System for save ship's fuel reduction harmful emissions increase diesel engine motor potential

All photos and diagrams in this presentation received with our equipment and belong to the author www.energy-saving-technology.com
Why am I reading this presentation?

1. **I am the owner of the ship**, which burns 25 tons of fuel a daily and **I want to save 30 tons of fuel per month**.
2. I want to use a cheaper shipboard fuel.
3. I want to stop paying for the disposal of my sludge and safely burn it in my engines.
4. I want to increase or maintain service life of my engine.
5. I want to reduce the amount of smoke from the chimneys of my ship.
6. I am not the owner of the ship, but **I am marine officer** or superintendent and I want to be useful to the ship-owner and make a career in his company.
7. I am not the owner of the ship or chief engineer, but **I want to be your partner** in the sale, installation or production of fuel-saving systems on ships.

All we've been looking for a **reliable, naval system of preparation and economy fuel**, which really tested long-term exploitation, among countless declarations and fantastic promises of miraculous fuel economy of 10-20-30%.

**We are interested** in not only the purchase of equipment, but also **installed** it on my ship **package certificates, training, service, reliability and long-lasting effect**.

Clear explanation of why and how it works - below
Wind energy ... We have forgotten these clean ships before the third world war will start ... One problem only - the wind.
Coal. Ships became faster but come smoke - an indicator of combustion efficiency and engine wear.

Since first starting the engine all problems are increasing steadily.
Liquid fuels. Ships became more faster smoke left but came sludge.

Fuel worse, engines more critical to the fuel separator discards in sludge 2-4% of fuel.
short technical proposal

We offer install on your ship - the system of pretreatment ship's fuel (save ship's fuel) - PSSF (pretreatment system of ship fuel) produced by BIMONT d.o.o. (SLO), which would provide the following results:

1. An increase speed of fuel combustion in engines and boilers, which will reduce harmful emissions and the amount of smoke up to 30%, reduce specific fuel consumption and provide fuel economy from 2% to 4%.
2. Reduced fuel viscosity from 10 to 15%, it can use the cheaper fuels.
3. An increase lifetime for separator and engine in 2 times, which reduces the amount of particulate Al, Si up to 30%, and reducing the amount of coke in the treated fuel to 40%
4. Reducing the amount of fuel that cast separator to sludge tank up to 95%.
5. Reduction size and quantity of particles of aluminum and silicon in the sediment residual ship's fuel RME 180

The main difference PSSF:
= high reliability, long-term effective work with heavy fuel oil, high-quality processing of different fuels.
= possibility of execution scheduled operations by ship's crew without calling customer service.
= experience of successful exploitation for 5 years and the presence of some positive objective analysis and testing.
Evidentiary facts 1. **Reliability** - before we offered you PSSF system, we tested it practically to the territories of Russia, Ukraine, Belarus, Syria, in continuous operation for 2-3 years with heavy fuel oils, in conditions of poor filtration of high viscosity and content of abrasive particles, resins, asphaltenes suspension. The similar German equipment breaks down after 3-4 months and cannot be serviced through the board crew.

It worked on buffer tank  28.11.2011–03.08.2012, 15.08.2013-01.04.2013
It worked on settling tank  16.08.2013-01.04.2013
The results of a review sheet 1

- Increase the exhaust gas temperature: + 40 °C
- Reduction CO: - 10-15%
- Reducing the length of the plume: - 30-600%
- Reducing the amount of fuel in the sludge tank: - 95-100%

Documentation:


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.transeuropaferries.com
Direktor – ing. Rhard Stergule

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**The result of a review sheet 2**

- parallel heating buffer tank to 85-90 C
- parallel heating settling tank at 5 C for one treatment cycle
- reducing the viscosity of the fuel by 10-15%
Examples of the fuel processing by system PSSF - fuel oil M100 and coal tar pitch

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 the fuel processing by system PSSF - coal tar and water-coal fuel
Examples of the fuel processing by system PSSF - fuel IFO-180

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

fuel ships IFO-180, after processing with TRGA, focal ratio - 60
The appearance of a "simple, more reliable and more cost-effective device for the treatment of "bad i.e. cheaper ship's fuel"
The homogenizer was operated perfectly; the pressure and temperature differences were expected in the required limits. When you switch to the homogenized fuel, the engine and the whole system were warm faster and achieved a stable state, which indicates a higher effective power.

2. They were not able to measure directly a fuel consumption, because this would require the installation of flow meters supplied and return fuel to the plant. Also, effective engine power or torque on the shaft could not be measured directly and therefore, is needed a different conclusion about the specific fuel consumption: the increase in the rotational speed of the propeller in the same quantity of fuel injected (index = const.) From 490 to 510 min⁻¹, 1.4 %. From the square propeller this situation is not improved.
8. for how long the effect of homogenization is visible, after the fuel is returned into the tank.
9. what kind of savings of the power can be expected in comparison with a conventional rotary homogenizers

Measurements of the pilot project were carefully performed, they tried to catch as more similar sea conditions in the comparison between the normal and the treated fuel. With some reasoning we can answer all questions as follows:

1. The homogenizer was operated perfectly, the pressure and temperature differences were expected in the required limits. When you switch to the homogenized fuel the engine and the whole system were warm faster and achieved sooner a stable state, which indicates a higher effective power.

