

HIGHLIGHTS

- A fungal/bacterial coexistence system was applied to increase the mass transfer of hydrophobic VOCs in the biofiltration.
- The fungal–bacterial biofilter (F&B-BF) outperformed the bacterial biofilter (B-BF) in terms of BTE p -X removal performance and long-term stability. Furthermore, the recovery rates of the F&B-BF were faster than those of the B-BF.
- The bacterial genus *Pseudomonas* and the fungal genus *Phialophora* both played important roles in BTE p -X degradation.
- Community structure analysis revealed that the adsorption, transfer and degradation capacity of fungi improved BTE p -X removal.
- F&B-BF strengthened the removal performance in the biofiltration of VOCs from a petrochemical industry wastewater treatment plant.