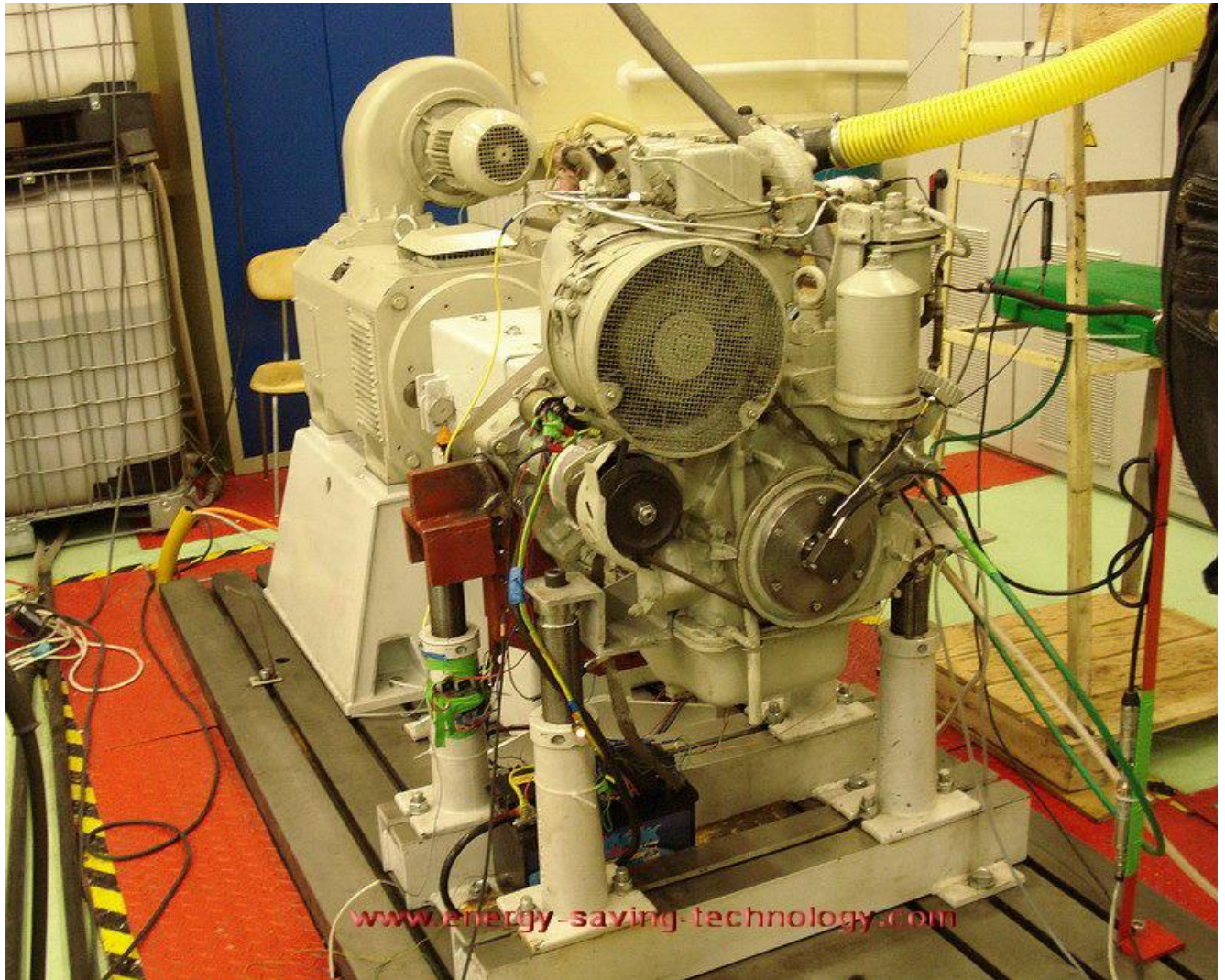


**Test - is it possible to save diesel fuel on diesel engines,  
if use the pre-treatment of diesel fuel on hydrodynamic module TRGA?**

**Tallinn 2011**



**Location of the Test** - Technical University of Tallinn.

**Chief of the Test** - PhD Rhine Muonio.

**Equipment** - special stand made in Italy (Richard HYDRA), diesel engine, 4 cylinder, 5 kW, hydraulic brake, electronic equipment for monitoring and control.