2. They were not able to measure directly a fuel consumption, because this would require the installation of flow meters supplied and return fuel to the plant. Also effective engine power or torque on the shaft could not be measured directly and therefore is needed a different conclusion about the specific fuel consumption: the increase in the rotational speed of the propeller in the same quantity of fuel injected (index = const.) From 490 to 610 min⁻¹. 4 %. From the square propeller characteristics (typical graph in the appendix) shows that this means at least 8% more power and therefore 8% lower specific fuel consumption. If the direct measurement of fuel consumption and the effective power of this has been confirmed, this is an extremely positive result.

3. Measurement of exhaust emissions have shown that contrary to expectation, despite the intense combustion and more powerful oxides of nitrogen do not increase but even slightly reduced. Similarly is with the monoxide.

4. Measurements of smoke directly in these experiments, on the ship has not been measured, but the comparative photographs were included in the report, which are showing us the significantly less black smoke in the homogenised fuel. Similarly, as was also found in boiler rooms (they were included in the report a comparison of smoke after Bosch similar procedure).

5. The sulfur in the fuel cannot disappear, because it is a basic element. Can be only binded differently. In the emissions with TRGA- 3G treated fuels are measured at slightly lower levels, but this can only be attributed to measurement methods, which detect less of them. It may be somewhat easier to sulfur

"Gains increasing the rotational speed of the shaft was 1.4%, this means an increase in energy by 8% or decrease of specific consumption by 8%.

Change smoke opacity contradicts the expectation of increasing combustion intensity - smoke has declined, as have decreased the CO and NOx level.

proved a sure decline of smoke "

Page 4
Accompanying comparative photographs under the microscope between the original and processed fuel show a decrease in the particle size 10-20 times ...

the effect of treatment lasts a few hours ...

TRGA-3G device requires less energy and uses standard pumps ... and operation of this system is not expected any hidden problems

page 5
Reducing the amount of particulate matter, tars and the other impurities in the fuel leads to:

1. more efficient fuel combustion and reduce fuel consumption
2. reduces the amount of unburned residues and the deposits in the engine and heat exchanger that increases the average efficiency power plant in the period between repairs or cleaning.
3. Reduces the amount of smoke and emissions

The company "Saacke" with Chinese universities in Jamey experimentally proven

- “increase the efficiency of the boiler due to crushing fuel = 303 kJ / kg “

www.afuelsystems.com/ru/trg/a/s12.html
The residue fuel on filter

results of research
IFO180, processed by
PSSF system, 2013

Laboratory group
INA, Zagreb, Croatia.

Sample left –
the original fuel

Sample middle -
processed fuel

Sample right-
fuel after 3 times
treatment
The residue fuel on filter
1. The sample on the left—the original fuel laboratory filter is completely clogged fuel residues.

2. Sample right-to-fuel processing after 3 times Laboratory filter is clean—in the photo—visible filter structure and only a few bits ...

All photos were taken with an electron microscope in central laboratory INA group, Zagreb, Croatia. Increase of 500 times.
Slika 3. SEM mikrofotografija uzorka "0", povećanje 500x
Slika 5. SEM mikrofotografija uzorka "5", povećanje 500x
Separation of sediments from HFO – hot filtration of fuel with chloroform on a nitrocellulose filter 0,45μm

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mass of particles on the filter (mg on kg of HFO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.8 mg/kg</td>
</tr>
<tr>
<td>2</td>
<td>7.7 mg/kg</td>
</tr>
<tr>
<td>5</td>
<td>6.1 mg/kg</td>
</tr>
</tbody>
</table>

Reduced by "- 38%"

The official conclusion of the laboratory INA group, Zagreb, Croatia

After the filtration process 3 dry residual on the filter paper were obtained (Photo 2), those are analyzed with electronic microscope. Samples were steam processed with gold, and then analyzed using scanning electronic microscope JEOL JSM-6510 LV. Several micro photography were taken.
The EDX analysis is maiden (identification of peaks of the energy spectrum of X-radiation) for individual particles using Oxford INCA X-act.

Samples of treated fuel RME 180, 7-15 days after treatment, the result - reduced viscosity at “-10%”

Other indicators are interesting, namely:

1. Lowering pour point from 15 to 6 and 9 C.

2. Increase in calorific value from 40.7 up to 41.4 MJ / kg

3. Reducing flash point to 116.5 from 128.5 degrees.

4. Reduction in the amount of trapped particles of aluminum and silicon in 2 times.

Laboratory Ljubljana, Slovenia, 2013.
The effect of increased caloric content indicate tests from Russian Railways 2013. Original fuel has 2.8% water content, processed fuel oil - 6.9%, but the calorie content is almost equal. Recalculation shows an increase caloric content by 4.29%. ...
PSSF system crushes even fibrous particles in the ship's fuel ...

