

Note: I revised this abstract, with tables and figures, for the May 2016 issue of the Journal of Hydroecology. The journal is published by the IHE (in Chinese, but with abstracts, figure captions and table headings in English and Chinese) and the three visitors are all authors.

Treatment of Rural Domestic Sewage in Mountain Areas by a Combined Ecological Trench and Stabilization Pond System

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Abstract: A system combining an ecological trench and stabilization pond was used to treat rural domestic sewage. The removal rates of SS, NH₃-N, TN, TP, COD_{cr}, were measured to evaluate the removal efficiency of the combined system and provide a reference for domestic sewage treatment in rural mountainous areas. The experiment was carried out in Jinguo Village, Kaixian County of Chongqing City from August, 2014 to May, 2015. The 150m ecological trench was constructed by broadening the drainage ditch and planting vegetation. The stabilization pond system consisted of a settling pond, a biological purification pond and an enhanced biological purification pond with a total area of ~1230m². Five sampling sites were located; at the inlet and outlet of the ecological trench and at the outlet of each pond. During the experiment, continuous water flow was maintained at an average rate of ~7m³/h, giving a total hydraulic retention time (HRT) of ~102h, including 5.4h in the trench and 96.6h in the ponds. Water samples were collected once a week for determination of DO, SS, NH₃-N, COD_{cr}, TN, TP and the first water samples were collected after one week of operation. After ~4 days, the black color and odor from the waste disappeared and turbidity declined. Moreover, the DO saturation of the effluent increased to >65% and the average removal rates of SS, NH₃-N, TN, TP and COD_{cr} were 84.9%, 70.1%, 49.6%, 44.9% and 80.5%, respectively. The ecological trench removed 40.1% of the SS, 47.0% of the total SS removed, and created favorable conditions for subsequent stabilization in the ponds. After treatment in the integrated ecological trench and stabilization pond system, the effluent meets the Class II criteria of the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plants (GB18918-2002). This research demonstrated that an integrated system combining an ecological trench with stabilization ponds is both sufficient and practical for treating rural domestic sewage in mountainous areas.

Key words: ecological trench; stabilization pond; rural domestic sewage treatment

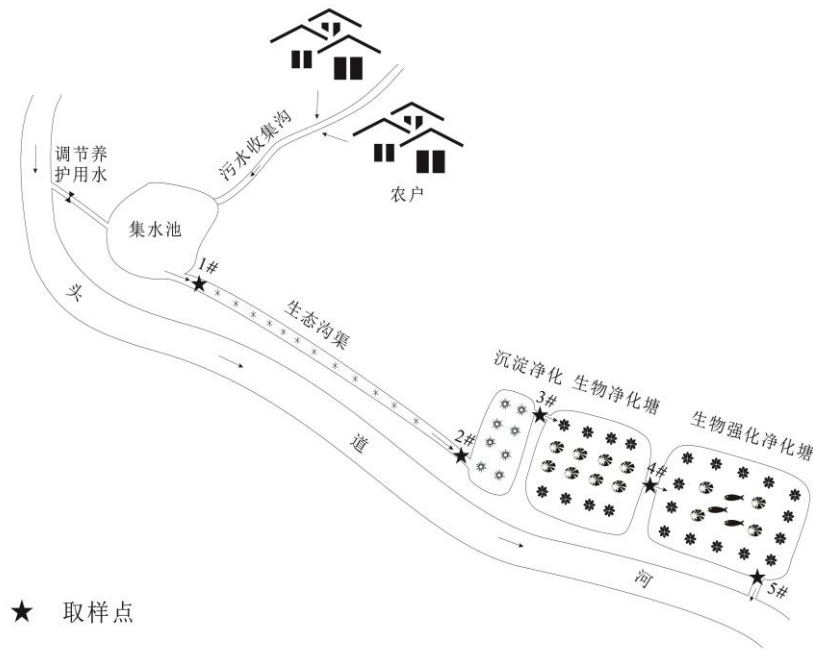


图1 处理系统及采样点位置

Fig. 1 Schematic diagram of the sewage treatment system with sample site locations

表1 试验进水水质状况 mg/L

Tab. 1 Water quality parameters (mg/L) at the inlet of the combined system

指标	DO	SS	NH ₃ -N	TN	TP	COD _{cr}
变化范围	1.78~4.76	90.2~214.1	17.4~38.5	21.2~45.7	2.79~4.08	125.3~262.5

