

Factors controlling the ripening of manganese removal filters in conventional aeration-filtration groundwater treatment

Jantinus H. Bruins^{a,b,c,*}, Branislav Petrusevski^b, Yness M. Slokar^b, Koen Huysman^d, Koen Joris^d, Joop C. Kruithof^{b,e}, Maria D. Kennedy^{b,c}

^aWLN, Rijksweg 85, 9756 AD Glimmen, The Netherlands, Tel. +31 (0) 50 402 2121, email: j.bruins@wln.nl (J.H. Bruins)

^bUNESCO-IHE Institute for Water Education, Westvest 7, 2611 AX Delft, The Netherlands, Tel. +31 (0) 15-215 1715, Fax +3115-212 2921, email: b.petrusevski@unesco-ihe.org (B. Petrusevski)

^cTechnical University Delft, Stevinweg 1, 2628 CN, Delft, The Netherlands, Tel. +31 (0) 15-278 9111, email: info@tudelft.nl, j.bruins@wln.nl, m.kennedy@unesco-ihe.org (M.D. Kennedy)

^dPidpa Department of Process Technology and Water Quality, Desguinlei 246, 2018 Antwerp, Belgium, Tel. +32 (0) 3 216 8888, Fax +32 (0) 3-260 6000, email: koen.huysman@pidpa.be (K. Huysman)

^eWetsus, European Centre of Excellence for sustainable Water Technology, P.O. Box 1113, 8900 CC, Leeuwarden, The Netherlands, Tel. +31 (0) 58-284 3000, email: joop.kruithof@planet.nl (J.C. Kruithof)

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ABSTRACT

Relatively long operational time is required to achieve effective manganese removal in conventional aeration-filtration groundwater treatment with virgin filter media. Ripening period depends on water quality, operational parameters, and the filter media used. This study assessed the role of filter media type, backwashing and iron loading on the time required to achieve very effective manganese removal. Filter runs were conducted with two set-ups each with six pilot filters with virgin sand or anthracite, and different types of manganese oxide coated sand/anthracite (MOCS/MOCA). Pre-treated groundwater (aeration-rapid sand filtration), either directly, or after an additional pre-treatment (ultrafiltration-UF), was used as feed water. UF pre-treatment eliminated head loss development in pilot filters and backwashing was consequently not required. Filters that received feed water without UF pre-treatment required backwashing after 14 d of continuous operation. Use of virgin sand and anthracite resulted in comparable ripening time (25 d and 14 d for feed water without and with UF pre-treatment, respectively). Use of fresh MOCS/MOCA directly taken from operational filters, eliminated the need for ripening of virgin filter media, while dried MOCS was less effective than fresh one, while the total period required to achieve highly effective manganese removal ($\geq 95\%$) was not shortened.

Keywords: Filter backwashing; Filter media ripening (manganese oxide coated sand/manganese oxide coated anthracite); Groundwater quality; Groundwater treatment; Manganese removal

*Corresponding author.