Photos - Laboratory INA, Zagreb, Croatia. Increase 5000 and 4000 times. Electron microscope.

All details and contacts of laboratory can be provided.

Before and after…
"The influence of contamination of diesel fuel on the life of the plunger pair (fuel pump) of diesel engine"

Lifetime diesel engine in the automotive diesel fuel:

1. unfiltered = 100%
2. in filtering (or grinding particles) up to 5-7 microns. = 850%

Fineness particle by system PSSF = 4-5 microns.
improved combustion and fuel economy 4.1% on the boiler
Burning black oil
standard

Burning black oil after processing
Photos –

Visual changes in smoke opacity before and after switch PSSF on the ship (Ostend - Ramsgate August 2012)
Photos - work system PSSF on the ship in 2012 (Ostend - Ramsgate) engines are running at full speed - no smoke.
Photos - work system PSSF on the ship in 2012 (Ostend - Ramsgate)

engines are running at full speed - no smoke. compare the date and time with the previous photo
two of the same ship, the same company, on the same fuel on a collision course. "Our" ship below

Photos - work system PSSF on the ship in 2012 (Ostend - Ramsgate)

difference in smoke ...
Left - treated fuel

Below - the original fuel

Photos - work system PSSF on the ship in 2012 (Ostend - Ramsgate)

difference readings on different fuels
PSSF system is mounted on a ship and can be serviced by marine crew without calling a manufacturer of equipment.

Photos - installation of PSSF on the ship in 2012 (Ostend - Ramsgate).

Measuring devices during testing.
PSSF system is mounted on a ship in a few variants using standard certified pumps.

we have all the necessary certificates for installations on ships.
a bit of the economy

on-board system to improve fuel properties PSSF (pretreatment system of ship fuel) on the tests carried showed out:

1. **reduce harmful emissions and the amount of smoke up to 30%**, reduce specific fuel consumption and provide **fuel economy from 2% to 4%**. Direct minimum fuel economy on the ship's diesel engines was 415 liters per day (daily rate from 20 to 22 c. m. of fuel.

2. decrease the viscosity of the fuel up to 15%, without the use of additives, which reduces the cost of purchased fuel.

3. **Reducing the amount of fuel that cast separator to sludge tank up to 95%**. And consequently, reducing the cost of his monthly utilization.

and the organization

We have the necessary permits for the construction and installation of PSSF on all ships from London's Lloyd, just preparing documents on the transfer our equipment in the category of mandatory equipment for installed on all ships.

The main difference PSSF: high reliability, long-term effective work with heavy fuel oil, high-quality processing of different fuels, possibility maintenance and repair by ship's crew, experience of successful exploitation for 5 years in extreme conditions
The main differences from the existing analogue

System to improve fuel properties **PSSF** - provide the same **degree of fuel dispersion**, like most oil-fired rotary homogenizer – **5-4 microns**.

**Low weight** 110-140 kg, unlike the rotor (200-350 kg). Substantial savings in transportation and installation costs.

**Low power consumption**, allows to work from a standard pump without overload. The minimum energy consumption when the optional pump - **0.5-1 kW h per 1 ton**.

Can be installed in the supply line to the nozzle black oil boiler.

It does not contain seals and rotating elements (except the pump) and safe. The pressure range **2-40 atm**. Temperature range **40-250 degrees**. High crushing effect.

Ability to work aggressive fuels - Coke, jet fuel, various fuel blends may be used for blending biodiesel components comprising methanol and alkali.
Awards and Certificates

- 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 of the 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

- Diploma for the participation in the exhibition Energy Efficiency, 2011, Ukraine
- Lloyd's Certificate for the right execution of repair and installation work on the ships of any class, Slovenia, 2012

- Certificate of the Maritime Register of Ukraine on the use TRGA on marine engines and boiler installations, 2011
- Certificate of compliance with the Russian Federation on a series of devices TRGA, the right to use TRGA in high-risk industrial objects of Russia, Kazakhstan, Belarus, 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
1. PSSF system tested long-term operation at more than 100 sites in over 6 years in the most extreme conditions on the light and heavy fuels and fuel blends
2. PSSF system was laboratory tested by certified laboratories in Slovenia and Croatia.
3. PSSF system successfully passed a test of reliability during the 12-month operation of the ship.
4. PSSF system has a positive opinion from marine department of the university in Ljubljana, Slovenia
5. PSSF system has CE certified and ends its additional certification in English Lloyd.
7. PSSF system is made in Slovenia by BIMONT d.o.o. which has all the necessary certificates to install this system on any ships.

8. The official conclusion of the restructuring of fuel.
9. The official report on the full tests on the ship.
10. You want to be our partner?
11. You want to be our customer?

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