

---

## Liquid-Phase Bioreactor System for Landfill Leachate

### **Challenge**

Envirogen was requested to provide a system to treat leachate from Wright-Patterson Air Force Base's landfills 8 and 10. The leachate contained 400,000 mg/l of BOD, 1,300,000 µg/l COD, and varying amounts of chloroform, BTEX, methylene chloride, TCE, and vinyl chloride among other chemicals.

### **Solution**

Envirogen supplied a full-scale fluidized bed bioreactor (FBR) to treat up to 20 gpm of leachate. The fluidized bed system contained:

- Reactor column containing granular activated carbon
- Recycle pumps to fluidize the carbon
- Oxygen generation and feed system
- Basket strainers, which are located upstream of the reactor column
- Nutrient and supplemental substrate feed systems
- Sodium hydroxide feed system to maintain the pH level in the system
- Biomass separation and carbon return system.

The function of the activated carbon in the FBR system was to:

- Provide a substrate to support microbial growth
- To capture organic compounds through adsorption

The FBR system was controlled by a programmable logic controller (PLC) which monitors several system operating parameters, including:

- Nutrient, supplemental substrate, and sodium hydroxide levels in the storage tanks.
- pH
- Dissolved oxygen content
- Temperature
- Flow rates

### **Results**

The microbial population degraded organic compounds desorbed from the carbon when surge loading decreased. The biomass growing on a carbon particle reduced the particle density causing it to float to the top of the reactor. When the carbon particle reached a certain height, it overflowed from the

reactor and entered a settling tank. The carbon particles left through the bottom of the settling tank and flowed through a pinch valve, which sheared the biomass from the carbon. The carbon was returned to the reactor while the biomass was sent to waste.

The FBR system discharge was piped directly into the Dayton, Ohio POTW.