An example of a typical offers system for economy heavy fuel oil on industrial boilers and furnaces.

1. A bit info - on 01.10. In 2016 we installed 150 such projects (some examples here). Our range of HFO direct economy from 2.44 up to 4.1% (1). In some cases, more (2). One year warranty. Average operating time 2-3 years, full (our experience), 2-5 years (3).

Cooperation method - equipment rent for whole working term by a single or parts payment. An unconditional replacement during the warranty period. Repair under prime cost during the life cycle. Manufacture time- 20-45 days. Delivery time- 5-15 days. Time for install- 3-5 days.

Calculating initial (direct) direct fuel economy. (for example only)

<table>
<thead>
<tr>
<th>APPROXIMATE SAVINGS BY INSTALLING ONE TRGA UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNICAL CHARACTERISTICS BOILER</td>
</tr>
<tr>
<td>CALORIFIC POWER BOILER</td>
</tr>
<tr>
<td>CALORIFIC POWER FUEL OIL No. 6</td>
</tr>
<tr>
<td>CALORIFIC POWER REQUIRED</td>
</tr>
<tr>
<td>BOILER</td>
</tr>
<tr>
<td>Price per gallon Fuel Oil No. 6</td>
</tr>
<tr>
<td>Working Regime</td>
</tr>
<tr>
<td>consumption rate Fuel Oil No. 6</td>
</tr>
<tr>
<td>Working Cost</td>
</tr>
<tr>
<td>Cost of one (1) TRGA System - USD:</td>
</tr>
<tr>
<td>Time to Recuperate the Investment on the TRGA Unit:</td>
</tr>
<tr>
<td>Due to Savings</td>
</tr>
</tbody>
</table>

2. Other benefits:
- Reducing the amount of smoke;
- reducing clogging and wear atomizers and pumps;
- Reducing the amount and sizes of solids in the fuel;
- Reducing the amount of unburned residues on heat exchangers, maintaining maximum efficiency and reducing the cost of boiler cleaning;
- Reducing fuel viscosity;
- reduction in separation and settling of the fuel in the tank;
- Safe disposal of the condensate water by its safe combustion with fuel;
- You can use cheaper fuel and pay less fines for emissions.

Notes
(1) for black oil type M100 or HFO No 6 and without any additives, but our systems are compatible with additives using).
(2) - in special cases requiring professional explanations.
(3) - it depends on the subject and the mode of operation.
Maximum use of local materials, labor, equipment. 
Work with customers - algorithm, documentation and support.
Payback period - no more than 6 months.

If you want get the best price and reduced payback time for our system, please fill in our questionnaire and answer any additional questions. Perhaps we use some your existing equipment (pumps, pipes) and your staff to reduce your start-up costs. Questionnaire for boiler here, other (for ships, industrial generators, etc.) will be sent on request.

Please contact www.energy-saving-technology.com/en/contacts-en.html or direct 5183898@ukr.net Andrew Ruban

level 1 - for managers and owners - end
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level 2 - for technicians - start
Some examples in pictures.

Ship fuel IFO-180 before and after treatment on our systems (comparison chart). On a more viscous fuels - the difference will be even more.

