Supplemental Material

Comparison of performance of organics and nutrients removal in tidal flow and horizontal flow constructed wetlands

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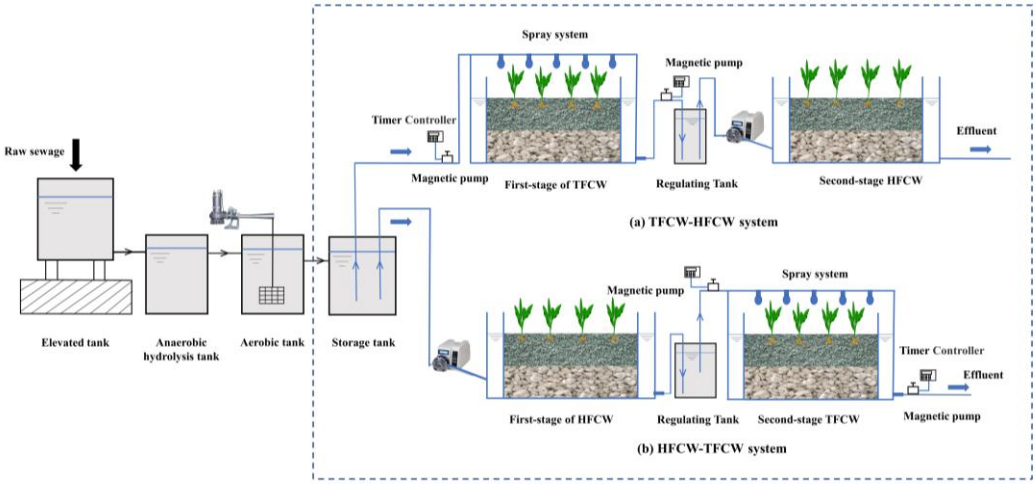

Figure S1. The schematic diagram of the whole bio-ecological system at low temperatures (<15℃).

Substrate analysis

The 500g of substrate samples were collected from the main filter layer of the bed at a depth of 20 cm and microbial biomass and nitrification/denitrification intensity were analyzed. Microbial biomass was tested using the mass of the biofilm on the surface of the substrate. In detail, 10g of fresh substrate in the crucible, whose weight is denoted as X_0, was heated in an oven and then burned in a muffle furnace. After more than 12 h of drying at 105℃ and 8 h of burning at 700℃, the weights of the substrate sample before and after preparation were expressed as X_1 and X_2, respectively. The microbial biomass was calculated based on the following equation: $(X_1\text{-}X_2)/(X_1\text{-}X_0)$. The potential of nitrification and denitrification was estimated based on their intensity measurements in the CW. Each sample was thoroughly homogenized, and 50 g of fresh substrate was placed in 250 mL conical flask filled with specific standard solutions. To measure denitrification intensity, a 250 mL solution with sufficient nitrate (pH=7.2) containing the following components per liter was utilized: 1.6 g KH_2PO_4, 4.8 g K_2HPO_4, 1.8 g KNO_3, and 0.72 g glucose. Conical flasks containing the samples were

sealed with rubber stoppers to ensure total anaerobiosis. The flasks were then incubated at 20 ℃ for three days in the temperature incubator. Following similar sample preparation, nitrification intensity was analyzed using 200 mL solution containing sufficient ammonium (1.27 g/L) to measure potential nitrifying activity without ammonium limitation. The solution medium contained the following components per liter: 2.7 g KH_2PO_4, 7.0 g K_2HPO_4, and 6.0 g $(NH_4)_2SO_4$. Subsequently, the nitrifying flasks were sealed with parafilm to prevent substrate from drying while still allowing gas exchange, and then incubated at 20 ℃ with shaking (150 rpm) for 24 h to ensure adequate oxygenation. For all substrate samples, nitrate concentrations in the initial and final incubations were measured for calculation of nitrification and denitrification intensities. In particular, the measurements were based on the specific dry weight of the substrate in mg NO_3^--N/(kg·mdry·h).

