
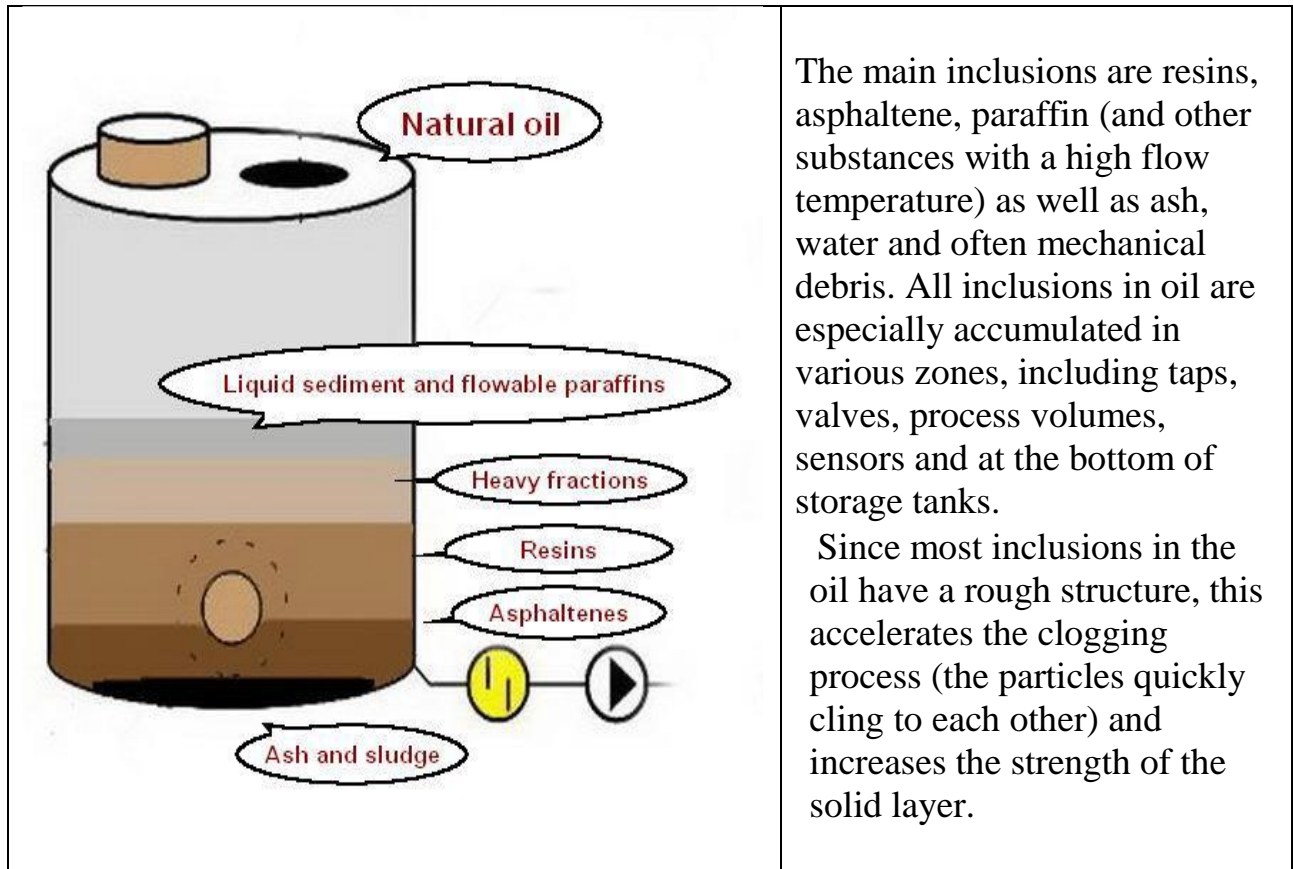


Tank bottom petroleum sludge prevention and treatment in crude oil storage vessels.

We have created a reliable device for continuous operation in the most labor-intensive petroleum products (crude oil, open-cut oil slurry, oil slurry in the tank farm and power plants), which are guaranteed to work without clogging / sticking / breakage . We have created circuit solutions that increase their efficiency. Since 2007, we have done 167 such projects in different countries of the world.