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

<table>
<thead>
<tr>
<th>shipboard fuel</th>
<th>N</th>
<th>formal standard</th>
<th>original sample</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>density at 15 °C</td>
<td>1 kg/m³</td>
<td>&lt;= 991</td>
<td>947.6</td>
<td>945.7</td>
<td>945.7</td>
<td>948.1</td>
<td>949.6</td>
<td>agree</td>
</tr>
<tr>
<td>kinematic viscosity at 50 °C</td>
<td>2 mm²/s</td>
<td>&lt;= 180</td>
<td>138.5</td>
<td>117.8</td>
<td>117.6</td>
<td>129.1</td>
<td>136</td>
<td>super</td>
</tr>
<tr>
<td>aromaticity index</td>
<td>3 (CCAI)</td>
<td>&lt;= 860</td>
<td>820</td>
<td>820</td>
<td>820</td>
<td>821</td>
<td>822</td>
<td>agree</td>
</tr>
<tr>
<td>total sulfur content</td>
<td>4 % m/m</td>
<td>&lt;= 4.5</td>
<td>1.59</td>
<td>1.56</td>
<td>1.57</td>
<td>1.54</td>
<td>1.49</td>
<td>agree</td>
</tr>
<tr>
<td>flash-point</td>
<td>5 °C</td>
<td>&gt;= 60</td>
<td>92.0</td>
<td>94</td>
<td>94</td>
<td>&gt; 100</td>
<td>&gt; 100</td>
<td>*</td>
</tr>
<tr>
<td>amount of sediment</td>
<td>6 % m/m</td>
<td>&lt;= 0.10</td>
<td>0.07</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td>0.04</td>
<td>**</td>
</tr>
<tr>
<td>amount of coke residue</td>
<td>7 % m/m</td>
<td>&lt;= 15.0</td>
<td>14.06</td>
<td>8.53</td>
<td>8.18</td>
<td>8.19</td>
<td>7.63</td>
<td>super</td>
</tr>
<tr>
<td>flow point</td>
<td>8 °C</td>
<td>&lt;= 30</td>
<td>+30</td>
<td>+24</td>
<td>+24</td>
<td>+21</td>
<td>+24</td>
<td>super</td>
</tr>
<tr>
<td>amount of water</td>
<td>9 % m/v</td>
<td>&lt;= 0.50</td>
<td>0.1</td>
<td>0.05</td>
<td>0.05</td>
<td>3</td>
<td>5.6</td>
<td>agree</td>
</tr>
<tr>
<td>amount of ash</td>
<td>10 % m/m</td>
<td>&lt;= 0.07</td>
<td>0.04</td>
<td>0.04</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>agree</td>
</tr>
<tr>
<td>amount of vanadium</td>
<td>11 mg/kg</td>
<td>&lt;= 200</td>
<td>125</td>
<td>122</td>
<td>120</td>
<td>115</td>
<td>112</td>
<td>super</td>
</tr>
<tr>
<td>amount of sodium</td>
<td>12 mg/kg</td>
<td>&lt;= 50</td>
<td>4.93</td>
<td>7.25</td>
<td>7.85</td>
<td>5.72</td>
<td>5.34</td>
<td>***</td>
</tr>
<tr>
<td>amount of Al + Si</td>
<td>13 mg/kg</td>
<td>&lt;= 50</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>agree</td>
</tr>
<tr>
<td>energy value</td>
<td>14 MJ/kg</td>
<td>--</td>
<td>--</td>
<td>41.02</td>
<td>41.02</td>
<td>38.7</td>
<td>38.88</td>
<td>agree</td>
</tr>
</tbody>
</table>

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.
No problem if your fuel is highly viscous, we have practical experience with such fuel. Our unit reduces the viscosity. It lengthens lifetime of pumps, nozzles, requires less heating fuel before atomizers. Speed of clogging of heat exchangers - minimum.

Look the difference

1. **Comparative examples** burning heavy fuel oil.
2. Example - **dispersion and homogenization** of heavy fuels.
3. **Some diagrams**... It gives fuel economy 2.44-4.1%.

Heavy viscous black oil (M100 type) high-quality, original, water content of 4%, **prior to treatment**.

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**standard black oil M-100**

**increase of 150 times**

**diameter of the hair 90 microns**

[www.afuelsystems.com](http://www.afuelsystems.com)
Heavy viscous black oil (M100 type) high-quality, original, water content of 4%, after treatment by TRGA homogenizer.
change in the amount of carbon on the heat exchangers after 2 months of HFO burning without use of our TRGA-unit and after installed TRGA-unit
3. Information block for professionals.

3.1 Open results are summarized in the presentation, and a lot of these presentations is here.  

3.2 Many examples and photos are here www.afuelsystems.com/ru/trga/trga-mz.html

3.3 We can not show major customers this review from Kazakhstan. Although the technical level of professionals in Kazakhstan is high, but "fuel savings of 18%," they wrote it - it's fantastic.  
www.afuelsystems.com/ru/trga/s64.html  
www.afuelsystems.com/foto/history/KAZ_USHTOBE/ot_1.gif  
www.afuelsystems.com/foto/history/KAZ_USHTOBE/ot_2.gif

Another review from Kazakhstan. "Fuel savings of 20%," they wrote it - it's fantastic too,  
www.afuelsystems.com/ru/trga/s59.html  
www.afuelsystems.com/foto/history/kaz_3/kaz_30.gif

3.4 A good report from Ukraine. Professional and serious. There's nothing about the economy but there honestly describe many effects. And it is interesting for experts.  
www.afuelsystems.com/ru/trga/s33.html  
www.afuelsystems.com/foto/history/zp-1/zap-otziv-1.jpg