**The answer** - "yes." The increase in engine power up to 10%, and the total fuel savings up to 12%, as well as the reduction of harmful emissions.

The result is fantastic but **it is fully consistent** with the results of tests on locomotives.

[www.afuelsystems.com/ru/gok1/sevgok.html](http://www.afuelsystems.com/ru/gok1/sevgok.html)

[www.afuelsystems.com/ru/gok1/goks.html](http://www.afuelsystems.com/ru/gok1/goks.html)

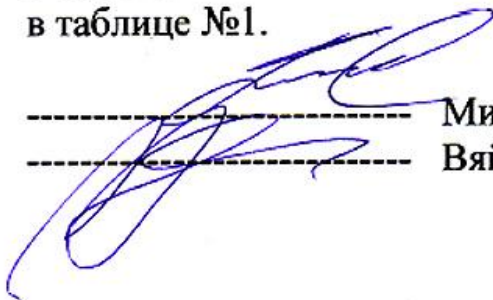
[www.afuelsystems.com/ru/gok1/gok-isp.html](http://www.afuelsystems.com/ru/gok1/gok-isp.html)

Протокол  
проверки работы гомогенизатора TRGA во время  
стендовых испытани

Настоящий протокол составлен в том, что эстонская фирма A-Kütus в лице членов правления Михаила Ногина и Вяйно Сууре произвела 14.04.2011 стендовые испытания установки гомогенизации дизельного топлива TRGA в специализированной лаборатории по испытанию топлива Таллиннского Технического Университета под руководством доктора технических наук Рейна Муони.

Испытания производились на специализированном стенде, в состав которого входит четырехцилиндровый дизельный двигатель мощностью 5 кВт. с водяным охлаждением RICARDO HYDRA оснащенный гидротормозом, а так же электронное оборудование, позволяющее производить замеры мощности двигателя, расход топлива и характеристики выхлопных газов.

Результаты испытаний подтвердили эффективную работу гомогенизатора, что привело, после активации обычного дизельного топлива полученного из автозаправки, к увеличению мощности двигателя на 10,7% при снижении расхода топлива на 12,5%. Улучшились все основные показатели выхлопных газов. Результаты испытаний показаны в прилагаемом Акте Университета в таблице №1.



