

INTEGRATED TREATMENT OF OIL WELLS USING THE MOBILE PULSATING UNIT (MPU)

The developed method is related to a fundamentally new pulsating method of action by fluid pressure impulses upon the bottom-hole zone of oil wells **in the sparing mode** (pressure at mouth of well is up to 80 atm), **leaving the well's structure intact, without using any downhole devices.**

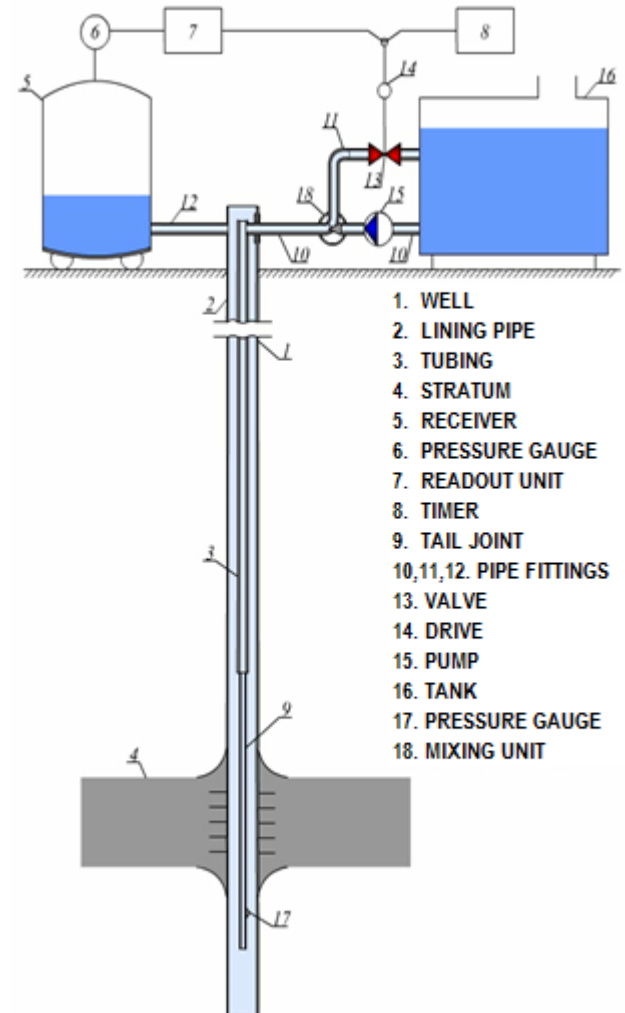
Designation and technological capabilities:

1. Integrated water and reactant washing of wellbore and sump by pulsations;
2. Integrated water and reactant treatment of bottom-hole zone by pulsations;
3. Water flooding of injection wells by pulsations;
4. Squeezing of reagents by pulsations.

Based on the action's type, treatment by pulsations belongs to the class of **hydropulse methods**, whose application is defined in the Russian normative documents, RD, for carrying out repair works in oil wells (RD 153-39-023-97 of 18.09.97, subsection 4.9.1.1.8).

Objects: - operating injection and producing wells; - stripper wells; - wells of alternating designation; - cluster of wells.

Pulsating treatment is conducted only during maintenance or well-workover operations.



DISCERNIBLE ADVANTAGES OF THE PULSATING METHOD OF TREATMENT

Pulsating method of treatment is related to applying low frequency (0.02–0.001 Hz) impulses of working liquid pressure in combination with alternating-sign change of flow direction in tubing and annular space at speed up to 2.8 m/s.

Hydrodynamic regime of action:

- forced;
- undamped;
- nonstationary;
- controllable;
- turbulent ($Re = 30000 - 50000$);
- regularly recurring.

High efficiency of the pulsating method can be attributed to the following factors:

- Forced-type non-stationary action applied to the treated zone;
- Effects of liquid “ebullition”, gas phase separation and near-wall layer destruction;
- Formation of steady depression in the bottom-hole zone promoting decolmatation of contaminated zones, unblocking of cross flows and pore openings;
- Rehabilitation of filtration properties and stabilization of water permeability of the bottom-hole and near well bore zones.

Performance verification of the pulsating method of treatment is conducted under pilot testing conditions in **9 oil wells** (7 injection wells and 2 producing wells) of the Romashkinskoe, Urmyslinskoe and Urustamaskoe oilfields of the Republic of Tatarstan, Russia. The stratum is terrigenous-carbonate.

CHARACTERISTICS OF MOBILE PULSATING UNIT (MPU)

Parameter	Value
Capacity, m ³ / h	20-50
Operating / maximum wellhead pressure, atm	63 / 80
Working medium	Technical and stratum water, water-oil emulsion, oil, surfactant solutions, etc.
Design	Modular type, placed on top of a sled or a skid, stationary
Material	Standard, corrosion resistant, aggression-proof
Dimensions, m (length/width/height)	5.8 / 2.2 / 2.55 (fits in truck beds)
Electric power, kW	Up to 100
Weight of one block, ton	Not more than 8



Control block of MPU



Power block of MPU

LOCATION OF MPU IN THE OIL FIELD



RESULTS OF TESTING OF MPU

The positive effect is achieved in testing of MPU only due to hydrodynamic action applied to the zone of treatment by stratum water without using any reagents, auxiliary downhole devices or special-purpose equipment.

Results of hydrodynamic testing of MPU:

1. The wells react to the pulsations at various treatment modes and positive dynamics of changes in characteristics of the reaction is observed;
2. At water washing of the wells by pulsations, the wellbore and the sump are cleaned off the deposits and their lift to the mouth of well can be achieved;
3. At treating the injection wells by pulsations, increase in injectivity, at least, threefold is observed;
4. In the course of treatment by pulsations, chemical composition of a working liquid changes (liquid's hardness and quantity of chloride ions decrease; quantity of iron ions increases);
5. At treatment of the bottom-hole zone of the well by pulsations, rehabilitation of filtration properties and stabilization of permeability take place;
6. After treatment of the bottom-hole zone by pulsations, producing well logging data indicate a decrease and stabilization of pumping pressure within timeframe of not less than two months;
7. At integrated pulsating reactant treatment of producing wells, increase in time between overhauls is expected.