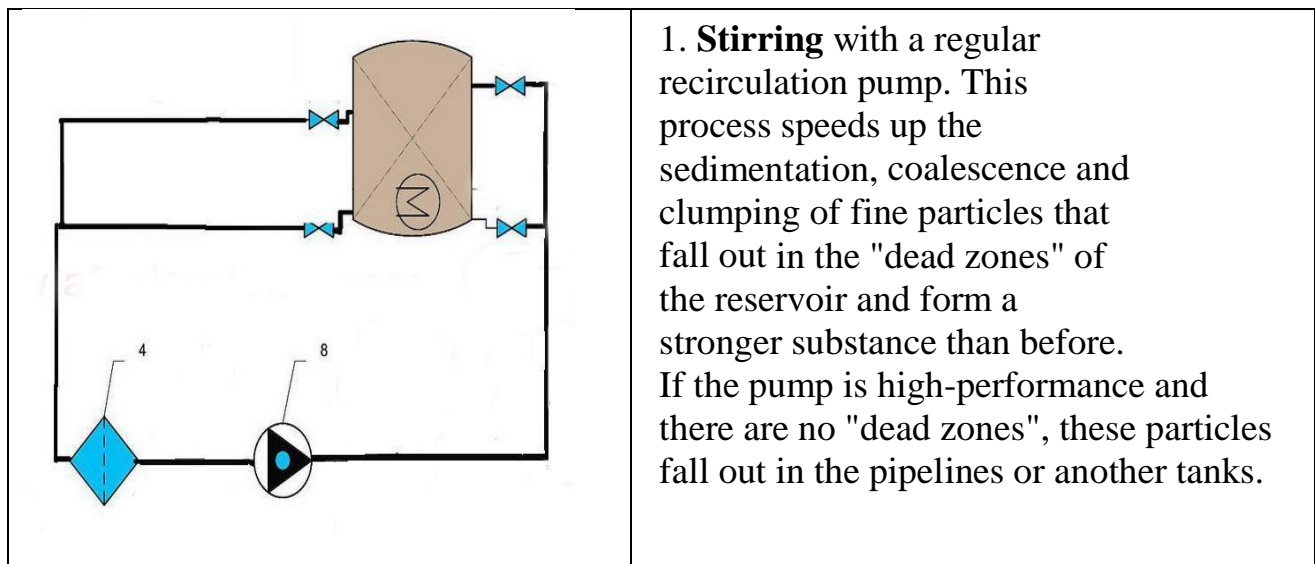
	Losses in oil storage / transit tanks	
<p style="text-align: center;">Input</p> <p style="text-align: center;">100% of crude oil</p> <p>if V (tank) = = 20 000 cubic meters</p>		<p style="text-align: center;">Output</p> <p style="text-align: center;">V(oil) – V (sludge)</p> <p>then V (sludge) = = 1000 cubic meters per year</p> <p style="text-align: center;">4-5 % losses</p>



The main inclusions are resins, asphaltene, paraffin (and other substances with a high flow temperature) as well as ash, water and often mechanical debris. All inclusions in oil are especially accumulated in various zones, including taps, valves, process volumes, sensors and at the bottom of storage tanks.

Since most inclusions in the oil have a rough structure, this accelerates the clogging process (the particles quickly cling to each other) and increases the strength of the solid layer.

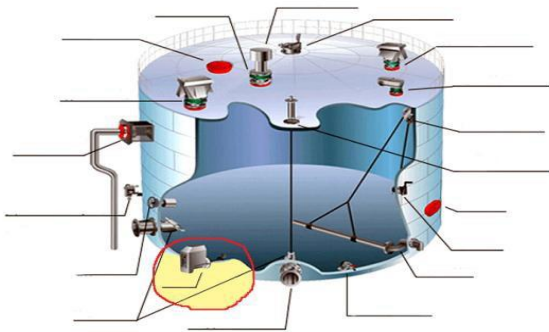
Besides tank cleaning we know today two ways how to solve this problem:



1. Stirring with a regular recirculation pump. This process speeds up the sedimentation, coalescence and clumping of fine particles that fall out in the "dead zones" of the reservoir and form a stronger substance than before. If the pump is high-performance and there are no "dead zones", these particles fall out in the pipelines or another tanks.

These processes are similar to mixing flakes of tea leaves in a glass, with stirring they will be in a suspended state, if the mixing stops, they again settle on the bottom of the glass.

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2. **Intensive mixing** with a submersible screw pumps with its own electric motor: some people say that this erodes the bottom sediments.

This process is more intense and more focused.

This process destroys large and medium particles and clumps (especially in the direction of the jet but cannot destroy small particles, resulting in the coalescence of small particles that fall out in the "dead zones" of the reservoir and form a stronger substance than before.

This process requires a lot of energy, it does not work well in medium and large tanks and must be carried out continuously. Works only for low-viscosity products.

Mixing, even intensely, does not change the size of the fine particles. So, **when these systems are turned off**, oil continues to settle. In a tank or in a pipe. Without the use of additives - quickly. With the use of additives - slowly.