----- Михаил Ногин  
----- Вяйно Сууре

Address  
Järveotsa tee 41-13  
10120 Tallinn, Estonia  
10220193965220

Phone  
+372 53093444

E-mail  
mihhail.nogin@gmail.com

Bank  
SEB Bank  
a/a



**work of the engine with the diesel fuel that  
has been processed by the module TRGA**

**Diiselmootori Regulaatorikarakteristik  
Pidurdusstand Dynas3 LI 250  
Aktiveerimata kütusega**

Mootor: D-120

Kuupäev: 18.05.2011

Keskonna tingimused:  $p_{env}$ : 750mmHg  $t_{env}$ : 21 °C  $\phi_{env}$ : 44%

Karakteristiku määramise tingimused

vastavalt tellimusele: 0, 25,  
50, 100 ja 110% koormusest

Summaarne töömaht: 2.08 liitrit

Parameeter	Unit	1	2	3	4	5	6	7	8
$\alpha_{pa}$	ckm deg	21	21	21	21	21	21	21	21
$n_e$	$\text{min}^{-1}$	1873	1860	1852	1842	1820	1800	1712	1300
$T_e$	Nm	7	22	34	49	73	85	99	115
$P_e$	kW	1,3729	4,285	6,5935	9,451	13,912	16,02	17,747	15,654
$m_f$	g	26	36	42	50	61	81	83	71
$\tau_f$	s	60	60	60	60	60	60	60	60
$V_a$	liter	2988	2857	2788	2923	2810	2801	2481	2307
$\tau_a$	s	60	60	60	60	60	60	60	60
$t_{env}$	°C	21	21	21	21,2	21,4	21,5	21,5	21,5
$t_o$	°C	80	82	82	82	86	89	90	92
$t_{egt}$	°C	<200	<200	<200	<200	260	300	320	320
$p_o$	bar	3,3	3,0	3,0	3,0	3,0	3,0	2,9	3,2
$B_f$	kg/h	1,56	2,16	2,52	3	3,66	4,86	4,98	4,26
$b_e$	g/(kW h)	1136,3	504,1	382,19	317,4	263,08	303,4	280,6	272,13
$\rho_{env}$	$\text{kg m}^{-3}$	1,187	1,187	1,187	1,186	1,185	1,185	1,185	1,185
$m_a$	kg	3,546	3,390	3,309	3,466	3,330	3,318	2,939	2,733
$B_a$	kg/h	212,76	203,4	198,52	208	199,81	199,1	176,36	163,99
$\lambda_a$	-	9,5372	6,586	5,5088	4,848	3,8177	2,865	2,4764	2,6919
$p_e$	MPa	0,0423	0,133	0,2053	0,296	0,4408	0,513	0,5978	0,6944
$\eta_e$	-	0,0742	0,167	0,2205	0,266	0,3204	0,278	0,3004	0,3097
		0%	25%		50%	75%	100%	110%	



## work of the engine with standard diesel fuel

### Düüselmootori Regulaatorarakteristik Pidurdusstand Dynas3 LI 250 Aktiveeritud

Mootor D-120

Kuupäev: 18.05.2011

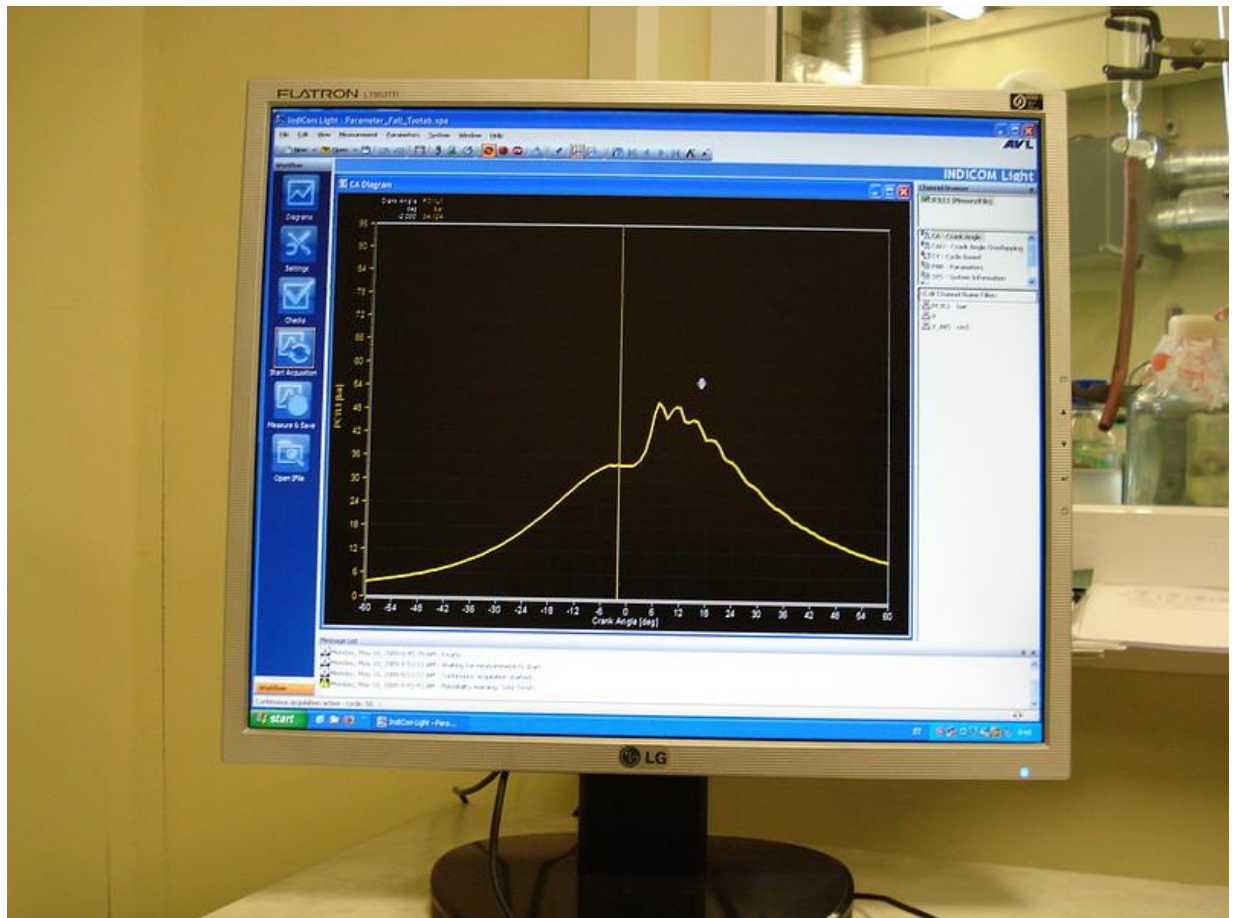
Katsekeskkond:  $p_{env}$ : 752mmHg  $t_{env}$ : 21 °C  $\phi_{env}$ : 39%

