# Yolo County's Accelerated Anaerobic and Aerobic Composting (Full-Scale Controlled Landfill Bioreactor) Project

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## Background

Sanitary landfilling is the dominant method of solid waste disposal in the United States, accounting for about 217 million tons of waste annually (U.S. EPA, 1997). The annual production of municipal solid waste in the United States has more than doubled since 1960. In spite of increasing rates of reuse and recycling, population and economic growth will continue to render landfilling as an important and necessary component of solid waste management.

Yolo County Department of Planning and Public Works, Division of Integrated Waste Management is demonstrating a new landfill technology called Bioreactor Landfill to better manager solid waste. Co-sponsors of the project with Yolo County are the California Integrated Waste Management, US Department of Energy-National Energy Technology Laboratory (NETL), US Department of Energy-Western Regional Biomass Program, California Energy Commission-Public Interest Energy Research, Solid Waste Association of North America and Institute for Environmental Management (IEM). In a Bioreactor Landfill, controlled quantities of liquid (leachate, groundwater, gray-water, etc.) are added to increase the moisture content of the waste and improve waste decomposition. Leachate is then recirculated as necessary to maintain temperature and moisture at an optimum level for the organic fraction of the waste to decompose.

## Project Benefits

As demonstrated in a small-scale demonstration project at the Yolo County Central Landfill in 1995, this process significantly increases the biodegradation rate of waste and thus decreases the waste stabilization and composting time (5 to 10 years) relative to what would occur within a conventional landfill (30 to 50 years or more). When waste decomposes anaerobically (in absence of oxygen), it produces landfill gas (biogas). Biogas is primarily a mixture of methane, a potent greenhouse gas, carbon dioxide, and small amounts of Volatile Organic Compounds (VOC's). This by-product is a substantial renewable energy resource that can be recovered for electricity or other uses. Other benefits of a bioreactor landfill composting operation include increased landfill waste settlement and a resulting increase in landfill capacity and life, improved leachate chemistry that drains from fractions of the waste, possible reduction of landfill post-closure management time and activities, opportunity to explore decomposed waste for landfill mining, and abatement of greenhouse gases through highly efficient methane capture over a much shorter period of time than is typical of waste management through conventional landfilling. This project also investigates the aerobic decomposition of waste in a 2.5-acre (13,000 tons of waste) for eliminate of methane production and acceleration of waste decomposition.

**Project Status**

In the first phase of this project a 12-acre module that contains a 9.5-acre anaerobic cell and a 2.5-acre aerobic cell has been constructed and filled with over 220,000 tons of municipal solid waste. Portion of the anaerobic cell (3.5-acre) has been covered with reinforced polypropylene (RPP) and gas collection began immediately in early December 2001, when waste filling and cover system installation was completed. Water and leachate addition began in April 2002 and to date less than 200,000 gallons of liquid has been added to the 3.5-acre anaerobic cell. In the aerobic cell 13,000 tons of waste was placed. The waste filling phase of the aerobic cell was completed in June of 2002 and a 12-inches soil cover and 12-inches of greenwaste compost cover was placed on top of the cell. A vacuum will be applied to the piping within the waste to draw air through the landfill. Landfill gas collection for the 2.5-acre aerobic cell and the 6-acre cell is currently under construction. Instrumentations have been installed to monitor the following parameters: waste temperature, moisture, leachate volumes, leachate hydraulic head over the primary liner, leachate composition, gas volumes and composition. A supervisory Control and Data Acquisition (SCADA) system has been installed to monitor and control the operation of the bioreactor cells. All instrumentations installed in the 3.5-acre anaerobic and aerobic cell have been connected to the SCADA system. Waste samples were taken from each cell for laboratory testing in early June 2002.