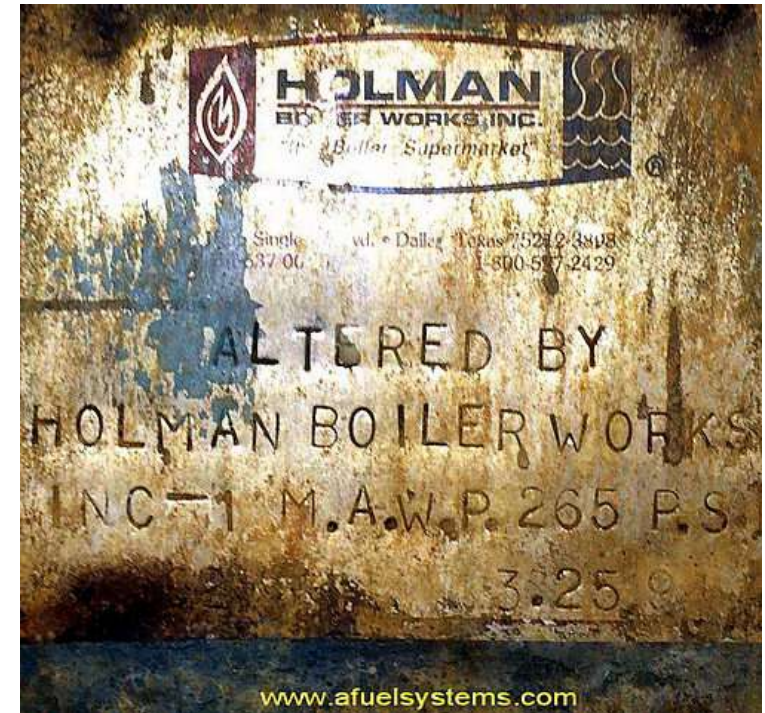


1. Burning standard black oil
2. Burning black oil after processing
3. Burning black oil with water, after processing

Optimization burning HFO, Syria - 3 months operation - clean surfaces, no corrosion (15% water in black oil)



Optimization burning HFO, Odessa, UA - 3 years operation - clean surfaces, no smoke, no corrosion (8% water in black oil), incineration own and port sludge. 2 boilers RILEY UNION Holman Boiler Works Inc. made in USA 1994





ash from black oil -
dry ash

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1. Fuel oil boiler economizer after 11 months of work (works on mix of heavy fuel oil and sludge).

2. "mix fuel" burns completely after treatment, leaving a dry ash ...



NO ash

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Equipment reliability.

Our system **tested** practically in Russia, Ukraine, Syria, Belarus, Guinea, Jamaica, Croatia, **in continuous working within 2-5 years** with heavy fuel oil in low filtration, high viscosity and high content of abrasive particles, resins, asphaltenes, other suspensions.

Some other... similar equipment (made in US and Germany) breaks down in 3-4 months and can not be serviced by the customer.




www.afuelsystems.com

23/11/2010 08:51

**On this quality HFO, our systems work 12 months without clogging.
(Aluminum Plant in Guinea)**



1. **Safety of operation.** The average operating time for the boiler - 10 months per year.

№	TRGA model of homogenizer	flow of black oil (tons) / total amount of solids (tons) / total amount of solids with a reduction factor 0.2 (pre-filtering and recycling) (tons)			
		max. and average p/h.	per 1 year	per 2 years	per 5 year
1	TRGA-3G-05	6, 4	28 800 288 tons 57.6	86 400 864 tons 172.8	144 000 1 440 tons 288
2	TRGA-3G-08	9, 7	50 400 504 tons 100	151 200 1 512 tons 302	252 000 2 520 tons 504
3	TRGA-3G-10	11, 8	57 600 578 tons 115	172 800 1 728 tons 345	288 000 2 880 tons 576
4	TRGA-3G-15	16, 12	86 400 864 tons 172	259 200 2 592 tons 518	432 000 4 320 tons 864
5	TRGA-3G-20	21, 18	129 600 1 296 tons 259	388 800 3 888 tons 777	648 000 6 480 tons 1 296
6	TRGA-3G-30	32, 26	187 200 1 872 tons 374	561 600 5 616 tons 1 132	936 000 9 360 tons 1 872
7	TRGA-3G-40	43, 36	259 200 2 592 tons 518	777 600 7 776 tons 1 555	1 296 000 12 960 tons 2 592
for comparison - open top wagon volume is 120 m. cub., lifting capacity is 60 tons.					

how much solids passes through the our fuel system TRGA for 1 year - wagon.

how long our systems works in Russia, Ukraine, Kazakhstan?

from 2 to 7 years and we have a lot of evidence.

Our industrial

TEST RESULTS is **2.44 - 4.1% fuel economy for industrial boiler, oven** and on some types of ship engines and industrial diesel generators.











Boilers and power plants not only on land - but also **on the sea, on oil rigs on power ships, on ships with boiler power systems...**

The same fuel, but more caloric and more energy.

The same objects, but lower specific fuel consumption and maintenance.

Works on the principle – - install and forget.

But it works not only for open fire!

