

Phosphorus Removal in Wastewater Treatment Lagoons Using Water Treatment Residuals

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Abstract. Phosphorus (P) removal is an important aspect of controlling the increasing eutrophication in this country and around the world. The research presented here describes the development of a sustainable adsorption-based technology that can be implemented in a small-system wastewater environment or for agricultural waste lagoons. The process utilizes an aluminum-based water treatment residual (Al-WTR) from a local water treatment facility that is considered a waste by-product of the operation. The project, being conducted in conjunction with Stewart Environmental Consultants, is aimed at developing a technology that can be used by animal feed operations (AFOs) and rural, small municipalities to meet the more stringent P removal standards that will be implemented in the near future. Batch tests and continuous-flow fixed-bed column tests have been carried out in the laboratory scale using multiple configurations and sand-WTR mixtures. Both domestic wastewater and P-spiked synthetic solutions have been studied for P removal efficacy. The adsorption isotherm of the granular Al-WTR was approximated by a modified Langmuir type, and the maximum adsorption capacity was determined. Al-WTR was shown to be a more effective adsorbent for dissolved reactive phosphorus (DRP) than organic phosphorus (OP) but each fraction had a removal of greater than 90%. Down-flow and up-flow configurations have been tested to help determine the best approach for implementing the technology in wastewater and lagoon applications. Currently, field tests are being planned with the objective of optimizing the configuration of the reactive media and operational characteristics.