3.6 It Is worth note -- fuel Savings 2.83% - www.afuelsystems.com/ru/trga/s196.html Vladivostok,

3.7 System for utilization (and thus fuel economy) bilge water from Commercial Port of Mariupol. Feedback from 2011 and 2014.  
www.afuelsystems.com/ru/trga/s41.html  
www.afuelsystems.com/ru/trga/s168.html

3.8 Four reliable tests that were conducted by certified companies (Institution and laboratories). Direct fuel economy. Those tests, which were conducted in the EU and Russian economies have shown a range of 2.44 - 4.1%. Without any additives, without adding water or something else ...

1. Croatia - heating light oil from refinery RIJEKA (20 km.). German boilers LOSS, Italian jets, experts have done tests Technological Institute of Rijeka, part of which experts from the refinery. Savings fuel is 3.7% - report www.afuelsystems.com/arhdoc/test-hov-rieka.pdf significant reduction CO.

2. Serbia - dry black oil and fuel oil with water (10%), the tests did experts from the institute Nikola Tesla, Belgrade, profile laboratory, which serves the entire heating equipment in Serbia. Savings fuel is 2.66% without addition of water, with the water still more… report. www.afuelsystems.com/ru/trga/v2.html  

3. Guinea, more specifically Alumina Plant Corporation RUSAL. Black oil without additives and without water, such as SLURRY, and solid particles. Duration of test 2 months with a stop, cleaning and washing heat exchangers for each test cycle. Measurement accuracy APCS 1 gram of fuel per 1 ton of steam.
The first test – fuel saving 4.1%. report  www.energy-saving-technology.com/test/rsal-test-noname.pdf  This is the Internet version can send scans to the seals.

The second test - save 3%  www.afuelsystems.com/ru/trga/s56.html

The third test - Work 2 identical boilers with fuel from one day tank. One boiler is equipped with a homogenizer TRGA, the other does not. The difference in the specific consumption via presence of unburnt residues on heat exchangers, 2 months later – is 9%.  www.afuelsystems.com/ru/trga/s71.html

After that this company bought our systems for their enterprises in Krasnoyarsk -  www.afuelsystems.com/ru/trga/s57.html  (German slotted furnace) and in Jamaica  (where now work 4 homogenizer at the same time  www.afuelsystems.com/ru/trga/s178.html  www.afuelsystems.com/ru/trga/s147.html  ) Unfortunately, the technical data is forbidden to transfer or publication.


3.12 Finally an excellent report - two years operation with 3 TRGA series homogenizers on bunker oil terminal in Odessa, Ukraine. It is very interesting.  www.energy-saving-technology.com/documentation/test_odessa_full_ru.pdf

In Odessa we got - fuel economy, complete smoke reduction, and long-term safe recycling of residues watered sludge and sediment, as this tank farm and from the trade port of Odessa. All documented, photos and movies.

In addition, four oil-fired boiler worked for two years between the heat exchanger cleaning. Cleaning was carried out “by tapping surfaces with a hammer “, followed by removal of soot broom flown away ... It shows the degree of inhibiting the formation of a layer of unburned fuel on the surfaces of heat and the nature of deposits - fragile soot.

Treatment itself was made “tapping of a hammer surfaces”, followed by removal of soot broom flown away ... It shows the degree of inhibiting formation of a layer of unburned fuel on the heat surfaces and shows the nature of deposits - fragile soot.

There are beautiful photos and movies, how the character the mazut combustion (more precisely watered mazut from the lower horizons of supply tank) with turned off and on TRGA homogenizer before the nozzle -  www.afuelsystems.com/ru/trga/s99.html

As well as research, how increases cleaning interval for atomizers and reduced specific fuel consumption -  www.afuelsystems.com/ru/trga/s196.html

There are many analyzes from the Russian Federation - how changing the fuel caloric (despite the fuel watering).  www.afuelsystems.com/ru/trga/s144.html

Why the black oil, after treatment with TRGA homogenizer, burn better?

Let's start with the photo that explains a lot.
Fuel black oil M100 - before and after treatment photos.

Coal tar pitch, Kazakhstan - before and after treatment photos.
www.afuelsystems.com/ru/trga/s22.html

Kazakhstan, 2010-11. Type of fuel - coal tar pitch, density of 1.07, increased viscosity, ash and tar.
12-24 months of operation. 4 installation.