It is also necessary to consider that the installation of this equipment is a complex and expensive process.

Neither the first nor the second method is intended only for mixing.

But it is not intended for grinding oil suspension - dispersion of mechanical impurities and changes fractional composition of the oil product. **Intensive mixing of tea, will never make it coffee.**

Our idea is simple – to return most of the oil components to their original composition.

An excellent illustration of mass transfer cavitation processes using which the TRGA homogenizer was built. Here, the secondary oscillation process is clearly visible, which is not carried out in most traditional designs of cavitation homogenizers in contrast to our product. The effects of cavitation on the example of the formation of a cavitation cavity by firing underwater from a Kalashnikov assault rifle.



What TRGA Homogenizer gives to sludge treatment process?

Maximum crushing, dissolution and emulsification of all fractions of paraffin and light resins. Asphaltene are destroyed significantly, with simultaneous maximum smoothing of their surface and covering with surface active substances. The process goes much faster.

The process of dispersion, dissolution and emulsification is more effective than all other processes.

This method provides factors that are fundamentally impossible in the method of simply adding additives and mixing them with a simple pump.

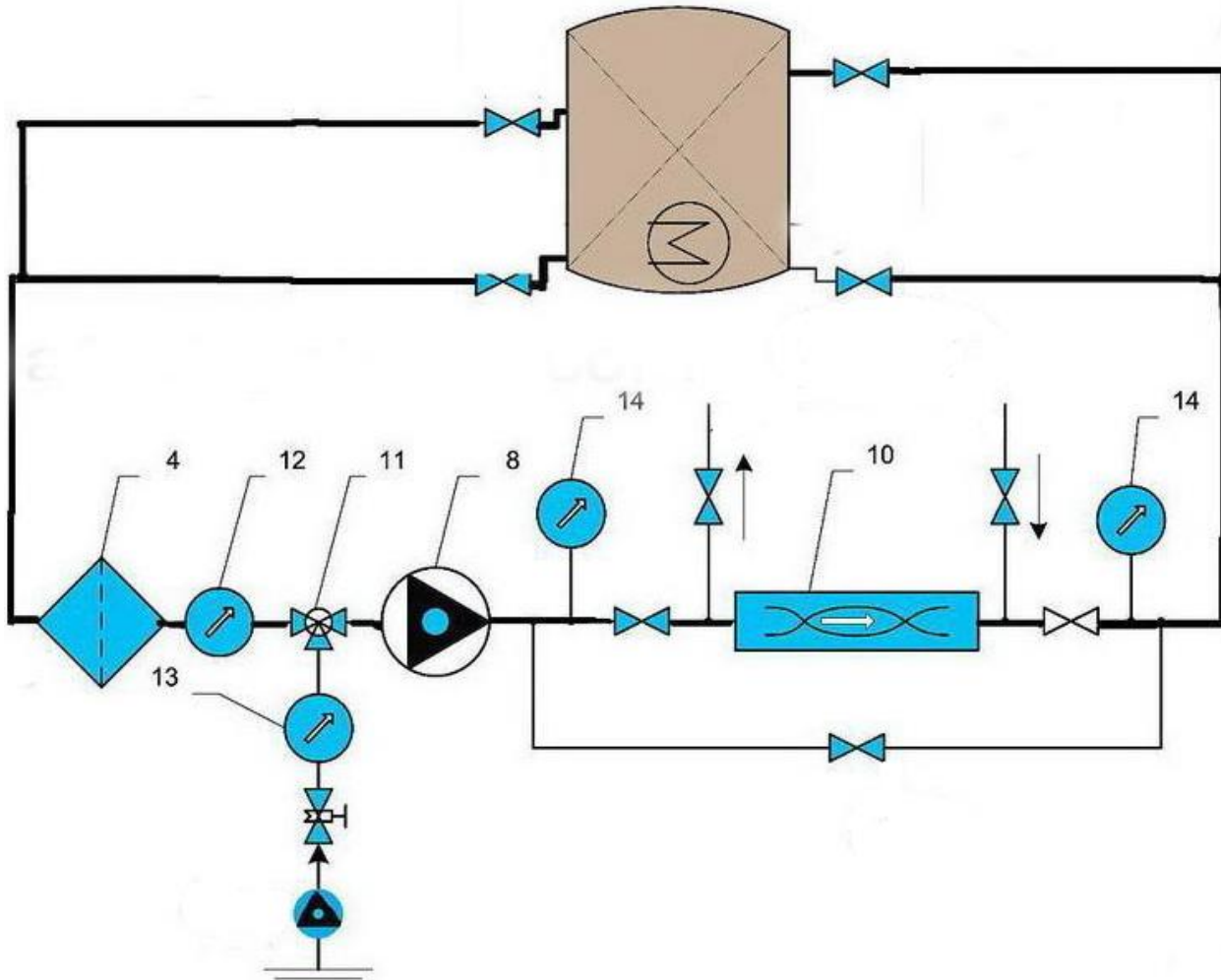
The main characteristics of this method are:

1. There is physical grinding of most soft, semi-soft and some solid (but brittle) particles. This reduces oil viscosity at low temperatures.
2. There is a maximum rounding of surfaces (smoothing of roughness's) of particles with simultaneous enveloping by own surface-active substances. This reduces oil viscosity at low temperatures.