Karakteristiku määramise tingimused:  
0, 25, 50, 75, 100 ja 110 %

Summaarne töömaht - 2.08 liitrit

Clean										
Parameeter	Unit	1	2	3	4	5	6	7	8	9
$\alpha_{pa}$	ckm deg	21	21	21	21	21	21	21	21	21
$n_e$	$\text{min}^{-1}$	1873	1860	1852	1842	1820	1800	1712	1300	1800
$T_e$	Nm	5,2	23	33	48	79	91	99	114	91
$P_e$	kW	1,0199	4,48	6,3996	9,258	15,055	17,15	17,747	15,518	17,152
$m_f$	g	24	34	42	49	70	81	82	72	82
$\tau_f$	s	60	60	60	60	60	60	60	60	60
$V_a$	liter	2926	2804	2836	2918	2859	2737	2532	2312	2755
$\tau_a$	s	60	60	60	60	60	60	60	60	60
$t_{env}$	°C	21	21	21,7	21,8	22	22,1	22,3	22,4	
$t_o$	°C	84	84	84	84	84	88	91	94	95
$t_{egt}$	°C	<200	<200	<200	200	305	315	315	295	300
$p_o$	bar	3	3	3	3	3	3	3	3	3
$B_f$	kg/h	1,44	2,04	2,52	2,94	4,2	4,86	4,92	4,32	4,92
$b_e$	g/(kW h)	1412	455,4	393,78	317,6	278,97	283,4	277,22	278,38	286,85
$\rho_{env}$	$\text{kg m}^{-3}$	1,187	1,187	1,184	1,184	1,183	1,182	1,182	1,181	1,278
$m_a$	kg	3,472	3,328	3,358	3,453	3,381	3,236	2,992	2,731	3,521
$B_a$	kg/h	208,34	199,7	201,45	207,2	202,88	194,2	179,49	163,84	211,26
$\lambda_a$	-	10,118	6,844	5,5904	4,929	3,378	2,794	2,5512	2,6522	3,0027
$p_e$	MPa	0,0314	0,139	0,1993	0,29	0,477	0,55	0,5978	0,6884	0,5495
$\eta_e$	-	0,0597	0,185	0,2141	0,265	0,3021	0,297	0,304	0,3028	0,2938





earlier in the simple and primitive experiments, we showed that diesel fuel after processing on the hydrodynamic module TRGA