<p>standard fuel burning & standard losses</p>	<p>or TRGA systems</p> 	<p>for HFO mechanical treatment for reduction of specific fuel consumption, sludge & emission</p>
<p>for platforms & power barges (with boilers and generators)</p>		
<p>Using standart HFO</p>  <p>Get standard energy</p>  <p>& standard equipment wear.</p>	 	<p>With TRGA systems You using less Fuel</p>  <p>But get the same energy</p>  <p>& less equipment wear.</p> <ul style="list-style-type: none"> ❖ 1-2 months for project. ❖ 2-4 years of successful and safe equipment working (up to 5 years). ❖ Compatible with all industrial boilers. ❖ Payback time 4-8 months.
<p>Call us when you buy this. We will provide HFO savings 2.66–4.1%, sludge disposal, long work injectors and pumps, the absence of smoke and long cleaning interval for boiler, nozzles, filter, separator and heat exchangers. It works on land and at sea.</p>		
<p>You primitive burning 10 tonnes HFO p/h. (72 000 tns p/years) ?</p>	<p>We can save 2.66–4.1% of HFO. we do it since 2007.</p> 	<p>Direct economy p/years is \$ 648 000.00 (in price Apr. 2017, not including other positive factors)</p>
	<p>TRGA technology. Tested on 10 years on 152 successful projects in Russia, Serbia, Croatia, Romania, Guinea, Ukraine, Kazakhstan, Belarus, Tatarstan, Jamaica, Syria, the Philippines, Slovenia.</p>	



Problem to improve HFO quality for ships engines and diesel power plants of high power.

Problems with HFO the same - not complete burning, smoke, harmful emissions, equipment wear, slurry disposal, possibility of using cheaper fuel and reduction of fuel costs.

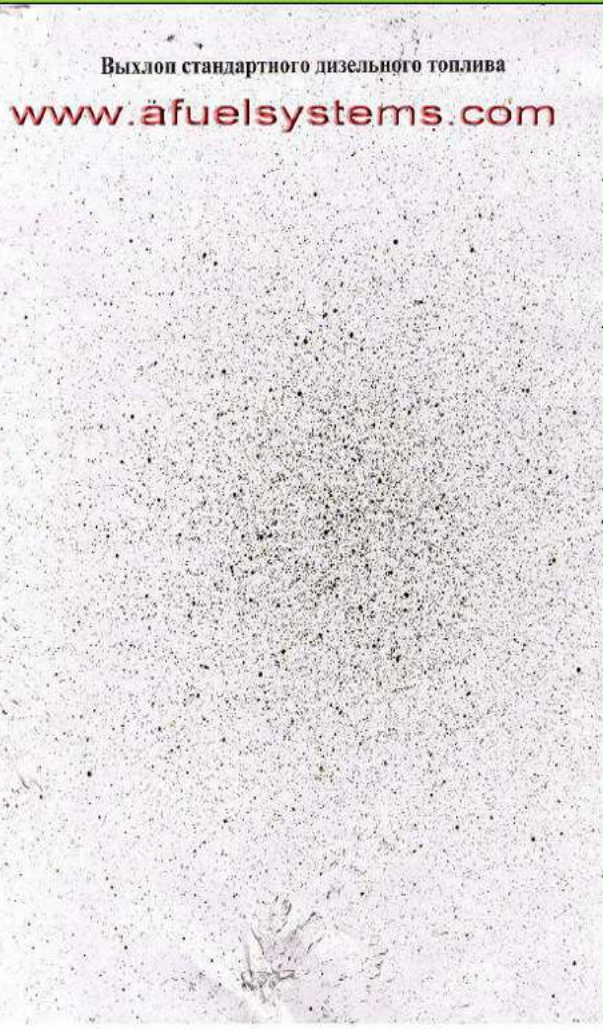


diesel generator exhaust
(standard automotive diesel fuel)
- 20 minutes of work

diesel generator exhaust
(automotive diesel after treatment
with a mechanical activator TRGA)
- 20 minutes of work

Выхлоп стандартного дизельного топлива
www.afuelsystems.com

Выхлоп Нестандартного дизельного топлива
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выхлоп дизельного генератора
(стандартное автомобильное диз. топливо)
- 20 минут работы

выхлоп дизельного генератора
(автомобильное дизельное топливо после
обработки механическим активатором ТРГА)
- 20 минут работы

Our first test

on **diesel generators**
with standard, light
automotive diesel
fuel.

Compare please :

- amount of unburned particles
- completeness of combustion in engine.