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3. The pour point of paraffin's decreases by 20-50% more than in the traditional method.
4. There are **several additional effects** that accelerate the effect of additives or additionally change the properties of oil.

1. Crushing,
2. Dissolution
3. Oil saturation with micro bubbles of its own gas phase.
4. Changing of fractional structure in the direction of light fractions.
5. Releasing own surface active substances that are involved in the process.
6. Decrease the size and amount of mechanical impurities.
7. Partially reduce the amount of active Sulphur in oil.



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This will reduce the loss of oil as a commercial product, dramatically reduce the rate of sludge formation and the amount of slurry, and reduce the cost of physical removal and disposal of these sludge deposits.

Proper construction of an oil treatment system based on TRGA mechanical dispersants will efficiently grind all inclusions in oil. **As for the composition** - resins, paraffin's, asphaltene, coke particles. **And in size - large**, medium and small, to a size 5-20 microns.

At the same time, **several more parallel processes** are taking place.

1. Increase of light fractions in oil (increases the rate of dissolution of residues).
2. Bubbles appear that work as a catalyst for the dissolution of oil sludge.

This means that:

1. Our system will work well without the use of additives.
2. If you use additives - you can use them less. If you use the same amount of additives - the process goes several times faster.

We can show how to reduce the costs, if return all components of natural oil conditions (which are temporarily in sludge form).

The truth is that the disintegrator series TRGA has practical experience of successful work with oil sludge for 3 years continuously and without repairs.

Our equipment is part of the service process and does not require capital expenditures. It is installed next to the storage facility temporarily or permanently. This is a big difference between our installation and traditional mixers, the installation of which requires draining the product from the tank. In addition, the percentage of failure of the paddle mixers is very high and, as a rule, to repair or replace them, it is necessary to drain the product from the tank again. In the photo, our equipment is installed next to the storage at the request of the customer. Bottom sediments are collected from below and, after passing through the TRGA device, are fed back to the storage through the upper hatch. This installation scheme was adopted in connection with the height of the tank (in most cases, our equipment works through the lower nozzles of the tank). The volume of this tank is 63,000 barrels. Before the installation of our equipment, the height of the bottom sediment was 18 - 20 inches a year, after one year of operation of the TRGA device, the height of the bottom sediments did not exceed 1.5 inches.

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These changes were obtained only through physical processing.



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Additional TRGA Advantages:

- ✓ The TRGA Modules are mobile.
- ✓ Equipment is easily built up and assembled according to the Volume of sedimentation/Total Volume of the tank.
- ✓ Available for transportation as a whole or disassembled.
- ✓ Modules can use the power supply of the local facility.
- ✓ Consumes minimal power and installed in-situ.

Measured result. Heavy fuel oil processing data from our customer.

The results summary:	sulfur content %/Mass	Kinematic viscosity (cSt) T 50C	Calorific (BTU/lb)	Density at T 15C	Water and sediments %/ Volume	Gravity API at T 60F/ T 15C
Sample # 3, original fuel	0.531	94.33	8,875	0.9822	50	12.4
Sample # 2 – original fuel processing by TRGA,1 time.	0.458	77.84	10,786	0.9722	40	13.9
Percentage comparison	-13.74%	-17.48%	+21.53%	-1%	- 20%	+12.09%
Sample # 1 – the starting fuel (HFO) + Diesel 10% + processing by TRGA	0.3	9	15.179	0.9103	20	23.8
Percentage comparison	- 43.51%	- 90.46%	+71%	-7.32%	- 60%	+ 91.94%

As a result of using TRGA technology, our customers receive the following benefits:

1. Bottom sediments no longer occupy useful volume in oil storage facilities.
2. Oil sludge restores the properties of the original crude oil and returns to the refining process.
3. The time and cost of cleaning oil storage facilities are significantly reduced.
4. The cost of waste disposal is minimized.
5. We offer a service option for processing crude oil in your tanks, and it means you will not have capital expenditures.
6. Our technology will save your company much more money than the cost of our services.