1. Has a higher combustion temperature.

diesel fuel before	diesel fuel after	comparative photographs
 <p>www.afuelsystems.com</p>	 <p>www.afuelsystems.com</p>	 <p>www.afuelsystems.com</p> <p>2009/05/08 12:14</p>  <p>2009/05/08 12:42</p>  <p>2009/05/07 15:30</p> <p>0.75</p> <p>0.94</p>

Are you smiling? Let's smile to 2 times more and move to serious things...



We treated diesel and filled one in a diesel generator and then was assigned to the exhaust pipe a simple sheet of white paper.

1 hour on a standard diesel fuel, and

1 hour on diesel fuel that has been processed by module TRGA

No philosophy - only objective photos

[1 hour on a standard diesel fuel](#)





1 hour on diesel fuel that has been processed by module TRGA

Выхлоп НЕстандартного дизельного топлива

[www.afuelsystems.com](http://www.afuelsystems.com)

[www.afuelsystems.com/russia/trga/sdt-6.html](http://www.afuelsystems.com/russia/trga/sdt-6.html)



Let's stop smile move to serious things... [work on a standard diesel fuel](#)





work on a standard diesel fuel

[www.afuelsystems.com](http://www.afuelsystems.com)





on diesel fuel that has been processed by module TRGA

[www.afuelsystems.com](http://www.afuelsystems.com)



[www.afuelsystems.com](http://www.afuelsystems.com)





**Show next serious thing Object - Russia asphalt plant.**



**Smoke from the asphalt furnace with installed and just turned on homogenizer TRGA.**





**In the background is a similar plant for the production of asphalt.**

**Design of installation - Germany. Manufacturer - China.**

**Fuel - the same. The smoke from the chimney – black.**



**Comparative photos**



In this furnace was installed with a nozzle diameter of 4 mm. Trying to reduce the diameter of the nozzle hole led to a decrease in temperature in the furnace and the destruction of the technological regime

After installing the module for training fuel oil TRGA, we decided to try to reduce the diameter of the hole in the nozzle. The diameters of the new and old nozzles







[www.afuelsystems.com](http://www.afuelsystems.com)

**Burning in furnace and the smoke from the chimney after replacing the nozzle.  
The new nozzle provides maintenance the required temperature in the furnace.**



[www.afuelsystems.com](http://www.afuelsystems.com)






**The new nozzle provides maintenance the required temperature in the furnace.**



**After adjustment the quantity of air,  
the smoke from the chimney is now even lighter.**



## Comparative photos

 com	 com
<b>with TRGA</b>	<b>without TRGA</b>
 www.afuelsystems.com	 www.afuelsystems.com
<b>with the reduced nozzle</b>	<b>after additional adjustment of air</b>
<a href="http://www.afuelsystems.com/ru/trga/s117.html">www.afuelsystems.com/ru/trga/s117.html</a>	<a href="http://youtu.be/vrG9K0aQb5M">http://youtu.be/vrG9K0aQb5M</a>

**Show next serious thing -  
fuel economy and ecology on ship engines**

**result - [http://bimont.si/en/Fuel\\_Treatment.html](http://bimont.si/en/Fuel_Treatment.html)**

**below - feedback and comparative photographs**

## review and summary of the test module TRGA ship. Belgium 2012

### 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
<b>The main observed effects</b>				
<b>Flue gas temperature St. (C)</b>	325	356	353	<b>368</b>
	326	356	347	<b>370</b>
	337	357	353	<b>370</b>
<b>Level CO</b>	100%	- 3.8 – 6.4 % -5.27 – 6%	-6.47 – 10.39%	<b><u>-10 – 14.97 %</u></b> <b><u>-12.34 – 13.67</u></b>
<b>Visual amount of smoke length in meters of water followed</b>	100% at startup – a lot of smoke  during the driving 30-80 meters	at startup – less for 30%  during the driving 5-40 meters	<b><u>at startup – less for 40%</u></b>  <b><u>during the driving 5 - 10 meters</u></b>	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	<b>0</b>
	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.



