# SUMMARY: SAFE DISCHARGE OF LANDFILL LEACHATE TO THE ENVIRONMENT

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Some closed or partially closed landfills still produce important quantities of leachate, but instead of blending this material with active Class I leachate for disposal, there may be better alternatives. If a relatively inexpensive way to pretreat the leachate and safely dispose of it onsite can be developed, a giant step toward the potential for zero liquid discharge can be achieved. FAU has pioneered the advancement of landfill leachate treatment systems using photochemical iron-mediated aeration and $TiO_2$ photocatalysis at laboratory scale in previous research funded by the Hinkley Center, which has led to the development of reactor prototypes for pilot scale testing. The objective of the proposed research is to test a prototype photooxidative reactor at pilot scale to determine the feasibility of safely discharging or reusing this leachate as a resource on-site.

In previous work funded by the HCSHWM, 23 different engineering alternatives for long-term leachate management were evaluated (Meeroff and Teegavarapu 2010). For on-site treatment to work, some form of aerobic treatment would be expected to reduce leachate strength prior to discharge. However, biological systems are not well-suited for the removal of bio-toxics from water and are inefficient in dealing with wastes of varying quality, such as leachate. Thus post-treatment, using constructed wetlands, combined physicochemical treatment, or evaporation systems, would then be required. Unfortunately, technologies such as activated carbon and certain advanced treatment processes, such as ozone, do not adequately address inorganics, and membrane systems or air stripping merely transfer organics to another phase or create a side stream, like concentrate brine, that cannot be discharged readily. Furthermore, multiple barrier systems are complicated to operate, costly, and generally inefficient. For on-site treatment options, the most effective strategies involve technologies that can destroy different classes of harmful contaminants all at once, without producing adverse byproducts and residuals.

Fortunately, FAU has been working to address this need for sustainable, economical options for routine leachate treatment and safe discharge to the environment by investigating energized processes, such as photocatalytic oxidation. In our previous studies involving the use of photocatalytic oxidation technologies for treatment of landfill leachate, we were able to demonstrate destruction of 1400 – 2500 mg/L of COD in just 24 hours. But these leachates had initial COD concentrations on the order of 6,000–10,000 mg/L, so if we start with a less concentrated material (e.g. partially closed landfill leachate), it should be possible to completely destroy the COD with the added potential of meeting the requirements of F.A.C. 62-302 for metals and 62-777 for surface water target levels or even meeting the less stringent industrial water quality guidelines for onsite beneficial reuse of this material.

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**PROGRESS REPORT**
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**Project Title:** Safe Discharge of Landfill Leachate to the Environment
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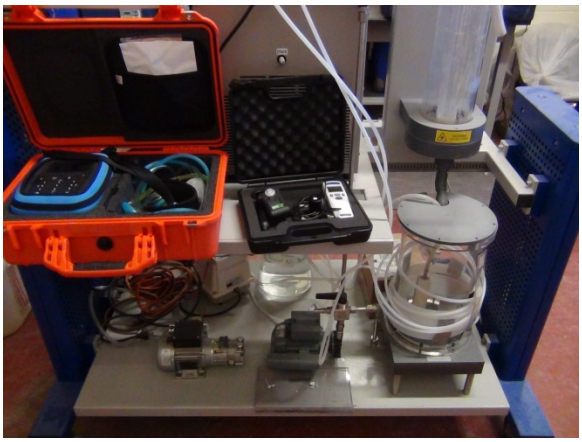
The project is just getting underway, but to date the existing pilot plant has been modified with a new magnetic drive pump with stainless steel shaft to reduce the corrosion impacts from the leachate's high TDS. In addition, a new ultraviolet light sensor to be able to measure more of the full spectrum of the ultraviolet lamp has been installed, and new methods for measuring the offgas have been implemented to better determine the fate of the ammonia and COD during the reaction. The pilot plant is still in the process of being upgraded with a way to increase the UV intensity to help reduce reaction times and is being fitted with a catalyst recovery system.

**Photos of the upgrades to the existing pilot unit**

**Research planned for the upcoming months:**

- Update the literature review.
- Complete upgrades to the pilot unit with respect to catalyst recovery and varying the UV power by possibly using a 3-D printer to manufacture the top distribution weir and lower collection weir fittings for a smaller bore diameter quartz sleeve.
- Meet with FDEP to discuss treatment targets for beneficial uses.
- Start preliminary testing in the lab with leachate samples collected from Dyer Park.