Inhibiting sulfate reducing bacteria activity by denitrification in an anaerobic baffled reactor: influencing factors and mechanism analysis

Zhaohan Zhang\textsuperscript{a,b,d,*}, Guangmin Liu\textsuperscript{b}, Yujie Feng\textsuperscript{a}, Zhongxi Chen\textsuperscript{c}, Peirong Zhan\textsuperscript{d}, Nanqi Ren\textsuperscript{a}

\textsuperscript{a}State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology, No. 73, Huanghe Road, Nangang District, Harbin 150090, China
Email: hitzzh@sina.com
\textsuperscript{b}Department of Environmental Engineering, Harbin Engineering University, Harbin 150001, China
\textsuperscript{c}Daqing Oilfield Design and Research Institute, Daqing 163712, China
\textsuperscript{d}Heilongjiang River Fisheries Research Institute, Chinese Academy of Fishery Sciences, Harbin 150001, China

Received 4 April 2011; Accepted 28 April 2013

\textbf{ABSTRACT}

For controlling the equipment corrosion of hydrogen sulfide produced by the microbe in oilfield system, denitrification was used to inhibit the sulfate reduction in a continuous flow anaerobic baffled reactor. The influencing factors and running effects of this process inhibition were investigated. Batch experiments were conducted to study the inhibitory mechanisms. The results indicated that \(\frac{\text{SO}_2}{\text{NO}_3}\) and relative Chemical Oxygen Demand (COD) content were the two most important environmental factors affecting the inhibitory effect. The inhibitory effect increased with decrease of \(\frac{\text{SO}_2}{\text{NO}_3}\) ratio. The lower COD content benefited to increase the inhibitory effect. The inhibitor could act only in 1–3 chambers with the effective inhibitory time of 2.3–6.9 h. The inhibitory effect could be reflected by the system oxidation reduction potential (ORP). Denitrification predominated with the ORP in the range of \(-50\) mV to \(-150\) mV, while sulfate reduction predominated with the ORP in the range of \(-300\) mV to \(-400\) mV. Three inhibitory mechanisms were observed in the experiments: competitive inhibition for carbon source, nitrite-N inhibition, and oxidation by autotrophic denitrifying bacteria.

\textit{Keywords:} ABR continuous-flow experiments; Batch experiments; Denitrification; Inhibition; Sulfate reduction

\*Corresponding author.

1944-3994/1944-3986 © 2013 Balaban Desalination Publications. All rights reserved.