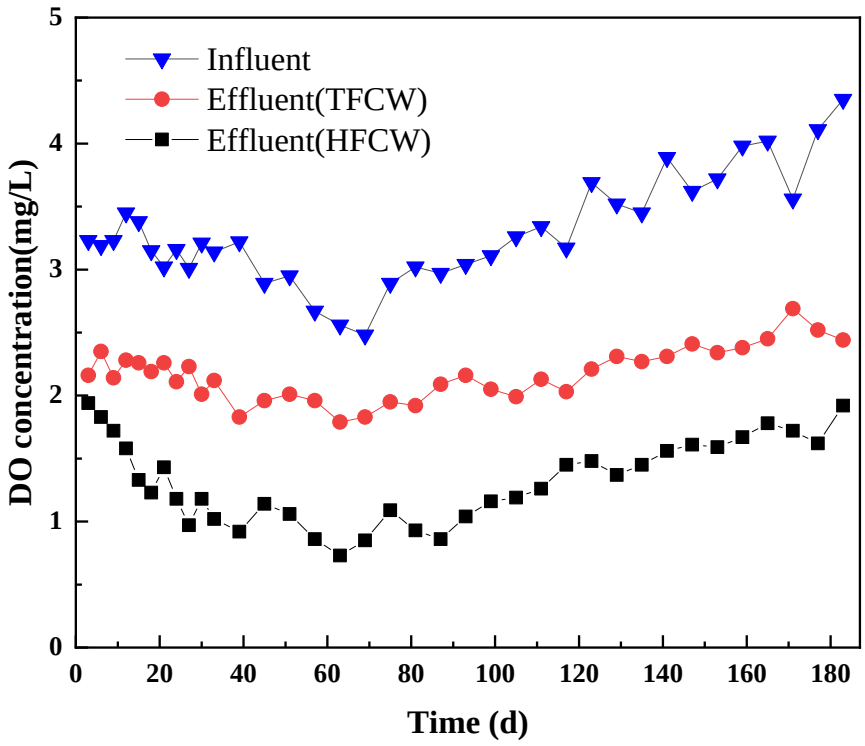

Figure S2. The variations of DO in the influent and effluent of the TFCW and HFCW.

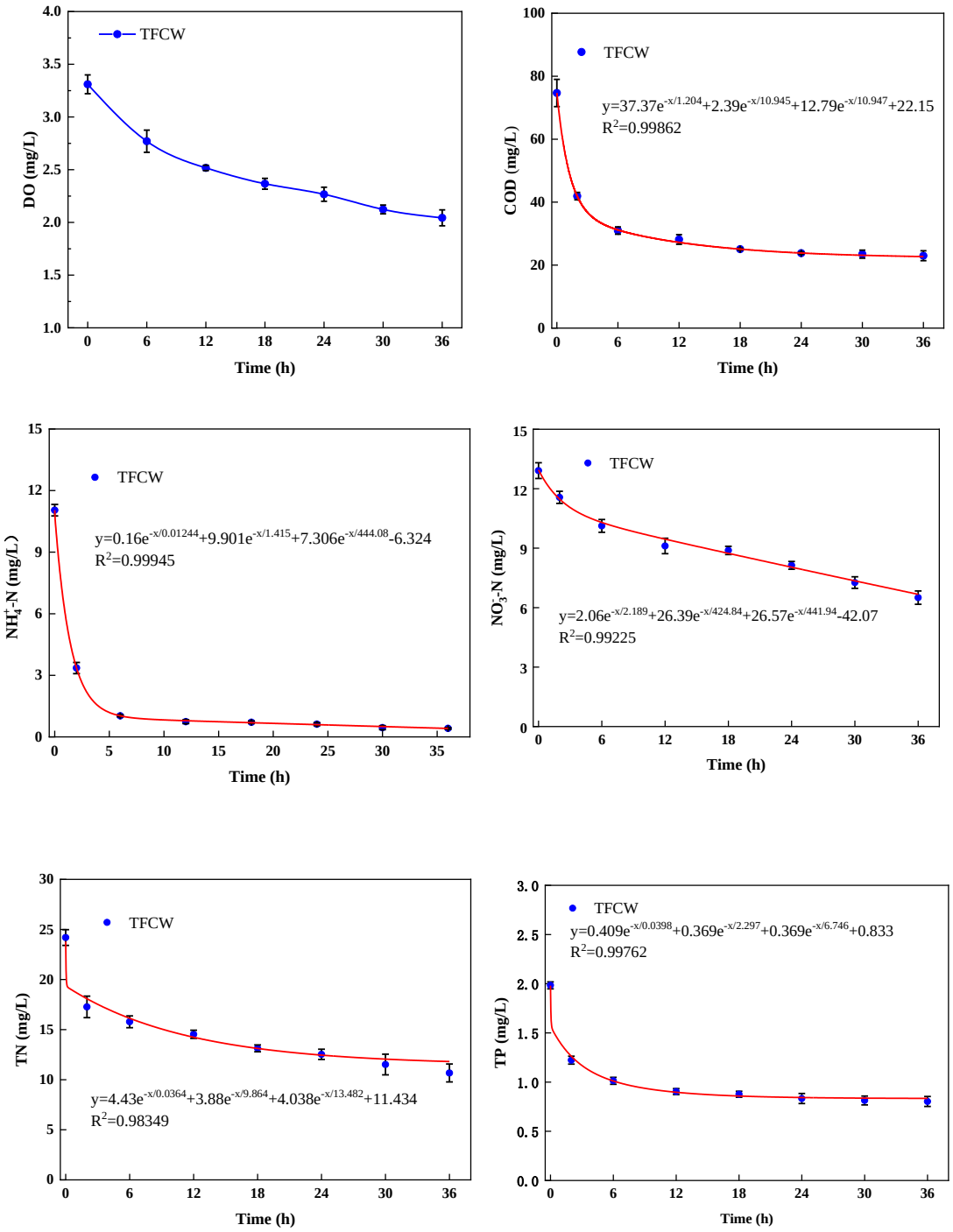

Figure S3 Changes of DO, COD, NH_4^+-N, NO_3^--N, TN, TP for the tidal cycle in TFCW.