Supplementary Material

The pilot-scale DNBF system (Fig. S1); Two of online-control strategies designed and the applied results during the pilot-scale experiments (Fig. S2); Variations of the effluent NO_3^--N and turbidity with online control strategies in DNBF at the filter velocity of 8.93 and 5.95 $m \cdot h^{-1}$ (Figs.S3–4); Comparison of carbon dosage between using online control and depending on experiences (Table S1).

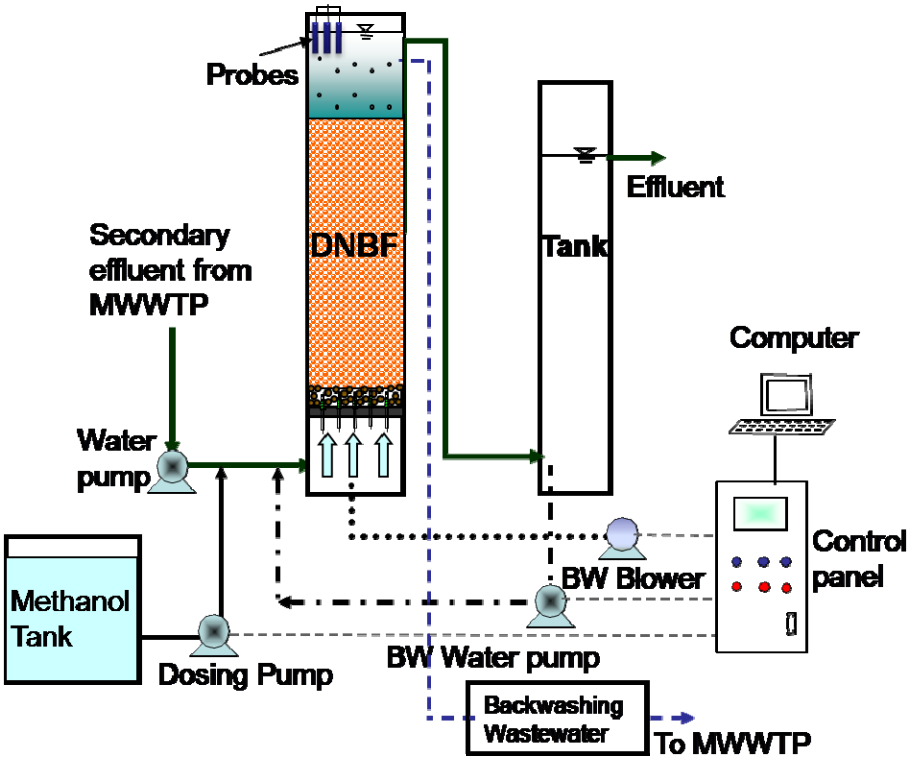
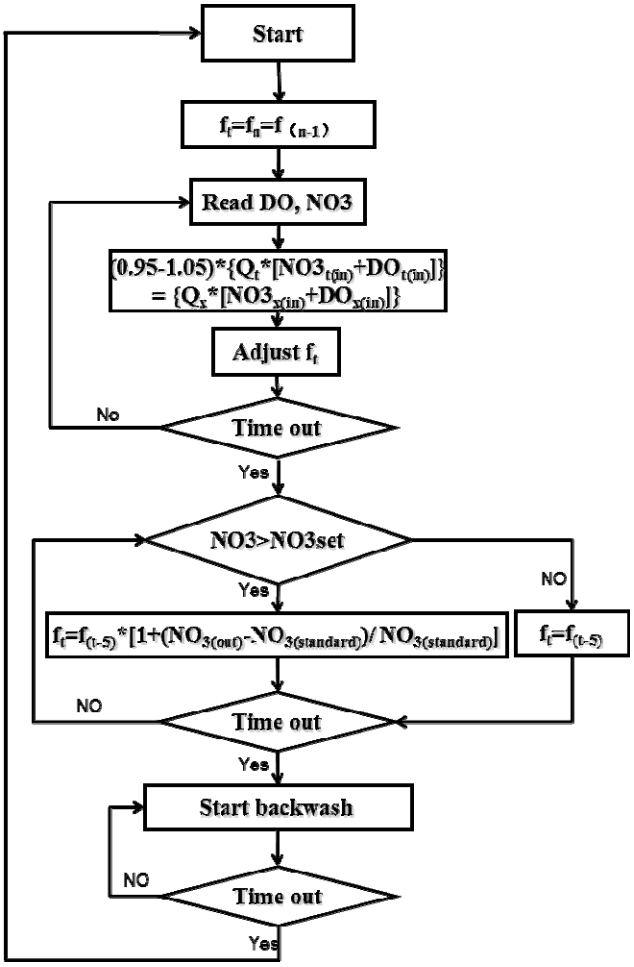
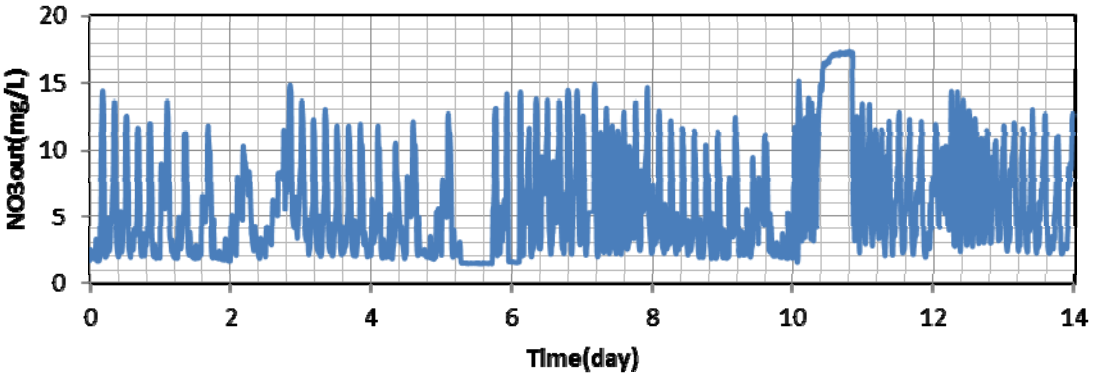
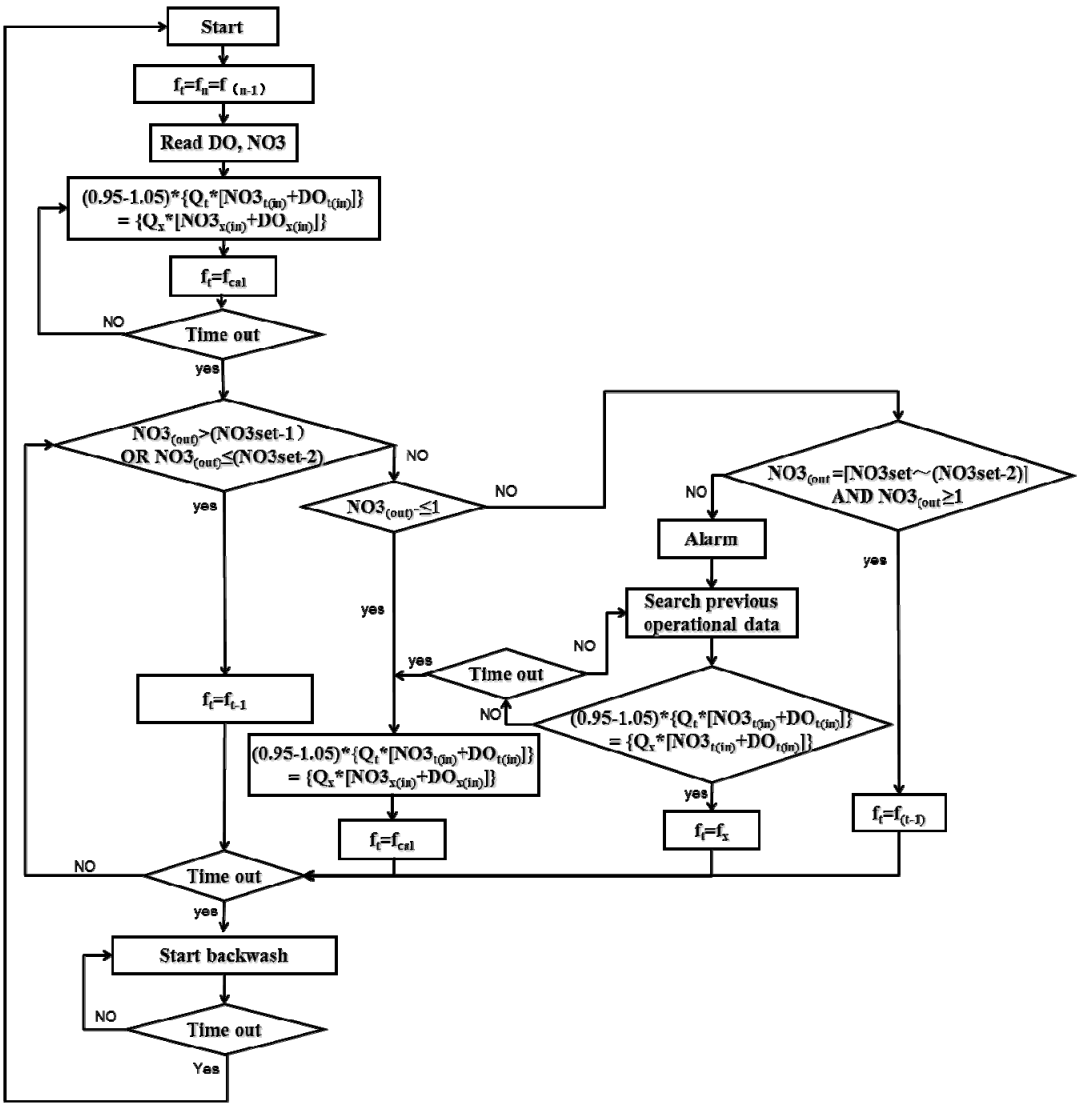


