



“Gheorghe Asachi” Technical University of Iasi, Romania



STUDY OF ECOLOGICAL INHIBITION OF SULFATE-REDUCING BACTERIAL ACTIVITY AND ASSOCIATED POPULATION SUCCESSION IN OILFIELD FLOODING WATER

Bin-song Wang^{1*}, Li Wei^{2*}, Chun-ying Li³, Jie Zhang⁴, Peng Ao⁵

¹Heilongjiang University, Institute of Chemistry and Chemical Engineer, 150080 Harbin, China

²State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology, 150090 Harbin, China

³Harbin University of Commerce, School of Energy and Civil Engineering, 150028 Harbin, China

⁴Northeast Forestry University, College of Life Sciences, 150040 Harbin, China

⁵Heilongjiang University of Chinese Medicine, 150040 Harbin, China

Abstract

In the conventional water flooding process of Daqing Oilfield in China, the occurrence of abundant sulfate-reducing bacterial populations has substantially affected the industrial production. This study was conducted from the perspective of ecological suppression by operating anaerobic ABR reactors and dosing ecological inhibitors in a continuous-flow experiment. The practical operating efficacy was investigated and associated dynamic bacterial population succession was analyzed. Results showed that the sulfate removal rate decreased upon the addition of eco-inhibitor, leading to a low concentration of sulfide products (<0.3 mg/L). Associated redox potential substantially varied from -300 mV to approximately -50 mV, whereas the pH and alkalinity slightly changed and imposed a minor effect on the reaction system. There were significant changes in microbial diversity before and after the eco-suppression, and dominant functional bacterial populations shifted from sulfate-reducing bacteria (*Thauera selenatis*, *Desulfovibrio* sp., *Clostridium diolis*, *Hydrogenophaga taeniospiralis*) to those capable of denitrification (*Uncultured firmicute*, *Clostridium butyricum*, *Paenibacillus lautus*, *Arcobacter cibarius*). These indicated that the utilization of eco-inhibitor has successfully inhibited the sulfate-reducing bacterial activities.

Key words: conventional water flooding process, community succession, ecological inhibition, efficacy, sulfate-reducing bacteria

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