A simple test - two sheets of paper near the exhaust pipe

fuel ships IFO-180, original,
focal ratio - 60

fuel ships IFO-180, after
processing with TRGA,
focal ratio - 60

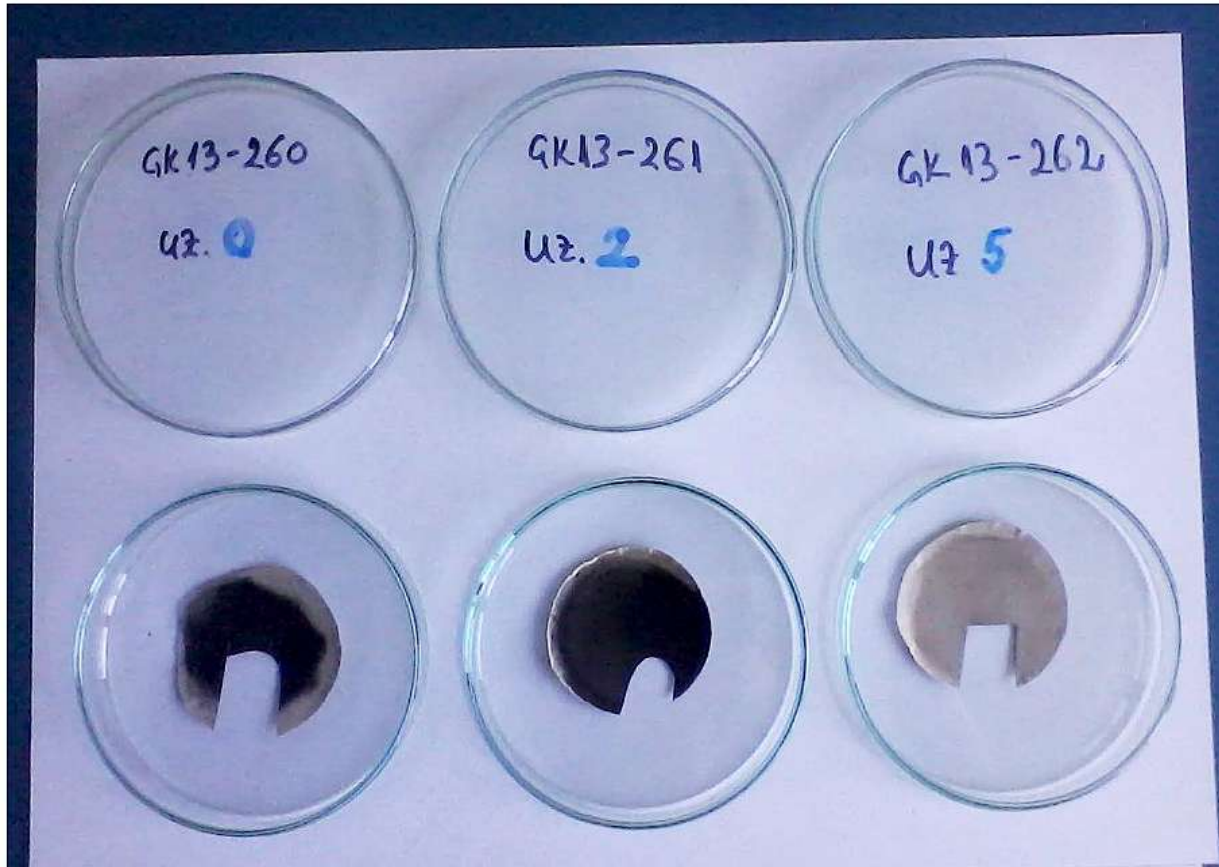


Next test processing marine fuel IFO-180 – before and after.

Reducing quantity and size of the solid particles,

tar and other impurities in the fuel provides:

1. more efficient combustion and reduced specific fuel consumption;
2. unburned residue deposits in the engine, increases average efficiency power units between repairs or cleaning;
3. Reduces smoke and emissions.

