



Tennessee Valley Authority, 1101 Market Street. Chattanooga. Tennessee 37402

September 5, 1991

Mr. Robert Carter
Office of Pollution Prevention
Post Office Box 27687
3825 Sarett Drive
Raleigh, North Carolina 27611-7687

Dear Mr. Carter:

This is to inform you that scientists and engineers from the University of Alabama at Huntsville (UAH), and the Tennessee Valley Authority's National Fertilizer and Environmental Research Center (NFERC), have developed and tested a Solar Evaporator to concentrate aqueous-based hazardous wastes. Tests in North Alabama have shown the passive "one-sun" solar system to evaporate 20 gallons of aqueous wastes/ft²/year as water vapor. A prototype outline drawing is enclosed. The project was funded jointly by TVA and the State of Alabama through a special research consortium designed to develop and commercialize new technology.

The solar evaporator was developed to meet the needs of small industrial and agricultural firms that need low-cost and easily maintained equipment. A study by UAH found over 8,000 potential industrial users in the state of Alabama. Firms suggested for initial targeting included electroplating shops, fabrication shops, and electronic parts manufacturers. The system offers a low-cost alternative to costly "end-of-pipe" treatment and disposal. In certain processes, the concentration step may be sufficient to allow the waste to be recycled directly into the process in-feed.

Some advantages of the Solar Evaporator include:

- *Low capital, maintenance, and operating costs.
- *Short payback
- *Simplicity
- *Concentrate waste "in-house"
- *Passive operation
- *High volume reductions (e.g. potential lower regulated status)
- *Less waste to be transported, treated, and disposed

The Alabama Department of Environmental Management (ADEM) has concluded that it may be possible to operate the evaporator in a manner which will reduce the regulatory requirements applicable to the unit. The

technology might be considered "in-process" or regulated under an existing NPDES or POTW pretreatment permit. However, ADEM has stated that this determination is strictly case-specific and generalizations cannot be made regarding the specific regulatory status of each application.

Consideration of each installation on a case-by-case basis is prudent and expected to be echoed by regulatory authorities in other jurisdictions.

However, if the technology status can be resolved by general consensus and formalized by interpretation and rulemaking to be in-process rather than treatment, the case specific review will be simplified. This will allow regulatory acceptance to be more predictable and facilitate technology transfer.

Please consider the economic and environmental pros and cons of this technology and provide your comments at the Southeastern Hazardous Waste Management Roundtable Conference in Atlanta, September 30 or feel free to call.

Additional research demonstrations are being considered for different locations and applications in the Southeast. If you would like to know more about this technology or discuss a potential demonstration in your state, please contact the NFERC staff listed at the end of the project summary. For general questions or comments contact me at TVA, HB 2G Chattanooga, Tennessee 37402, (615) 751-4574.

Sincerely,


J. Carroll Duggan, Manager
Waste Reduction and Management

Enclosure

SOLAR EVAPORATOR/CONCENTRATOR
FOR HAZARDOUS WASTE REDUCTION

PROJECT SUMMARY

INTRODUCTION: Policy directives from the Environmental Protection Agency, Office of Pollution Prevention and Office of Toxic Substances, challenge industry to change business practices in the 1990s to prevent pollution rather than to treat pollutants at the end of production processes. Both Federal and State regulatory programs are incorporating pollution prevention in environmental management. Consequently, industry is being strongly urged to adopt a pollution prevention and toxics use reduction perspective.

RESEARCH: Research supported by the Alabama Universities/TVA (Tennessee Valley Authority) Research Consortium over the past four years has resulted in a passive, "one-sun" solar evaporator/concentrator. This solar evaporator/concentrator, developed at the University of Alabama-Huntsville can easily be used by small quantity aqueous waste generators. Research on additional applications for solar evaporation/concentration, combined with destruction of contaminants in various wastes, will begin this summer. To date, cooperative research and individual technology demonstrations are in early planning stages with three land-grant universities and four fertilizer dealerships.

DEMONSTRATION: Demonstration of a solar evaporator/concentrator unit for reducing metal plating wastes is complete at Banner Fabricating, Huntsville, Alabama. Data from this demonstration unit show that 800 to 1,100 gallons of water per year can be evaporated from this commercial size unit. The unit is approximately 8' x 7' x 5' and has about 44 ft² of solar glass. Total cost for fabrication of the unit from stainless steel, along with installation, was \$5,600.

Because of a significant reduction in waste and the in-process design of the solar evaporator/concentrator demonstration unit, off-site waste disposal has not been necessary after 18 months of operation. Based on data gathered from this demonstration site, accumulation of less than one barrel of residue is anticipated every three years.

Before installation of the solar evaporator/concentrator at Banner Fabricating, monthly disposal of one 55-gallon drum of aqueous waste was required at a disposal cost of \$1,000 per month. Now, by utilizing this effective waste reduction technology, the firm saves the \$1,000 per month previously spent for waste disposal. No additional personnel are required to operate this unit and very little, if any, maintenance is required.