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.

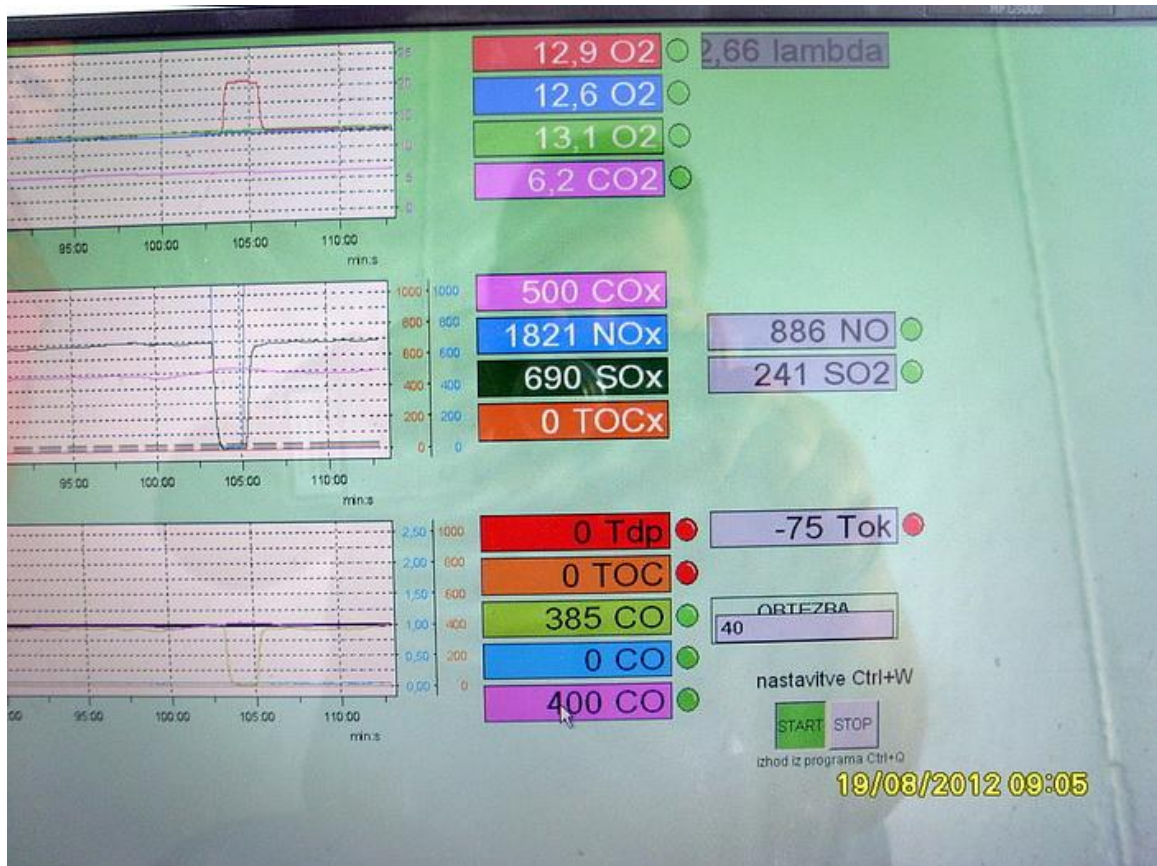
**Module TRGA in a settling tank has worked continuously from 19. 8. 2011 to 18. 10. 2012.** The module did not require continuous monitoring or any maintenance. The TRGA module did not require cleaning, adjustment, replacement of any parts or regulation.