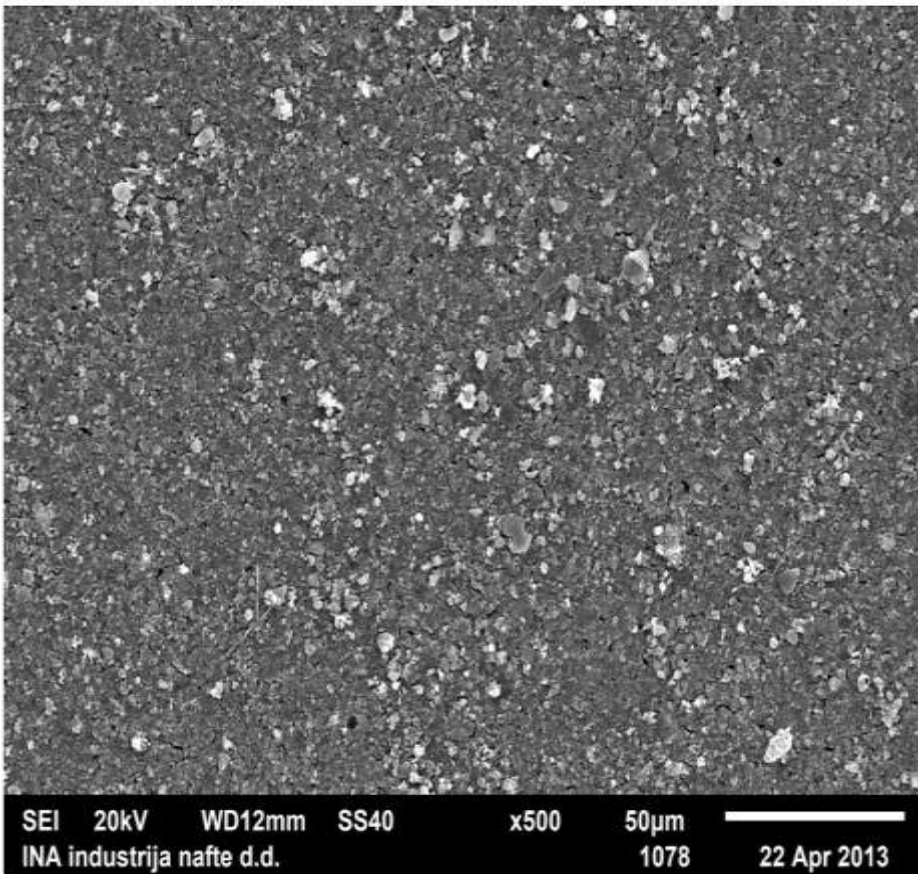


Processed fuel on a laboratory filter

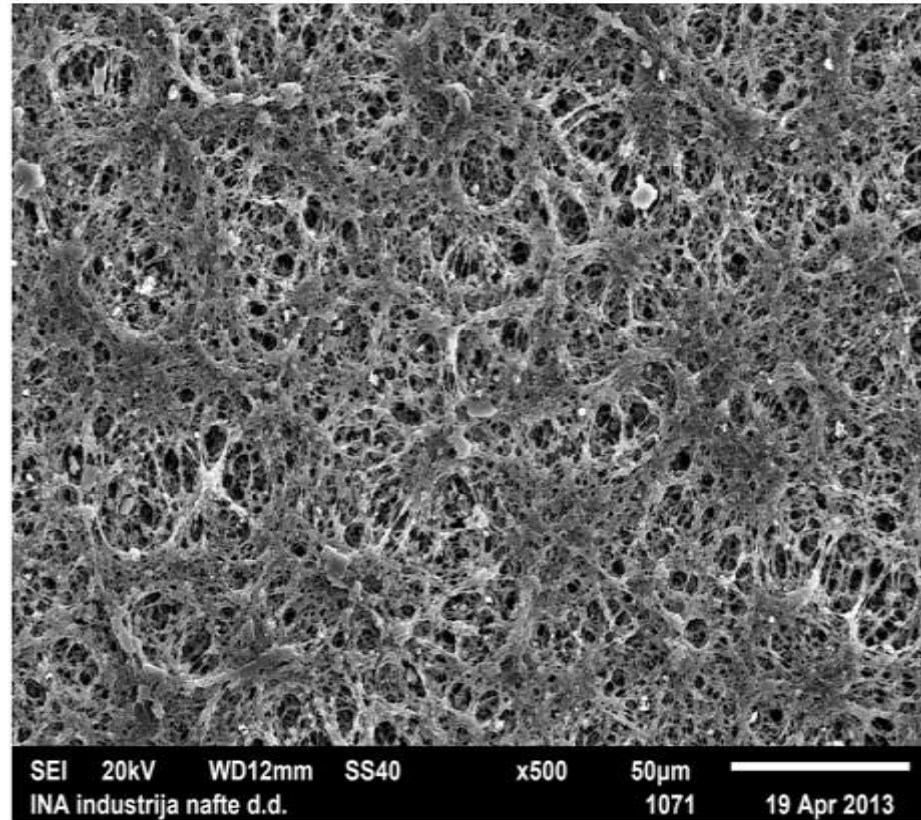
Sample 0 - weight of particles on the filter is **9.8 mg/kg**
(**standard HFO**)

Sample 2-5 - weight of particles on the filter is **7.7 and 6.1 mg/kg**
(**HFO after processing**)

Reduced to "- 38%"
The official test doc.
from INA, Zagreb,
Croatia



Slika 3. SEM mikrofotografija uzorka "0" , povećanje 500x



Slika 5. SEM mikrofotografija uzorka "5" , povećanje 500x

1. Left - laboratory filter is completely clogged by fuel residues from original ship fuel RME IFO 180.
2. Right – the same filter, but fuel after treatment 3 times by our system. It is clean, you can see the filter's structure only and single particles .

8.12. ВЛИЯНИЕ ЗАГРЯЗНЕННОСТИ ДИЗЕЛЬНОГО
ТОПЛИВА НА СРОК СЛУЖБЫ
ПЛУНЖЕРНОЙ ПАРЫ ДИЗЕЛЯ

	Относительный срок службы, %
Дизельное топливо до фильтрации	100
То же, после фильтрации через фильтр с тон- костью фильтрации, мкм:	
24	130
19	190
13	350
5-7	850

8.13. ВЛИЯНИЕ ЗАГРЯЗНЕННОСТИ МАСЛА НА СКОРОСТЬ ИЗНОСА
ГИЛЬЗЫ И ВЕРХНЕГО ПОРШНЕВОГО КОЛЬЦА

Размер частиц, мкм	Содержание механи- ческих примесей, %	Скорость износа	
		радиальной гильзы, мкм/ч	поршневого кольца, мг/ч
До 100	0,027	2,1	3,1
» 50	0,1	0,35	6
» 30	0,176	—	8

Киселев М. М.

К 44 Топливо-смазочные материалы для строитель-
ных машин: Справочник. — М.: Стройиздат, 1988. —
271 с.: ил.

ISBN 5-274-00040-1

Приведены основные свойства топливных и смазочных ма-
териалов, причины их изменения, а также сведения о приме-
нении в строительных машинах. Рассмотрены методы восста-
новления и контроля качества нефтепродуктов. Изложены во-
просы современного обеспечения строительных машин
топливом и смазочными материалами. Даны сведения о пра-
вилах хранения, учета и нормирования расхода топлива и сма-
зочных материалов.

Для инженерно-технических работников проектных и строи-
тельных организаций.