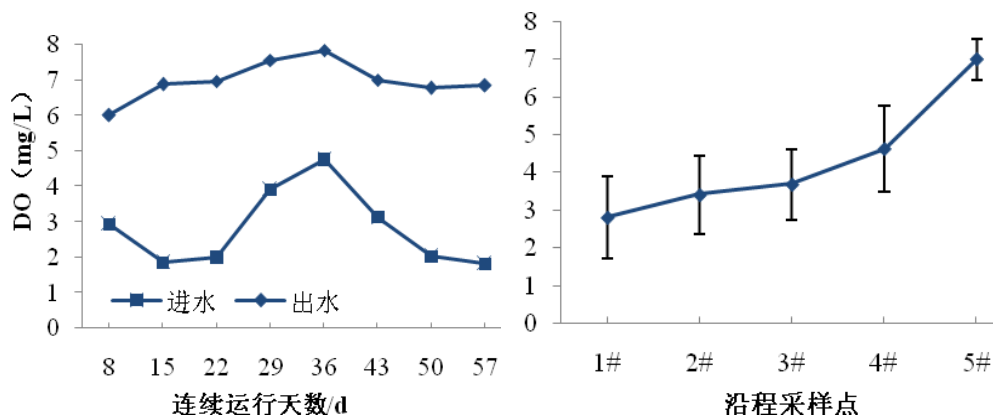


图2 溶解氧浓度变化

Fig. 2 Change in DO with time and by location

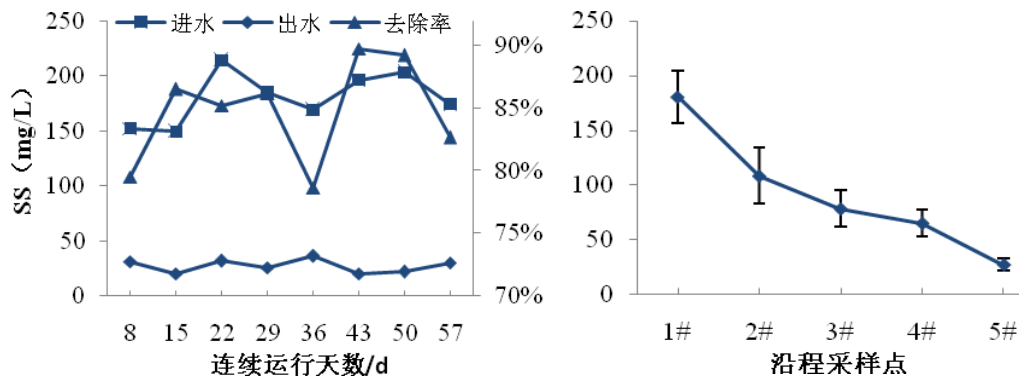


图 3 悬浮物去除效果

Fig. 3 Variation of SS with time and by location

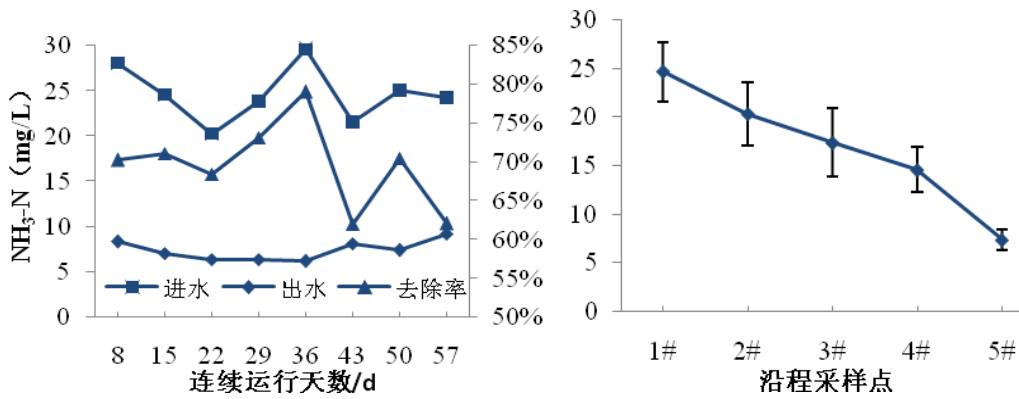


图 4 氨氮去除效果

Fig. 4 Variation of NH₃-N with time and by location

