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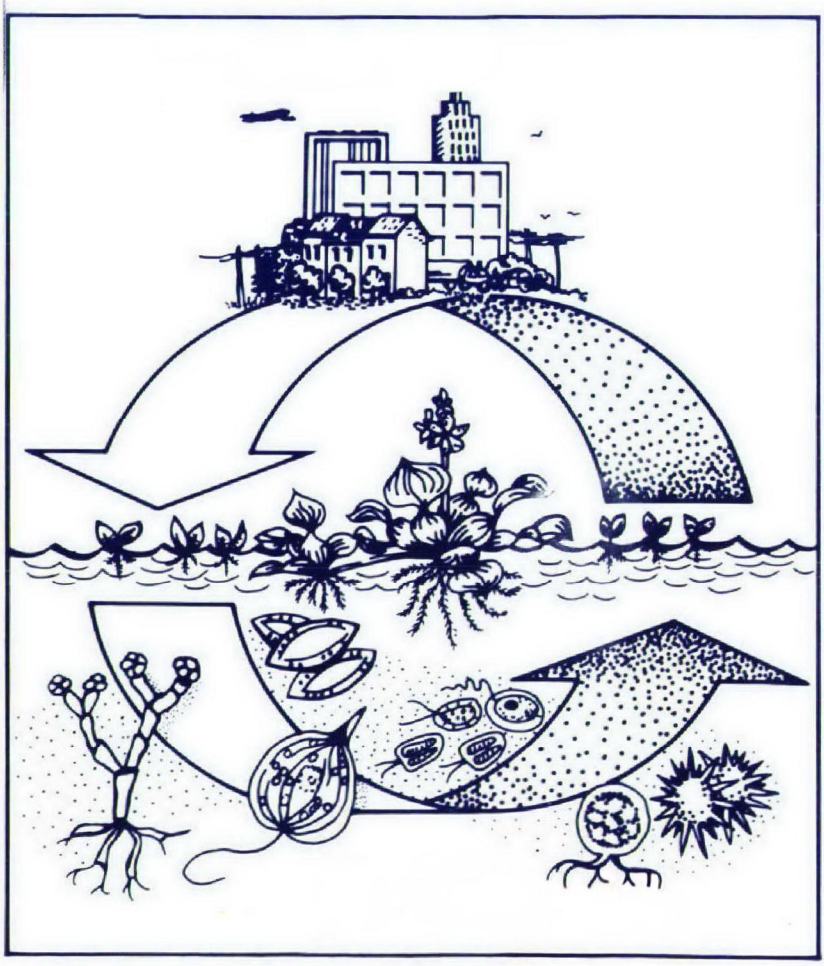
Innovative and Alternative (I/A) Technology

Wastewater Treatment to Improve Water Quality and Reduce Costs



Innovative and Alternative (I/A)

Introduction

The monetary burden of meeting required wastewater discharge standards to protect the environment is increasing for many communities throughout the country. As the annual costs of labor, energy, chemicals and sludge disposal grow, city administrators are seeking better alternatives to achieve the national goal of clean water. Many are learning that appropriate innovative or alternative (I/A) systems will improve water quality at less cost.

This folder describes I/A systems for wastewater treatment and explains how a community can qualify for increased EPA construction grant benefits.

What are Innovative and Alternative (I/A) Technologies?

The Clean Water Act of 1977 (PL 95-217) defined and authorized special construction grant provisions for wastewater treatment called the INNOVATIVE AND ALTERNATIVE TECHNOLOGY PROGRAM. These provisions establish increases in grant funding for applicants who are willing to choose a nonconventional system.

ALTERNATIVE systems are fully proven systems that reclaim or reuse wastewater, productively recycle wastewater components, recover energy, or eliminate the discharge of pollutants.

Specific technologies have been identified as alternative treatment systems. They include land treatment (rapid infiltration, slow rate irrigation and overland flow), aquifer recharge, aquaculture, direct reuse (nonpotable), horticulture, revegetation of disturbed land, total containment ponds, preapplication treatment and storage of treated effluent (prior to land treatment), land application of sludge, sludge composting, sludge drying (prior to land application), methane recovery and use, and self-sustaining incineration. In addition, for small community systems, on-site treatment (individual or cluster), septage treatment and alternative collection and conveyance systems utilizing vacuum sewers, pressure sewers and/or small diameter gravity sewers are considered alternative technologies.