Marine Company Transeuropa Shipping Lines d.o.o.  
(Transeuropa Ferries) Koper Slovenija  
[www.transeuropaferrries.com](http://www.transeuropaferrries.com)  
Direktor – ing. Rihard Stergulec

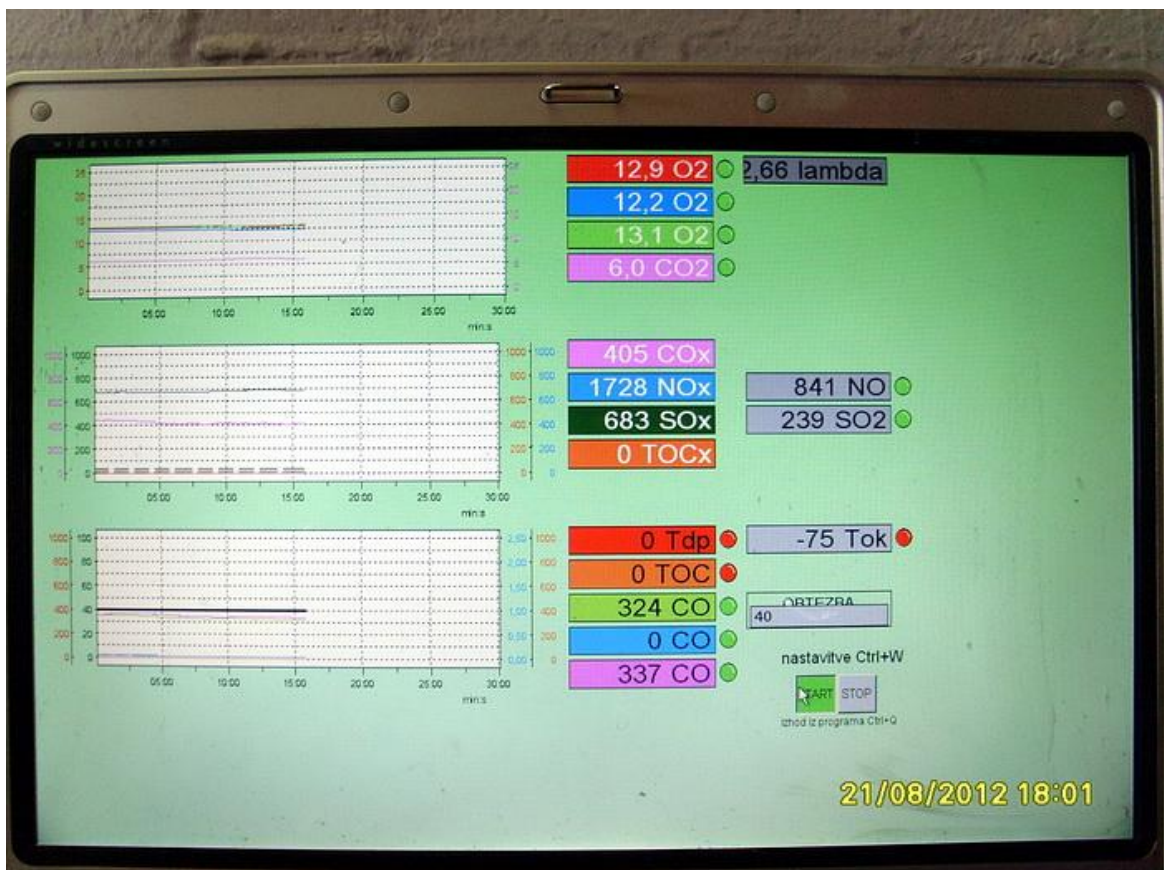




## Running the engine with standard HFO fuel



## Running the engine with HFO fuel processed with module TRGA





**working of a similar engine with standart HFO fuel**



**working of our (similar) engine on standard HFO fuel processed with module TRGA**



## 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/m <sup>3</sup>	<= 991	947.6	945.7	945.7	948.1	949.6	agree
kinematic viscosity at 50 °C	2	mm <sup>2</sup> /s	<= 180	<u>138.5</u>	<u>117.8</u>	<u>117.6</u>	129.1	136	<u>super</u>
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	<u>14.06</u>	<u>8.53</u>	<u>8.18</u>	<u>8.19</u>	<u>7.63</u>	<u>super</u>
flow point	8	°C	<= 30	<u>+30</u>	<u>+24</u>	<u>+24</u>	+21	+24	<u>super</u>
amount of water	9	% v/v	<= 0.50	0.1	0.05	0.05	<u>3</u>	<u>5.6</u>	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	<u>125</u>	<u>122</u>	<u>120</u>	<u>115</u>	<u>112</u>	<u>super</u>
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	



### Legend for understanding

0. A sample of the initial fuel.

1 - Fuel after the first stage of processing on the device TRGA - without any additives.

2. Fuel after the second stage of processing on the device TRGA - without any additives.

3. Fuel processed with the addition of 3% water.

 <b>INDUSTRIJA NAFTI d.d.</b> Rafinerija i marketing Sektor Rafinerija nafte Rijeka Kontrola kvalitete	<b>ISPITNO IZVJEŠĆE</b>	<b>BROJ:</b> 27/2013 - RN RIJEKA