К 3204010000—508
047(01)—88 147—88

ББК 38.6—5

ISBN 5-274-00040-1

© Стройиздат, 1988

Handbook "fuels and
lubricants", USSR publication

*"influence of polluted of
diesel fuel on the lifetime of
the plunger pump of diesel
engine"*

*Service life of the diesel engine
in the automotive diesel fuel:*

1. unfiltered fuel = **100%**
2. after filtering (or crushing
particles) up to 5-7 microns.
= 850%

The degree of particle size
reduction our fuel system =
4-5 microns and less.

All traditional system of fuel preparation have common drawbacks:

- After filtration (separation) of fuel, **part high molecular fuel moves to sludge tank;**
- It does **not provide complete removal of water;**
- Separation systems are **very expensive** to purchase and maintain.

type of equipment	dewatering	removal of solid particles in the fuel	loss of fuel
filter	no (water from the fuel is not removed)	satisfactory	moderate
separator	good, but not excellent (the limit is caused by the fuel density)	good but not complete	large, up to 3%
PSSF system	no (water dispersity up to 3-5 microns)	good - dispersity up to 3-5 microns	absent

Our PSSF system - work continuously and without repair 1-2 years, converts 95% of sludge into fuel and totally not destroy the ship or diesel generator engine.

Our system - **totally safe** for diesel engine (proved by supervision industrial diesel generator working during the 3 years). **Our system provides other effects.**

1. The uniform distribution of the additive* in the fuel – it reduces degradation of the fuel system and reduces piston wear.

Why ? - Increased concentration of additive* in the fuel leads to saturation by hydrogen surfaces of high pressure pump/pistons and it sharply increases brittleness and wear of these surfaces.

2. Minor residual water in the fuel is converted into a stable fuel emulsion which accelerates the combustion process in the engine or in ship's or energy boiler.

Why ? - It is not the subject of this presentation, it is shown on special test stands.

3. Dispersing of solid inclusions, not only reduces the degradation of fuel system and reduces wear on piston, but also increases the caloric value of the fuel due to its complete combustion.

Why ? - Fine particles of fuel burned completely, and do not destroy the friction surfaces. This is proven by the classical Soviet technical literature on the example of the automotive diesel fuel.



Before ...



After ...

Test - our ship-board system for processing fuel on ships without additives.

It worked continuously, without maintenance and safety for the engine - 1.5 years.

Result: reduction viscosity and ash content, pour point, size dispersion of solid particles, carbon residue, reduction amount of sludge (“-95%”), removing clots. Fuel economy 4%. Reduced smoke and harmful emissions. Conducted by a certified laboratory in Slovenia.

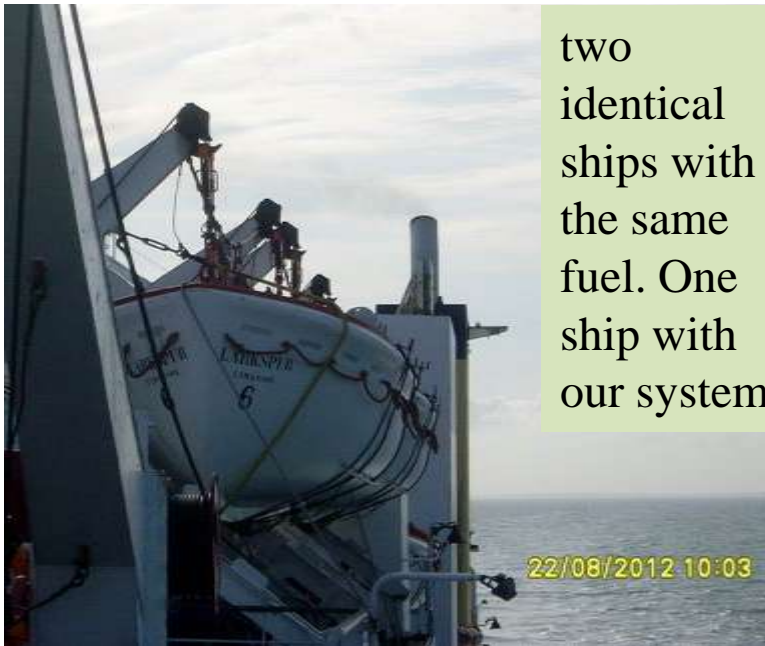
Analysis of the documents - modify the properties of heavy hydrocarbon fuels

shipboard fuel IFO-180 (INA HR)	N		formal standart	original sample	1	2	3	4	comment
density at 15 °C	1	kg/m3	<= 991	947.6	945.7	945.7	948.1	949.6	agree
kinematic viscosity at 50 °C	2	mm2/s	<= 180	138.5	117.8	117.6	129.1	136	super
aromaticity index	3	(CCAI)	<= 860	820	820	820	821	822	agree
total sulfur content	4	% m/m	<= 4.5	1.59	1.56	1.57	1.54	1.49	agree
flash-point	5	°C	>= 60	92.0	94	94	> 100	> 100	*
amount of sediment	6	% m/m	<= 0.10	0.02	0.05	0.04	0.03	0.04	**
amount of coke residue	7	% m/m	<= 15.0	14.06	8.53	8.18	8.19	7.63	super
flow point	8	°C	<= 30	+30	+24	+24	+21	+24	super
amount of water	9	% v/v	<= 0.50	0.1	0.05	0.05	3	5.6	agree
amount of ash	10	% m/m	<= 0.07	0.04	0.04	0.03	0.04	0.04	agree
amount of vanadium	11	mg/kg	<= 200	125	122	120	115	112	super
amount of sodium	12	mg/kg	<= 50	4.93	7.25	7.85	5.72	5.34	***
amount of Al + Si	13	mg/kg	<= 50	5	5	5	5	5	agree
energy value	14	MJ/kg	-	-	41.02	41.02	39.7	38.88	agree
			standart	no add	no add	no add	+3% w	+6% w	





official resume
after the test.



two
identical
ships with
the same
fuel. One
ship with
our system.