INNOVATIVE treatment systems use technologies that are developed but not yet fully proven. They are based upon documented research and demonstration projects

that show promise of benefits that outweigh potential risks. The term "innovative" does not apply to specific treatment processes. Rather, the designation "innovative" is made on a case-by-case basis by the appropriate State and EPA construction grant officials.

To be funded by the I/A technology program, an innovative process or system must be significantly different from proven conventional or alternative technologies. Conventional or alternative systems, or components of such systems, must contain an element of risk before they can qualify as innovative and become eligible for an EPA construction grant bonus.

In addition to the element of risk, an innovative system must advance the state-of-the-art in any of the following areas:

- Cost Reduction
- Recycling, Reclamation, or Reuse of Water
- Energy and Resource Conservation
- Improved Joint Industrial/Municipal Treatment
- Elimination or Confined Disposal of Pollutant Discharge

By definition, all I/A systems MUST offer the potential to accomplish one of the following:

- Reduce costs or energy demand
- Recycle water or other wastewater resources
- Eliminate pollutant discharge

Examples of I/A Benefits

The following examples illustrate the results of creative wastewater treatment planning by municipal officials and engineers with the support of local citizens. The communities described are good examples of where this approach was used to solve a problem. These examples represent only a few of the I/A technologies available to U.S. communities. They are presented to stimulate creative thinking, rather than to promote any particular process.

1. Low Operation and Maintenance Costs

During the early days of the EPA construction grants program, many small communities replaced failing septic systems by building a centralized wastewater collection system and a conventional treatment plant.

Recent experience is proving that a far less costly and more environmentally sound alternative is to upgrade or rehabilitate faulty septic systems. Other communities are finding that the combination of a small central treatment plant serving the mid-town, plus upgraded septic systems serving the outlying neighborhoods, is a more cost-effective solution to their wastewater management problems. In either case, a community septic system management program insures adequate maintenance and continued good performance of upgraded septic systems (Woodstock, NY).

2. Reliability
Wastewater irrigation is one of the oldest and most reliable alternative treatment technologies. The systems, called land treatment, protect water quality by combining pre-treatment and storage of wastewater with agricultural irrigation.

The largest U.S. slow rate irrigation land treatment system, built in Muskegon, Michigan in the mid-1970s, is turning 35 million gallons per day (mgd) of industrial and municipal wastewater into high quality irrigation water. Annual revenues from the sale of irrigated corn crops continue to offset operation and maintenance costs so dramatically that users in the Michigan community paid only 30 cents per thousand gallons of sewage treated in 1982 (Muskegon, MI; Clayton County, GA; Lubbock, TX).

Two other land treatment alternatives are rapid infiltration, which is suitable for communities with porous sandy soils and deep water tables (Lake George, NY; Corvallis, MT); and overland flow, which is suitable for impervious clay soils in locations with higher water tables (Davis, CA; Lamar, AR).

All three types of land treatment, if well designed and operated, may provide the equivalent of advanced wastewater treatment with less capital cost. In addition, revenues from the sale of reclaimed water or crops may offset much of the system's operating and maintenance costs.

3. Simplicity
Aquaculture and wetlands systems, like land treatment, utilize micro-organisms and plants to consume wastewater pollutants. They are often simpler to operate and maintain than high technology conventional systems. In an aquatic plant system, the

major operation and maintenance costs are usually directed to harvest and disposal of the plants themselves. Income produced from the recovery and sale of energy or compost from this harvest helps to offset treatment costs (San Benito, TX; Houghton Lake, MI; San Diego, CA).

4. Energy Savings and Income Production
A reduction of up to 50 percent of the energy required for conventional activated sludge aeration may be realized by using a system that offers more efficient oxygen transfer. Both counter-current aeration and fine bubble aeration are processes that have had extensive use in Europe. Data from similar systems operating in the U.S. confirm such savings (Los Angeles County, CA).