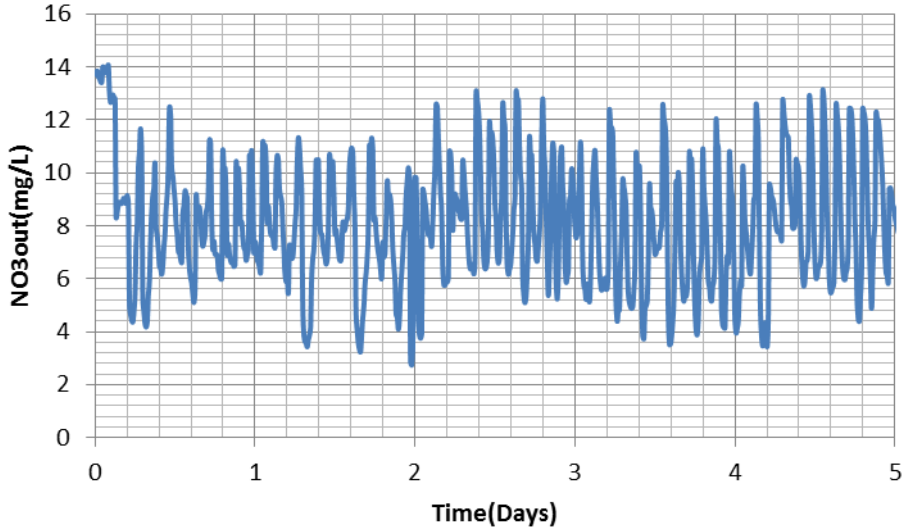
Fig. S1 The pilot-scale DNBF system





In this strategy, if nitrate in the effluent was higher than the standard nitrate, carbon dosage was increased, however, using this strategy, the effluent nitrate was fluctuated a lot.





Variation of the effluent nitrate in this strategy was much better than before.

Fig. S2 Two of typical online-control strategies designed and modified and the applied results during pilot-scale

experiments.

