

Comparison Table

	Traditional method of oil extraction	Shale oil production by Fracking, USA	Steam Generator	Binary mixtures	Supercritical water Equipment SCW-TRIZ
Depth of extraction of Hard-to-recover oil reserves, meters	Economically inefficient, small CIN	Over 1000 meters	Limited to a depth of 800-1200m	Over 1000 meters	Up to 7000 meters
The temperature of the heat carrier at the bottom of the well, degrees Celsius	Cold Flooding-cools the layers, causes waterlogging. There is no heat carrier.	Cold Flooding-cools the layers, causes waterlogging. There is no heat carrier.	Less than 100°C at a depth of more than 800 meters.	Up to 350°C	Up to 500°C
Pressure at the bottom of the well, MPa	formation pressure	Up to 100 MPa	Up to 20 MPa	Up to 30 MPa	up to 45 MPa at the wellhead, it is possible to create a pressure of up to 61 MPa at the bottom of the well
CIN (oil recovery factor)	3% - 10%	10% - 35%	35% - 65% to depths of 800 meters	10% - 20%	Up to 65% and more
Influence on the composition of oil			Modification of heavy oil into light oil due to exposure to high temperatures	Modification of heavy oil into light oil due to exposure to high temperatures	- Modification of heavy oil into light oil due to exposure to high temperatures; - Reducing the sulfur content in oil;
Environmental Impact	Negative: - Formation of oil sludge, - Formation of fuel oil lakes, - Formation of asphalt-resin-paraffin deposits in the well	Extremely negative: - increases the water content of the well; - Chemical substances get into drinking water, and cause a number of diseases in people living nearby; - Formation of oil sludge, - Formation of fuel oil lakes, - Formation of asphalt-resin-paraffin deposits in the well	Negative: - Formation of oil sludge, - Formation of fuel oil lakes, - Formation of asphalt-resin-paraffin deposits in the well	Extremely negative: - Chemical substances get into drinking water, and cause a number of diseases in people living nearby; - Formation of oil sludge, - Formation of fuel oil lakes, - Formation of asphalt-resin-paraffin deposits in the well	Positive: Taking into account the ability of supercritical water to oxidize organic matter into simple and environmentally friendly substances – into CO ₂ , water and thermal energy, SCW-TRIZ equipment allows, in parallel with oil extraction, to dispose of oil sludge, remove asphalt-resin-paraffin sediments.
Extraction cost of 1 ton of oil					40\$ USD/ton (The cost of the injected 1 ton of SCW is \$40 USD. 1 ton of SCW, gives 1-15 tons of over extracted oil)
Payback period of the equipment	It does not allow the extraction of stationary oil.	Direct dependence on the structure of the formation, in the presence of clay rocks – unprofitable . It does not allow the extraction of stationary oil.	It does not allow to extract stationary oil from a depth of more than 800 meters	High material costs – ammonium nitrate, delivery costs-logistics	Less than 6 months Consumables are available at the field: - fuel (gas, oil, fuel oil) - heat carrier (water)
The volume of over oil extraction	0				Min. from 240 tons per day (1 ton of SCW, gives 1-15 tons over extracted oil)
Water consumption		2-3 thousand tons / hour	20 tons per hour		10 tons per hour 240 tons per day, can be increased to 480 tons/day.
The possibility of using previously exhausted wells	no	possible	possible	possible	possible

* Explanations of abbreviations are given on the second page.

Explanations

SCW-TRIZ is an equipment complex for generating supercritical water, which makes it possible to efficiently extract Hard-to-recover oil reserves.

TRIZ - hard-to-recover oil reserves. More than 70% of all remaining world oil reserves are classified as hard-to-recover. The extraction of these reserves, without the use of methods of increasing oil recovery, is economically unprofitable. More than 70% of the world's conventional oil and TRIZ reserves are located at depths of 1000-3000 meters.

SCW is supercritical water. Water heated under high pressure. The critical point of the beginning of the formation of SCW is 374°C, at a pressure of 21.8 MPa. The optimal temperature of the heat carrier for injection into oil-bearing formations is up to 500°C, at a pressure of up to 45Mpa. Taking into account the critical density of SCW equal to $\rho_{\text{critical}} = 0.32 \text{ g / cm}^3$, at an injection depth of 5000 meters, the additional pressure of the water column will be 10MPa. That is, if the pressure at the wellhead (the ground part of the well) is 45 MPa, at the bottom of the well (at the exit point of the SCW from the product pipeline), the pressure will be 61 MPa.

SCWC - Supercritical Water Cracking.

Wellhead - the surface part of the well.

The bottom of the well is the lower part of the well that opens the productive reservoir. It serves to extract the necessary resource from the bowels of the earth.

CIN - oil recovery coefficient, oil recovery factor.

CIN TRIZ - the coefficient of extraction of hard-to-recover oil reserves, from a well where flowing oil has already been extracted.

Fracking - hydraulic fracturing. Cools the formation – a large amount of cold water is pumped (2-3 thousand tons / hour)

Binary mixtures are the injection of two chemical compounds into the well, which, when reacting with each other, lead to an increase in temperature. It gives a weak effect due to the high cost of the solution and logistics costs. This cannot create a volumetric thermal effect on oil-bearing formations weighing several thousand tons. Usually, the heating of the solution is not more than 350 °C. In the total mass, no more than 20-30 m³ of solution is pumped into wells.