ZEOLITE FILTERS: AN INNOVATIVE BMP FOR ENHANCED NITROGEN REMOVAL FROM STORMWATER

Authors: Smith, Daniel P.; Flint, Mark; Merriam, Jack

Source: Proceedings of the Water Environment Federation, WEFTEC 2004: Session 81 through Session 90, pp. 541-549(9)

Publisher: Water Environment Federation

Abstract:

Biologically active zeolite filters have the potential to retain and oxidize ammonia nitrogen in stormwater, thereby enhancing overall nitrogen removal when incorporated into a stormwater treatment train. Bench scale evaluation and process modeling were conducted to provide proof of concept for zeolite filters as an innovative Best Management Practice. Stormwater from a collection pond in Hillsborough County, Florida was spiked with 2 mg/L ammonia nitrogen and supplied to a laboratory zeolite-packed filter operated at 0.9 hour detention time for 57 days. The prototype consistently removed over 99% ammonia, producing effluent levels of less than 0.1 mg/L. Biological nitrification was evidenced by an increase in oxidized inorganic nitrogen (nitrite and nitrate) in column effluent. After three weeks of operation, effluent nitrate and nitrite concentrations declined, suggesting that denitrification was also occurring in the prototype column. Two perturbation experiments were conducted to simulate non-steady stormwater events. Minimal ammonia breakthrough was observed following a sudden increase in flowrate and sudden increase in influent ammonia concentration. The combined action of ion exchange and biochemical within the zeolite filter resulted in a consistent and resilient ammonia removal performance. Zeolite filtration appears to have promise in accelerating the ammonia transformation step in stormwater nitrogen treatment. Potential applications of zeolite filters include in-ground or above-ground filtration of urban and residential runoff, side bank filtration for stormwater detention ponds, roof runoff treatment devices, and filtration of parking lot and roadway runoff.

Document Type: Research Article

DOI: https://doi.org/10.2175/193864704784136649

Publication date: January 1, 2004

Kim, Hunho et al., Water Environment Research, American Society for Horticultural Science, ScienceDaily, 2010