Determination of electrical parameters for the electrochemical treatment of soils contaminated with oil

V P Meshalkin, N S Shulaev, V V Chelnokov, V V Pryanichnikova and R R Kadyrov

(Russian Chemical-Technological University named after D.I. Mendeleev, FSBEI of HE Ufa State Petroleum Technological University)

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Method of electrochemical cleaning of oil-polluted soils consists in passing an amperage through the contaminated soil.

The electrochemical method of soil cleaning is the passing a small amount of electric current. It has rather high efficiency in soils polluted with oil products, phenols, salts, heavy metals and other chemicals. Its main advantage is cleaning at a depth of up to several meters in situ, without changing the structure of the soil, its extraction and transportation.

The scheme of the electrodes location which allows effective cleaning at relatively low energy consumption
Structure of the electric field, created in the interelectrode space close to homogeneous.
Some parameters of electrochemical cleaning

The amperage of one anode: 

\[ I = \frac{2\pi H U}{\rho \ln \frac{l}{R}} \]

The number of required cells: 

\[ k = \frac{S}{4L^2} \]

The number of anodes: 

\[ Z_A = 5k = \frac{5S}{4L^2} \]

The total amperage between the electrodes: 

\[ I_s = \frac{5\pi SH}{2L^2\rho \ln \frac{L}{R}} U \]

The energy consumption: 

\[ W_s = I_s Ut \]
Summary

The correlations allow us to calculate the number of electrodes, voltage between them, the treatment time depended on polluted area, contamination depth, the properties of contaminated soil and the required cleaning efficiency.

The use of electrochemical treatment to reduce the concentration of pollutants in the soil has great interest because of large cleaning depth and the equipment mobility. However, the introduction of this technology requires a systematic approach based on the analysis of many factors, which is a significant challenge. The selection of the process optimal conditions requires preliminary laboratory tests before the full-scale field work often. The materials obtained in this research and the calculations of the electrical parameters can simplify the electrochemical process implementation.