		Broj zapisa: 50001193- /13
<b>HRN EN ISO/IEC 17025</b>	Kontrola kvalitete (Laboratorij) je akreditiran od HAA prema zahtjevima norme HRN EN ISO/IEC 17025 za uzorkovanje i ispitivanje značajki nafte, naftnih proizvoda te ispitivanje odabranih svojstava zaujlenog otpada, tehnoloških i otpadnih voda. Akreditacija važi za postupke navedene u prilogu Potvrdi o akreditaciji HAA. Metode ispitivanja iz područja akreditacije označene su znakom Q.	17025-HAA 

Rijeka, 22.02.2013

<b>Naručitelj</b> INA d.d., Sektor Rafinerija nafte Rijeka Urinj bb, 51221 Kostrena	<b>Datum zaprimanja:</b> 21.02.2013
	<b>Datum ispitivanja:</b> 22.02.2013
<b>Uzorak:</b> 27/2013	<b>Br. narudžbenice:</b> <a href="http://www.afuelsystems.com">www.afuelsystems.com</a>
<b>Vrsta uzorka:</b> FRME 180 broj 2	<b>Opis uzorka:</b> RN RIJEKA br:2

Rezultati se odnose samo na uzorak koji se ispituje

Značajke kvalitete	Jedinice	Rezultati ispitivanja	Metoda ispitivanja	
Atmosferski tlak	kPa	100,3	Očitanje barometra	
Gustoća na 15°C	kg/m <sup>3</sup>	945,7	HRN EN ISO 3675	Q
Kinematička viskoznost na 50°C	mm <sup>2</sup> /s	117,6	HRN EN ISO 3104	
Indeks aromatičnosti (CCAI)		820	Računski	
Količina ukupnog sumpora	% m/m	1,57	HRN EN ISO 8754	Q
Točka paljenja	°C	94,0	HRN EN ISO 2719	
Ukupna količina sedimenta - starenjem	% m/m	0,04	HRN ISO 10307-2	
Količina koksnog ostatka	% m/m	8,180	HRN EN ISO 10370	
Točka tečenja	°C	(24) ?	HRN ISO 3016	



**Our team of engineers Darius Stock, Sales Director Igor Trosht ( Slovenia )**







**You think that we turned off the engine? We are in the English Channel. Andrew Ruban**