The overall results of the use of ship's modules TRGA testing on ro-ro ship Larkspur "from 19 to 22 08. 2012

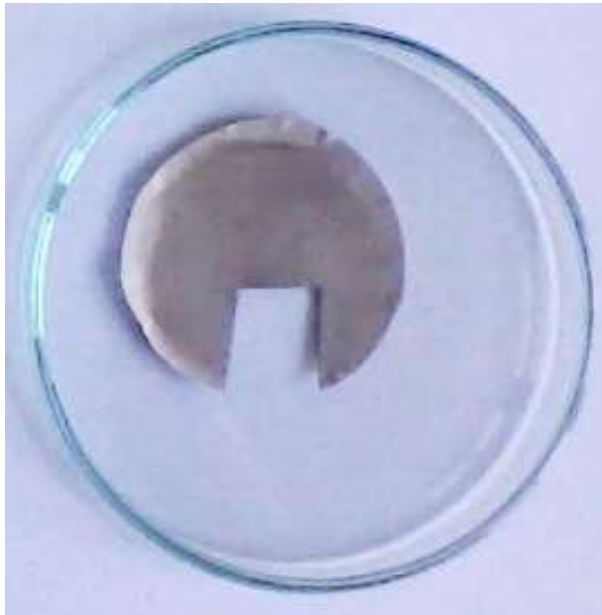
	Operation on the standard fuel	Using module TRGA only on the buffer tank	Using module TRGA only on the settling tank	Using module TRGA on the buffer tank and on the settling tank
The main observed effects				
Flue gas temperature St. (C)	325	356	353	368
	326	356	347	370
	337	357	353	370
Level CO	100%	- 3.8 – 6.4 % -5.27 – 6%	-6.47 – 10.39%	<u>-10 – 14.97 %</u> <u>-12.34 – 13.67</u>
Visual amount of smoke length in meters of water followed	100% at startup – a lot of smoke during the driving 30-80 meters	at startup – less for 30% during the driving 5-40 meters	<u>at startup – less for 40%</u> <u>during the driving 5 - 10 meters</u>	at startup – less for 30% during the driving 5 - 20 meters
The amount of fuel sludge from the separator	0.692 tonnes per day Of which the fuel is 415 kg	0.692 tonnes per day Of which the fuel is 415 kg	0	0
	1	2	3	4

Additional effects of the installation of ship modules TRGA

1. Additional heating fuel. **TRGA modul provides heating fuel in a buffer tank on the temperature of 85-90 degrees**, what reduces the viscosity of the fuel, using fuel or high binding in the case of poor fuel heaters lining the resin, which is the build-up. **TRGA module provides heating fuel in settling tank so that the fuel is heated to 5 ° C in a streaming through the module.**
2. Reducing the amount and size of solid particles in the fuel directly affects the speed and reduce the amount of fuel sludge to collection tanks for fuel mud tank and, in addition to direct fuel saving, provides cost generated by the fuel acquisition sludge by the port services.
3. Reducing the amount and size of solid particles in the fuel has a direct impact on the reduction of wear separator and saving in the cost of its repair and maintenance.



fuel purity before and after



4. Reducing the amount and size of solid particles in the fuel has an indirect impact on reducing pollution **settling tank** and the costs incurred in cleaning.
5. Using a modul TRGA back to the **buffer tank** provides a softer transition from a heavy fuel engine and vice versa, which, in addition to reducing the heat load allow to start the transition process in less fuel earlier, which also saves on diesel.

Reliable operation of modul TRGA

Module TRGA on the buffer tank has worked continuously from 28. 11. 2011 to 15. 8. 2012, which means for 9 months. TRGA module did not require continuous monitoring or any maintenance. TRGA module did not require any cleaning, adjustment, or replacement of any parts or regulation. TRGA module was turned off before testing in August 2012, and after the test is still working. Review of TRGA module during testing showed that the module is in an excellent and perfect mechanical condition and has no traces of wear.

Module TRGA in a settling tank has worked continuously from 19. 8. 2011 to 18. 10. 2012. The module did not require continuous monitoring or any maintenance. The TRGA module did not require cleaning, adjustment, replacement of any parts or regulation.

Marine Company Transeuropa Shipping Lines d.o.o.
(Transeuropa Ferries) Koper Slovenija
www.transeuropaferrries.com
Direktor – ing. Rihard Stergulc



official resume
after the test.



