Supplementary Information

Optimization of the real-time control strategy in petroleum-refining catalyst production wastewater treatment with shortcut nitrification

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Representative cycle profiles of the shortcut nitrification in this study

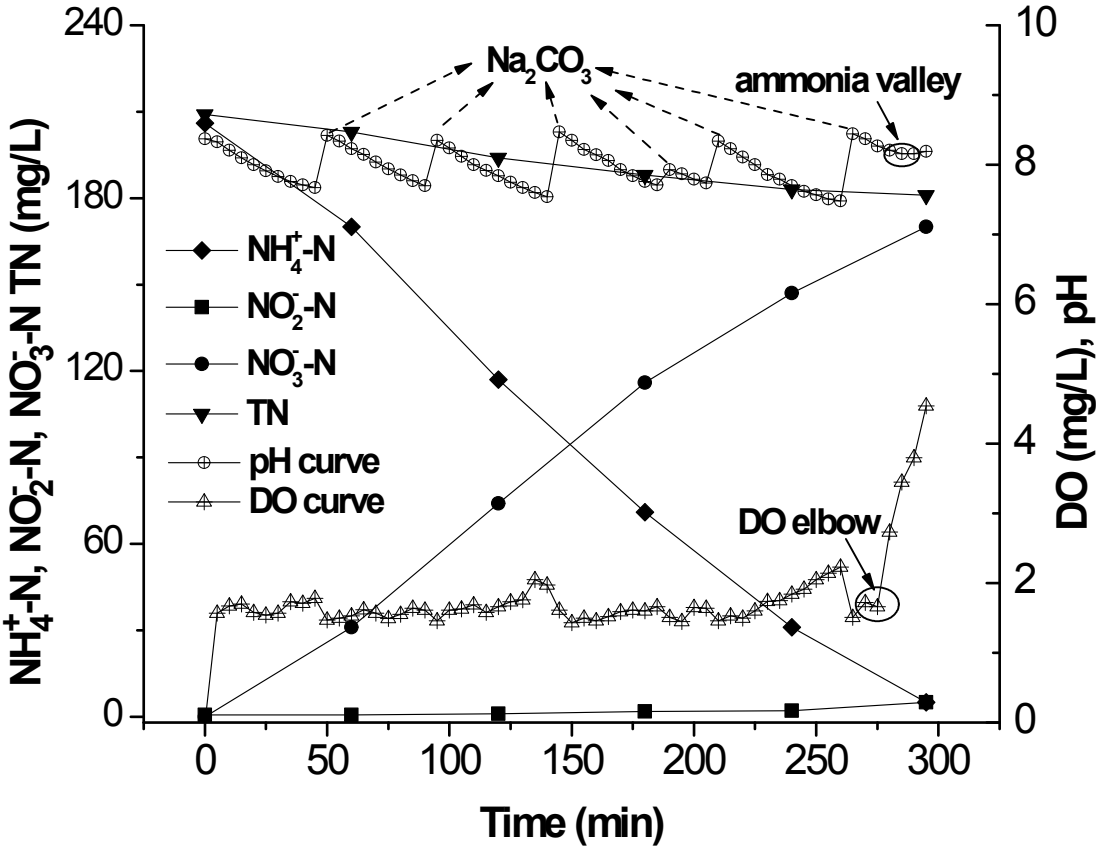

Fig. S1. Representative cycle profiles in the shortcut nitrification study

Fig. S1. is the aeration profiles of the 13th cycle in reactor #2 of the start-up stage. Before the break points were observed, with Na_2CO_3 added into the reactor, the DO was controlled at 1.5 ± 0.2 mg/L, and the pH was controlled at 7.8 to 8.3. As the influent NH_4^+-N concentration

was higher than the wastewater in other studied, Na_2CO_3 was added for several times. As shown in the profiles, DO and pH data were recorded every 5 minutes during the aeration period. The break points in DO and pH profiles were observed at the 280th min and the 290th min, respectively. Form Fig. S1., we can conclude that with the pH decrease, the DO slowly increased. However, the DO value after DO elbow increased much faster than the variation before the break point appeared.

The air pump was shut off at the 295th min as DO elbow and the ammonia valley were appeared, so the excessive aeration could be avoided.

We sampled the influent and effluent before and after the aeration period, respectively. The original TN in effluent was 209 mg/L, NH_4^+-N was 206 mg/L and all the NO_2^--N and NO_3^--N concentration was less than 1 mg/L.

In effluent the NH_4^+-N was 5 mg/L, the NO_2^--N concentration was 170 mg/L and the NO_3^--N was 5 mg/L. The NH_4^+-N removal rate reached 97.6%, and NAR was 97.1%, indicated that in SBR reactor, the real-time control strategy could exactly determine the endpoint of shortcut nitrification process. Total nitrogen in effluent was 181 mg/L, indicated that with a low DO about 1.5 mg/L, simultaneous nitrification and denitrification occurred as the total nitrogen reduced by 13.4%. Actually, the total nitrogen removal rate in the aeration period in the start-up and stable operation stage was 10% to 15%.