FOREST PRODUCTS
Project Fact Sheet

REDUCING EMISSIONS OF VOLATILE ORGANIC COMPOUNDS

BENEFITS

- A simple, reliable, and economic method for treating contaminated gas streams from pulp mills and other industrial sites
- Beneficial also to municipal wastewater treatment plants, where odor control is a problem

APPLICATIONS

During the third year, a demonstration of the pilot plant will be set up at an actual pulp mill site. Successful completion of these demonstrations would lead to commercialization of the new process.

Biological Treatment System Proposed To Control Emissions of Volatile Organics and Odors

A number of pollutants that originate from pulp mill operations fall under the Environmental Protection Agency's guidelines for controlling emissions of hazardous air pollutants (HAPs). Gas streams with high concentrations of HAPs are likely to be handled by incineration or steam stripping. These thermal treatment methods are highly energy-intensive, however, and result in high treatment costs. For more dilute gas streams (known as high-volume low-concentration (HVLC) gas streams), biological treatment technologies offer an economical alternative to thermal treatment methods.

HVLC streams are produced from a variety of plant processes. For example, chlorinated organic compounds are present in HVLC streams produced during bleaching operations. Other organic compound emissions of concern include methanol, acetone, aldehydes, terpenes, and benzene. The specific sources of these dilute gas streams might include foam breaker, filtrate, and black liquor tanks; knotter systems; brownstock storage tanks; pulp washers; oxygen delignification blow gas and washer areas; and others. Although odorous emissions from mills are not covered by EPA's rules, they are part of the 2020 Environmental Agenda, and their control is also desirable since they may contain such compounds as hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide.

Because the majority of the organic compounds emitted in pulp mill gas streams are biodegradable, it is believed that biological treatment is an economically sound, technically-feasible method for their handling.

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ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

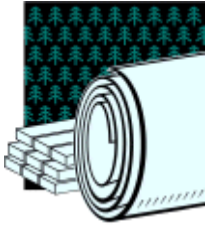
PROJECT DESCRIPTION

Goal: To develop a shallow suspended growth sparged gas reactor (SSGR) system for the cost-effective treatment of HVLC gas streams.

Rather than employing conventional biological gas-treatment systems such as biofilters or biotrickling filters, both of which contain a media to trap odors and emissions, the investigators propose further work on a non-media system. In the SSGR, the organic or the odor-causing inorganic pollutants are introduced as gas bubbles into a liquid phase containing a "suspended growth biomass," and the pollutants are transferred from the gas to the liquid phase as the bubbles move through the liquid. Even in a shallow reactor, where energy use and capital and operating costs are minimal, gas-liquid mass transfer rates can be efficient enough to remove more than 98 percent of the contaminants. The investigators will determine the operating conditions that are most efficient for treating HVLCs, while minimizing the liquid depth of the reactor.

PROGRESS & MILESTONES

- Determine the biodegradation kinetics of organic and odor-causing compounds
- Calculate the mass transfer and Henry's coefficients for the compounds
- Maximize the mass transfer rates and optimizing the SSGR system
- Test the SSGR in a pilot plant, and evaluating the economy of the SSGR system relative to other methods
- Test the pilot system at an actual pulp and paper mill



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