

INNOVATIVE TOOL FOR HYDROCHEMICAL CLEANING OF OIL WELLS EQUIPMENT

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Oil production wells are complicated by many factors, including scaling on downhole equipment. According to the investigations results, 60 % failure rate is due to scaling on the working bodies of pumping systems.

Processes of oil and gas production are often accompanied by the formation of unwanted salt deposits in downhole equipment and ground communications systems. In order to prevent its formation and to remove salt deposits from downhole and ground equipment, as well as from collection and transportation communications, company “Tomsk oil” tested the innovative chemical reagent “AldoKAS-1” produced by “Novokhim”. Ltd. “Novokhim” has manufacturing facilities and laboratories, qualified staff and it is specialized in the development and production of modern chemicals.



Figure 1 – Salt deposits at pipelines

The solution “AldoKAS-1” is a concentrate. It is designed to remove inorganic sediments, including salts of carboxylic acids and iron oxides from downhole equipment, deep pumping equipment. It is also used for cleaning of pressure sewers and pipelines as well as for rinsing wells burst of mineral deposits. This solution has a minimal corrosive ability, even at temperatures above 90°C. The “AldoKAS-1” should be stored in appropriate plastic containers (jerry cans, barrels) at temperatures from -45°C to +30°C. Warranty period of storage is 12 months from date of manufacturing.

Table 1 – The corrosion rates for different solutions

Solution	The corrosion rate, g/m ² per hour
Hydrochloric acid	4-10
Inhibited hydrochloric acid	0.3-0.6
Solution “AldoKAS-1”	< 0.1

The “AldoKAS-1” is a solution for mineral deposits removing that can be used on the following objects of oil and gas industry:

- To clean downhole equipment from mineral deposits: pumps ESP, SRP, check valves, filters, etc.;
- To clear tubing, flow lines, loops, piping systems RPE;
- To clean the bottom zones of oil and gas wells.

The “AldoKAS-1” is dark-colored liquid with a pungent odor. High concentrations of vapor may cause irritation of the eyes and respiratory tract. It also causes chemical burns in case of contact with unprotected skin.

All operations must be carried out outdoors or in areas equipped with running water and a forced ventilation system, providing state of the working area air in accordance with GOST-12.1.005. In poorly ventilated areas one must use personal respiratory protection (PRP). Personnel associated with the preparation and use of this tool must be provided with personal protective equipment (overalls, safety goggles, rubber stamps, PRP). Immediately wash the place falling under running water in case of contact with the skin. In case of chemical burns one should also rub the damaged area by swab dipped in an aqueous solution of baking soda and then rinse with soap and water.



Figure 2 – Corrosion at pipelines

The solution “AldoKAS-1” should be diluted with water in a ratio of 1 volume part of the solution to 10-20 parts by volume of water, no special preparation of water is required.

For example: to make 2m³ solution of the “AldoKAS-1” with a 1:20 dilution it is necessary to fill the 2.5 m³ vessel with 1.8 m³ water and then add 200 liters of the concentrate “AldoKAS-1”.

Burst cleaning of downhole equipment

The required amount of agent solution is pumped into the well annulus. Due to the hydrostatic column of fluid, solution is fed to the bottom zone and then directed to the inlet of the pump unit, goes up through the pump. Dissolution and removal of mineral deposits from downhole equipment and tubing takes place during the contact with the solution.

It is allowed to fill the annulus by concentrated solution “AldoKAS-1” in cases of high water cut oil. In this case, due to the high content of water, solution has appropriate dilution. Then the solution passes through the depth of the well equipment, dissolves and removes accumulated sediment.

Recommended amount of concentrated solution “AldoKAS-1” for the burst washing of wells ranges from 50 to 200 liters.

The bottom-hole cleaning

The required amount of the solution “AldoKAS-1” is pumped into the bottom-hole zone. Due to the interaction of solution components with mineral rocks and sediments, their dissolution takes place.

Pipelines cleaning

The prepared solution is pumped through the pipe section for cleaning it from mineral deposits. Dissolution and removal of deposits from the inner surface of the pipeline takes place during passing of the solution.

The problem of formation mineral deposits

Formation deposits leads to ESP shimming, damage of the pumping systems, clogging of pipes, well flow rate decline.

Table 2 – Comparison of technical and economic factors

Index	Hydrochloric acid	Solution “AldoKAS-1”
Class of danger	2	3
Dilution	1:5	1:5-1:20
Flow rate of working solution per well	5m ³	2m ³
Sediment dissolution rate	1	2-2,5
Extra inhibitor packet	yes	no
The cost of wells processing, thousand rubles	10.5	23.6
The corrosion rate	0.3-6	<0.1
Safety of equipment	no	yes
Special equipment for the preparation of the solution	yes	no

The most common solution for dealing with undesirable deposits in downhole equipment is hydrochloric acid. Let us compare technical and economic parameters of hydrochloric acid and the “AldoKAS-1”. It can be seen from table 2, that the “AldoKAS-1” has a lower class of danger and flow rate of working solution per well compared with hydrochloric acid. In addition, the “AldoKAS-1” promotes lower corrosion rate, and thus it is harmless for the equipment. The “AldoKAS-1” does not require special equipment for preparation, as opposed to the hydrochloric acid. The “AldoKAS-1” promotes twice-faster dissolution rate of deposits compared with hydrochloric acid. In addition, the “AldoKAS-1” does not require an additional packet of inhibitors. However, supplying of the advantages in technical parameters leads to a twofold increase in the cost of processing the well. It should be noted, that in this case the economic risk associated with the oil drilling equipment outwear failure is minimized.

Thus, we can conclude that the developed tool is a worthy analogue of existing solutions for pipelines cleaning, and its feasibility and performance characteristics are the basis for the widespread use.