Brief results - stable burning fuel, reduction of carbon deposits on heat exchangers, reduction nozzles
clogged time, fuel economy, reducing the temperature of heating fuels, the total elimination of smoke
from the chimney. Photos and reviews -
www.afuelsystems.com/ru/trga/s64.html  www.afuelsystems.com/ru/trga/s75.html

Water-coal fuel (test) - www.afuelsystems.com/ru/trga/s52.html

Sludge oil from open storage - www.afuelsystems.com/ru/trga/s198.html
www.afuelsystems.com/ru/trga/s158.html
www.afuelsystems.com/ru/trga/s159.html - pictures and movies ...

And here is report about on the service life with work for sludge -
after a year www.afuelsystems.com/arhdoc/trga_otziv_sp.pdf
after three years of work www.afuelsystems.com/ru/trga/s199.html
Our experience with heavy and high viscosity black oil in Syria.
www.afuelsystems.com/ru/trga/s114.html
Pay attention to the temperature of heating mazut before nozzles -
www.afuelsystems.com/ru/trga/s106.html
www.afuelsystems.com/ru/trga/s106_1.html

How it flared up on the brick and how it burns ....
www.afuelsystems.com/foto/sir_5/f_gor_obr_1.AVI
Russian oil sludge differs little from the black oil quality in Syria or Latin America ...

Now look at the difference of fuel oil burning in the boiler
(before and after using of our TRGA systems)
black oil fuel, slurri fuel burning without using TRGA activator of burning

black oil fuel, slurri fuel burning with installed activator TRGA
Comparative films changes in the mazut combustion in the boiler - the original, after treatment, after treatment with water in the form of an emulsion.


This fuel - worse than tar or sludge ... but it burning.

Reducing the solids of resins, asphaltene and other impurities in the fuel oil results in a more combustion efficiency and reduces the amount of unburned residues.

The company's specialists "Saacke" together with Chinese University (Jimay) spent experimental research - "the reduction of heat loss from the mechanical incomplete combustion and an increase in boiler efficiency www.afuelsystems.com/ru/trga/s12.html

In this way, dear colleagues, we clearly - surely can guarantee a significant improvement in the combustion of heavy and / or watered mazut on your boilers or furnaces. It's just a routine, which we have done, are doing and will do well and efficiently.


If necessary - we will send in word format. Then, will be more questions, and then we send the technical proposal for the discussion (one or more options). After approval of our technical proposal, it will determined the nomenclature and characteristics of our equipment. The equipment wich you will have to buy add (not always but sometimes - pumps, filters, piping). If you need to installation supervision o not, contract, payment, manufacture, shipping, assembly (contract supervision or step by step instructions for installation), check, start-up, distant lifetime support.

So - if you disturbs highly viscous black oil with or without a high content of asphaltenes, coke slurry or particles, condensed water, etc. ... We will surely solve this problem. Moreover – all our experience from all prior installations and exploitation (145 on 02.02.2016) will be used in your favor.

Related topic - recycling oiled water in refinery.

Problem - in any refinery has a large amount of water that is contaminated black oil, oils and other petroleum waste. Disposal of this water - a long, expensive, energy-consuming and unproductive process.

Most refineries or discard the dirty water into the river or pay huge money for the disposal of waste.
Solving the problem - adding the water to the black oil and burning in the boiler Refinery. In this case the refinery completely eliminate their own waste disposal costs. Burning water-oil emulsions, with proper of making and using will bring additional economic and environmental effects.

Add - Fuel economy and burning flooded, low-quality fuel on the asphalt.  
https://youtu.be/HkM_wdiinvg and other films  
www.youtube.com/user/andrewrubanu

Some public documents, presentations, tests and reports  

Certificates and guarantees  

Business philosophy  
ALTERED BY
HOLMAN BOILER WORKS
INC - 1 M.A.W.P. 265 P.S.I.
3.25
Note-1. All photos, films, test results, and other documents - belong to us, made by us or by our customers using our equipment. When you find our photos on other sites - please inform us about it.

Note-2. If, after reading this document, in your head will come an idea to write us "send us your equipment for free, we will try it a few months ..." – please do not write us anything. It will mean, that you have not boiler specialists or people who can count money.

Usefull info

- Some our public documents, presentations, tests and reports
- Our channel at www.youtube.com/user/andrewrubanut ( more then 80 films )

Andrw Ruban 08.02.2016