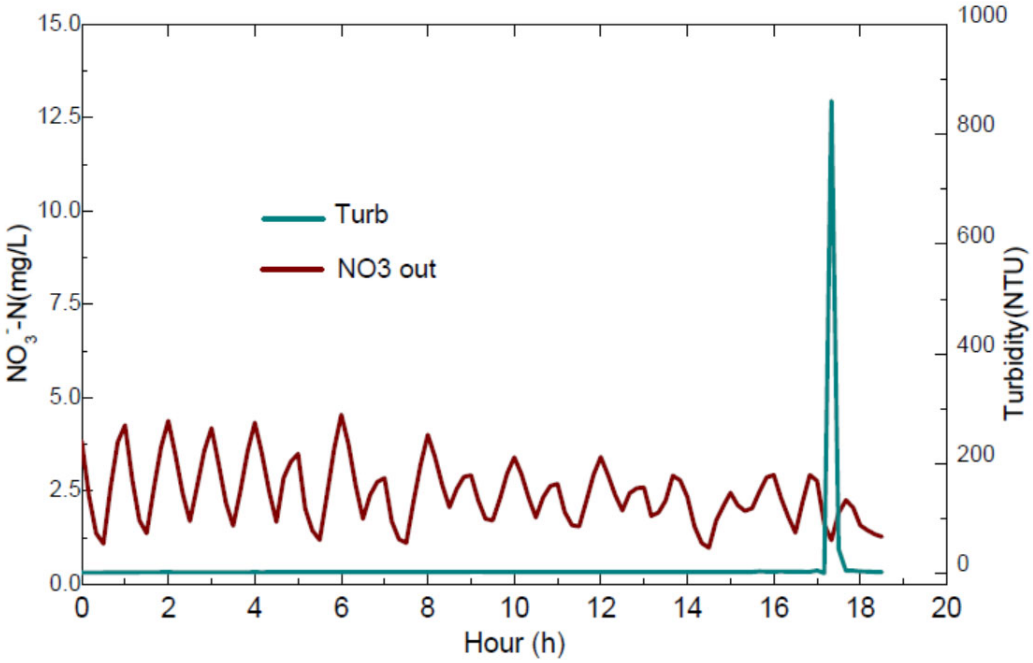


Fig. S3 variations of the online monitored NO_3^--N and turbidity with online control strategy at the filtration velocity of 8.93 m/h

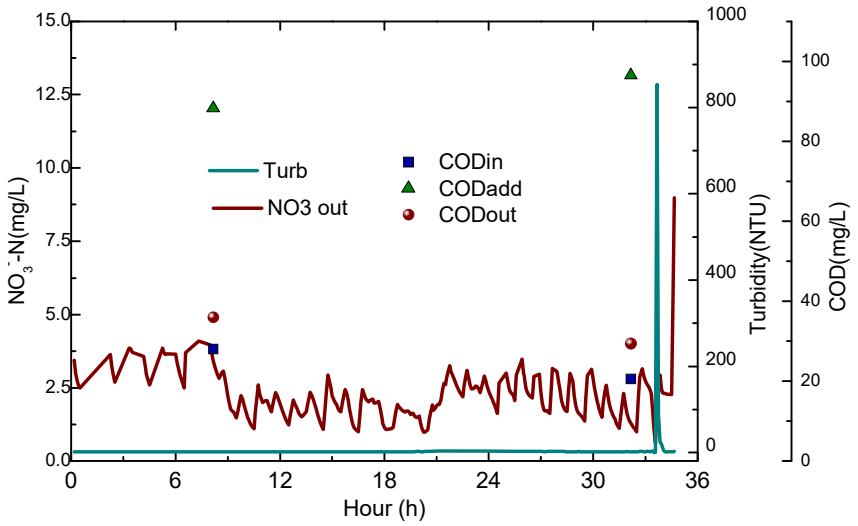


Fig. S4 COD and nitrate concentrations with online control at the filtration velocity of 5.95 m/h

Table S1 Comparison of carbon dosage between with online control and dependent on experiences

items	depend on experiences	online control
mean Carbon dosage rate/(mg·L^{-1})	53	43
total Carbon dosage /(kg·d^{-1})	5300	4300
save carbon dosage /(kg·d^{-1})	1000	
save cost	18%	
	3500/¥·d^{-1}）	