Anaerobic digestion of sludge or harvested plants will produce methane gas. This by-product can be used to fuel operations at the treatment plant, or can be used in vehicles and generators that have been adapted to burn methane (Charlotte, MI).

Composting sludge and/or plants produces a high quality soil conditioner that is extensively utilized at nurseries and farms. Income from the sale of compost can significantly reduce operating costs (Montgomery County, MD; Durham, NH).

Many land treatment systems sell treated wastewater for irrigation or for industrial cooling and processing. In water-short regions effluent purchased from land treatment systems for irrigation water can make the difference between a bountiful or a scorched harvest (Paynesville, MN; San Angelo, TX).

EPA Construction Grants I/A Program
Provisions for financial incentives through bonus funding of I/A systems was added to the EPA construction grants program by an Act of Congress (PL 95-217) in December 1977. The Federal government funded a three-year effort, beginning October 1978, to encourage resource conservation and recovery in wastewater treatment plants. During the initial three-year period, the I/A approach to wastewater treatment demonstrated promising environmental benefits. The Clean Water Act was, therefore, amended in 1981 to strengthen and continue the I/A incentive funding through September 1985. From October 1978 through April 1984, EPA granted over

2,900 awards to design and construct over 1,400 facilities with innovative or alternative components. The value of these bonuses totaled over $323 million, with projected savings of over one billion dollars.

How to Take Advantage of I/A Funding Benefits
Any community listed on the fundable portion of the State's construction grants priority list is eligible to apply for Federal funds to finance the construction of wastewater treatment facilities. Should it be determined that an I/A system meets the environmental and cost-effective criteria, bonus Federal funding is available that will reduce the local share of the construction costs. (For details see the current EPA Grants for Construction of Treatment Works Regulations, 40 CFR, Part 35).

Cost Advantage for I/A Technologies
Selection of the system or technology for award of construction grant funds is based on environmental considerations and a facility plan cost-effectiveness analysis. Exceptions to the cost effectiveness analysis rule are made in the case of I/A technologies. Present worth costs for I/A technologies may exceed, by as much as 15 percent, the present worth cost of the most cost-effective conventional system described in the facility plan and still be fully eligible to receive the grant award.

Special Funds for I/A Projects
I/A grants are funded from a portion of each State's total annual allotment of Federal construction grant funds. Each Governor must set aside a statutory minimum, but not more than a statutory maximum, of the total annual State construction grant allotment as a reserve to provide the bonus for I/A projects. The range for fiscal years 1982 through 1985 is 4 to 7 ½ percent (of which ½ percent must be for innovative projects only). Congress establishes these values each time it passes authorizing legislation.

States with at least 25 percent rural population must reserve 4 percent of their annual construction grant allotment to fund the base share of EPA support for sewage treatment systems in small communities (less than 3,500 population), or sparsely populated areas of larger communities. The Governors of other States may elect to do the same. Funds from this reserve provide the base grant to which the I/A bonus funds are added when I/A technologies are selected for a small community.

Field Testing

Special pre-construction grant awards and separate field testing grant provisions in the 1981 Clean Water Act Amendments enable a community to obtain an I/A grant to pre-test a high risk I/A system. These awards are designated as field tests and enable verification of design parameters for one or more full scale systems. The field test reduces the element of risk for applicants considering an I/A technology.

Modification/Replacement Grants

If within two years after initial operation, all or part of your I/A system fails to meet performance standards, and the failure is due to the innovative or alternative elements of the system, you are eligible to request modification or replacement (M/R) grant assistance. To justify award of an M/R grant, you must document that the system failed to meet performance standards, that significant additional capital expenditures and/or significant operation and maintenance costs are required to correct the problem, and that the failure is not due to negligence.

I/A Program Assistance

The EPA Office of Water Program Operations (OWPO) in Washington, D.C. coordinates the National I/A program. This office develops policy and provides guidance and technical information on the the status of various I/A technologies and projects. The EPA Office of Research and Development (ORD) conducts research and provides technology information through the Municipal Environmental Research Laboratory (MERL) in Cincinnati, Ohio and the Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma. For additional information about the I/A program, please contact your State construction grants program office or the I/A Coordinator at your EPA Regional office.

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