Photography

- visual changes in smoke before and after switching on our system on the ship

(Oostende - Ramsgate Aug. 2012)

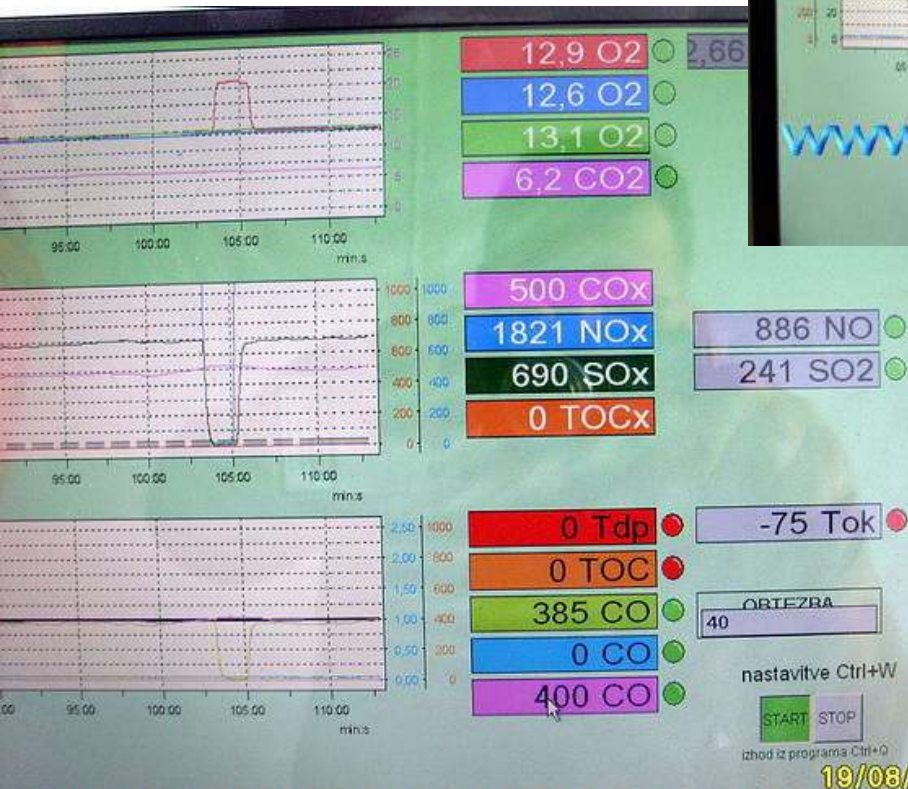
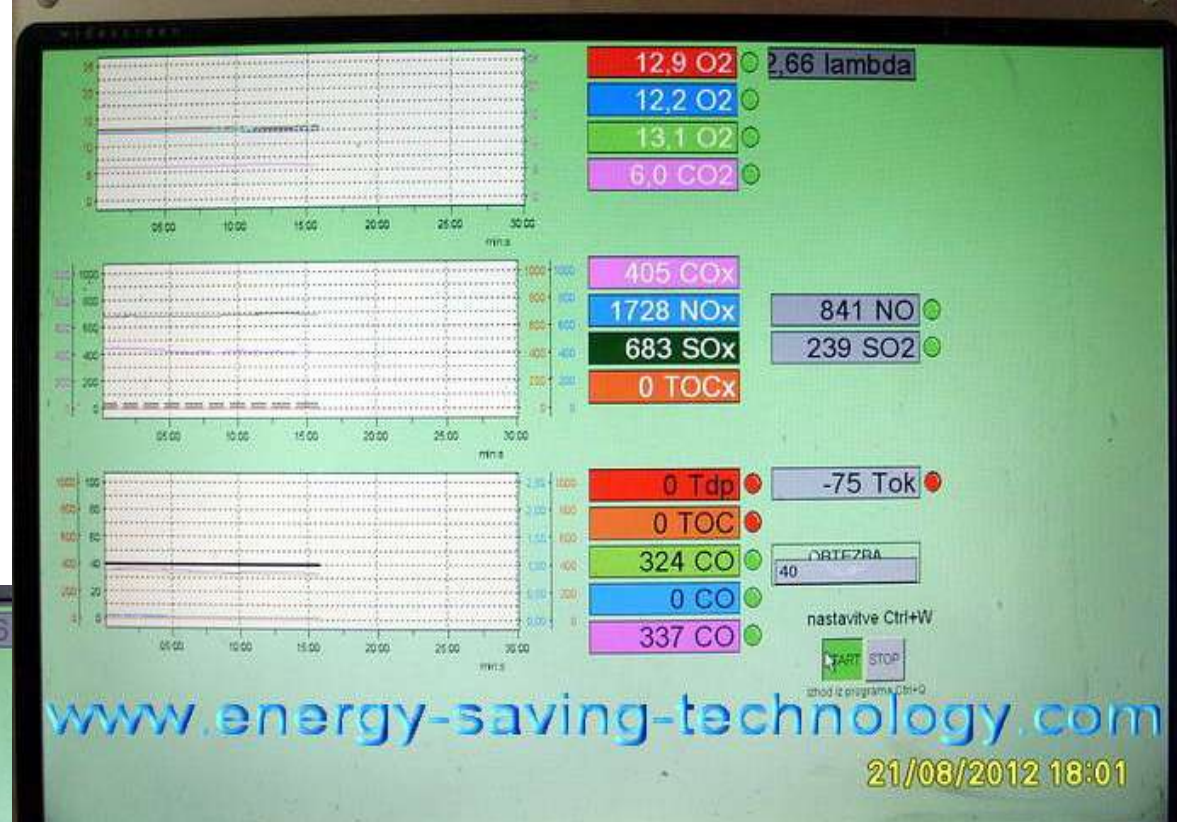


Channel La
Manche - full
speed and full load

Photography

- changes before and after switching on our system.