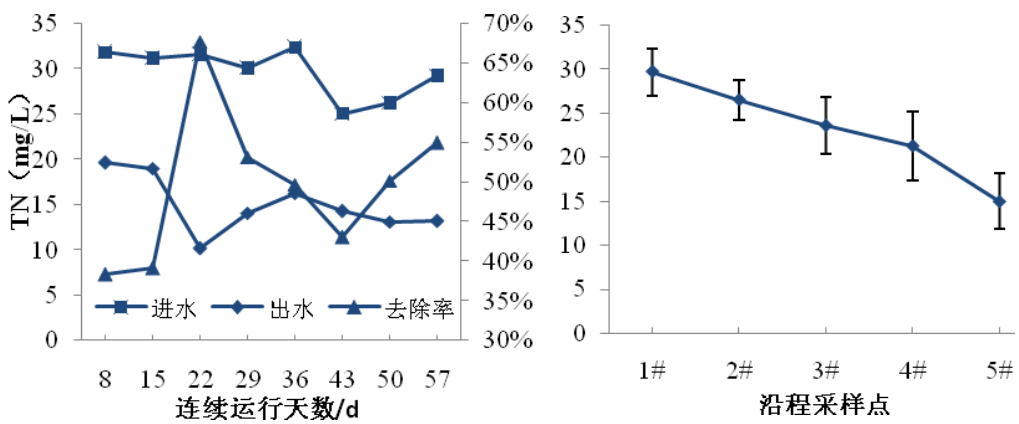


图 5 总氮去除效果

Fig. 5 Variation of TN with time and by location

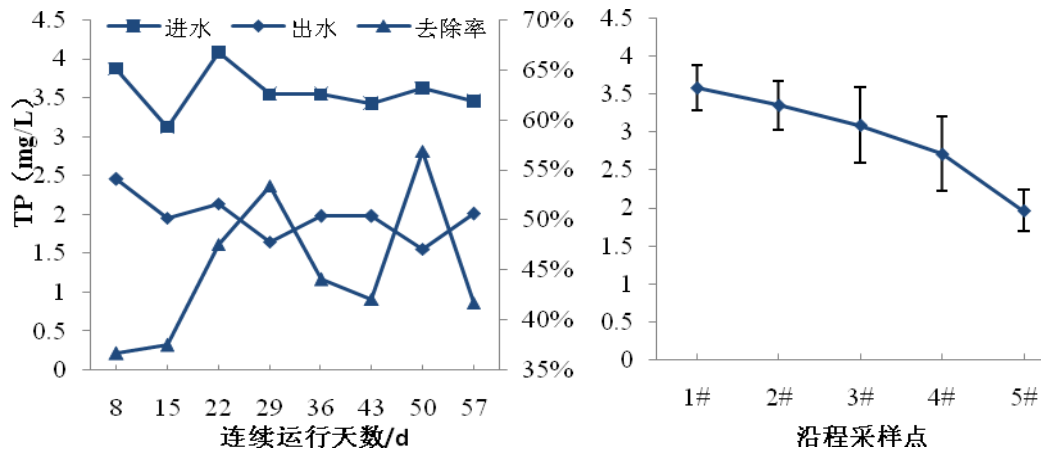


图 6 总磷去除效果

Fig. 6 Variation of TP with time and by location

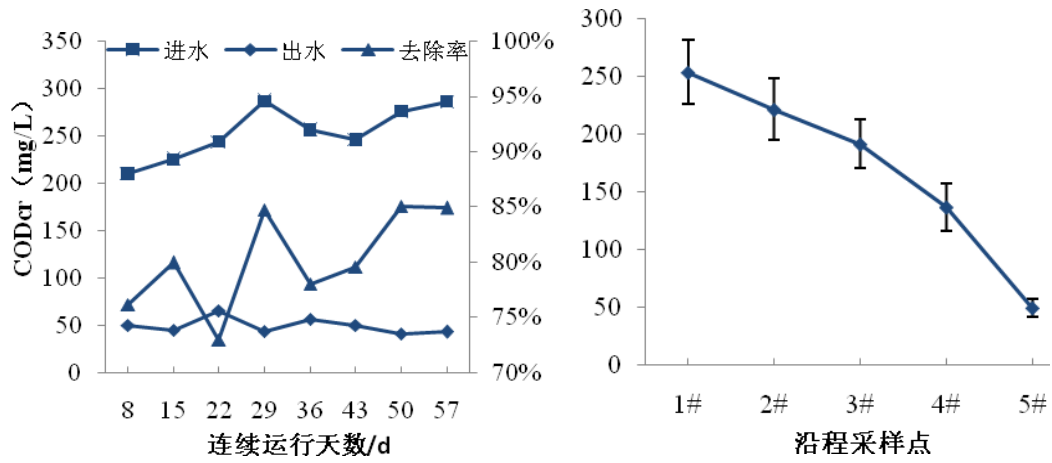


图 7 化学需氧量去除效果

Fig. 7 Variation of COD_{Cr} with time and by location