

Manganese removal from groundwater by oxide-carbonate manganese ore

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Most of underground water sources in Ukraine contain the increased concentration of manganese. There is a tendency to find technology with new more efficient and cost-efficient materials and technologies.

We obtained the filtration medium with oxidizing film on grains. It is modified natural oxide-carbonate manganese ore (OCMO-Mn) from Dnipropetrovsk region (Ukraine).

The aim of this work was to study the main technological parameters of manganese removal from water onto filtration medium, namely the average rate of filtration and frequency of backwashing.

The running well located in Kyiv region is currently used as a resource for supplying the company with drinking water. The well is 17 m deep. Based on repeated analyses, it was found that groundwater in the well contains higher concentration of manganese (0.65 to 0.72 mg·l⁻¹). The pH value is in the range from 7.6 to 7.8. The following technological method of water treatment was used:

Well – Pump I → Filter I – Tank – Pump II – Filter II.

Raw water (water from the well) was supplied by Pump I to Filter I for iron removal. Water is then flowed into the tank. Filter II provided manganese removal through the filtration column in downward direction and average filtration rate was in the range from 3 m·hour⁻¹. The parameters of column are as follows: diameter 18 cm, height 80cm, filtration medium height 56 cm.

The total time of filtration of water from well was 130 hours – 14 m³ of water was filtered during this period. After some time (about 7 m³ of purified water and after 65 hours of operation), the concentration of manganese in treated water increased to 0.05 mg·l⁻¹ and filtration medium was regenerated by backwashing. Regeneration using chemical reagents is not required. Parameters of backwashing are as follows: average rate 300 l·hour⁻¹, backwashing time 0.5 hour. Filtration medium OCMO-Mn was backwashed approximately once in three days (according to amount of precipitated manganese ions trapped in a filter).

Usability (advantage) of this method in water treatment is also demonstrated by the ratio of filtered water volume to filter medium volume, which is about 500 for each cycle.

Obtained results provide the basis for using OCMC-Mn in manganese removal from water (so called contact manganese removal).