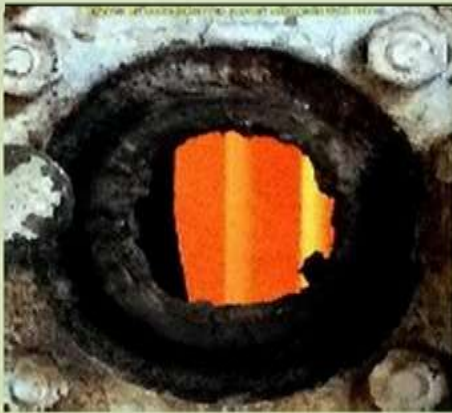
(Oostende - Ramsgate Aug. 2012)



difference of emissions
before and after

main difference from analogues

1. **Reliable and proven.** Works long and does not break. Tested in the work of 10 years and at more than 150 industrial facilities in the condition of different fuels and poor maintenance.
2. Works on the principle - **set - forget.**
3. **Low weight** 10-60 kg, (unlike other 200 kg). It savings in transport and installation costs.
4. **Can use add equipment** - pipes, pumps, valves and other - **from the customer location.**
5. **Low power consumption**, work with gear pump. Energy consumption 0.5-1 kWh per 1 t.
6. **May be install and served by the customer's staff.**
7. **Different models** work on **heavy and light fuel.**
8. **No moving parts**, does not require a supply of electricity and safe.
9. Operating data : pressure **2 - 40 bar**, temperature range "**-20 +250** " degrees.
10. **High crushing effect. Working in aggressive fuels** - coke fuel, jet fuel, and various mixed fuels, may be used for blending biodiesel components comprising methanol and alkali.



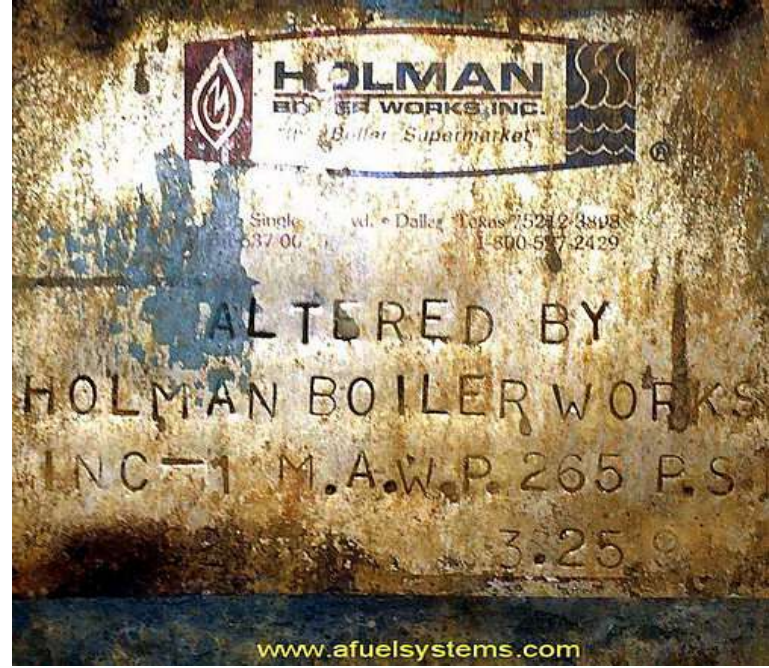
systems for HFO economy



& oil sludge utilization



Our systems work on old and new boilers, furnaces and engines, on the Russian, American, German and Italian power units, light and heavy, high-quality and shocking fuel.





We have made a lot, we can offer a lot too - technologies that have proven its effective for a long operation time. We can share with You our profit, if combine your capabilities and our practical knowledge. He did not turn away from us, we go behind his back

We are looking for new partners.

1. Cooperation under the **agency agreement**.
2. **Co-production** equipment in your territory.

Although alternative sources of energy, the world liquid fuels, for new and old boilers, furnaces, diesel ship engines and diesel power - enormous. **Latin America, Africa, Asia, Russia, and even some production in the US and Canada, can be our customers for a long time.** We can show you how it works for specific objects.

Saving fuel on boilers, furnaces and engines.

Recycling sludge and reducing harmful emissions.



award for the best realized project in Ukraine in the field of energy saving in 2009



diploma for the participation in the exhibition Energy Efficiency 2010, Ukraine



certificate Maritime Register of Ukraine on the use TRGA on marine engines and boiler installations, 2011



certificate Maritime Register of Ukraine on the use TRGA on marine engines and boiler installations, 2011



diploma for the participation in the exhibition of the latest energy saving technologies in the national Chamber of Ukraine 2011



award for third place at the exhibition of the latest energy saving technologies in the national Chamber of Ukraine 2011



quality certificate for EU homogenisation TRGA (quality of production and operation) in 2011



Number in the register of goods and products in the European Union on the device TRGA



diploma for the participation in the exhibition Energy Efficiency, 2011, Ukraine



certificate of compliance with Russian Federation on module for creating fuel compositions and nonchemical treatment of hydrocarbons 2012



Lloyd's Certificate for the right execution of repair and installation work on the ships of any class, Slovenia, 2012



RTN Certificate of the Russian Federation on a series of devices TRGA the right to use TRGA in high risk industrial objects of Russia, Kazakhstan, Belarus, 2012

awards, certificates and guarantees



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