Environmental regulatory officials from the Alabama Department of Environmental Management are observing the unit on a random basis. The demonstration continues to receive a good review from the State regulatory officials.

TVA is planning demonstration projects for 1991/92 to gather data on the applicability of the solar evaporator/concentrator unit to a variety of waste streams. The initial focus of one of these projects will be the reduction of pesticide rinsewaters generated at fertilizer dealer sites. The successful demonstration of the solar evaporator/concentrator unit's potential at Banner Fabricating, coupled with the low-cost, low-tech nature of the technology, indicates strong potential for future successes at many industrial sites.

COMMERCIALIZATION: The purpose of the Alabama Universities/TVA Research Consortium work is to develop and commercialize technology which could stimulate economic development and growth in the State of Alabama. An important part of TVA's mission is to develop the resources of the Tennessee Valley region. The Environmental Technology Demonstration at Banner Fabricating and those planned for several fertilizer/agricultural dealerships in 1991/92 should be viewed as models for adaptation through the United States. To date, one north Alabama company has indicated interest in possible commercialization of a waste reduction service based on this solar evaporator/concentrator technology.

INFORMATION: For further information on the solar project contact: David G. Salladay, Manager, Engineering Introduction, at (205) 386-2690 or Doris Ash, Research Chemist, Chemical Research Department, at (205) 386-2458. Written requests for information may be directed to either person just mentioned at the following address: Tennessee Valley Authority, National Fertilizer and Environmental Research Center, P.O. Box 1010, Muscle Shoals, Alabama 35660-1010.

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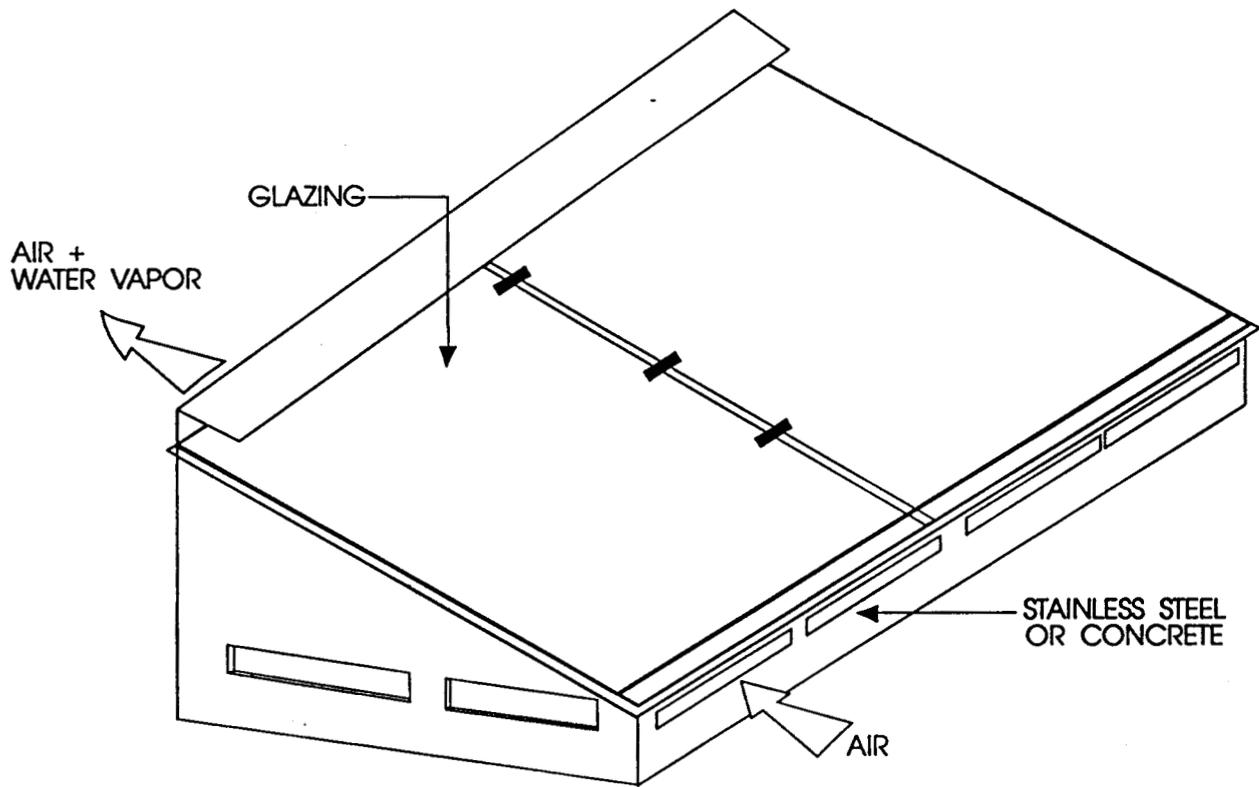


FIGURE : SCHEMATIC VIEW OF EVAPORATOR

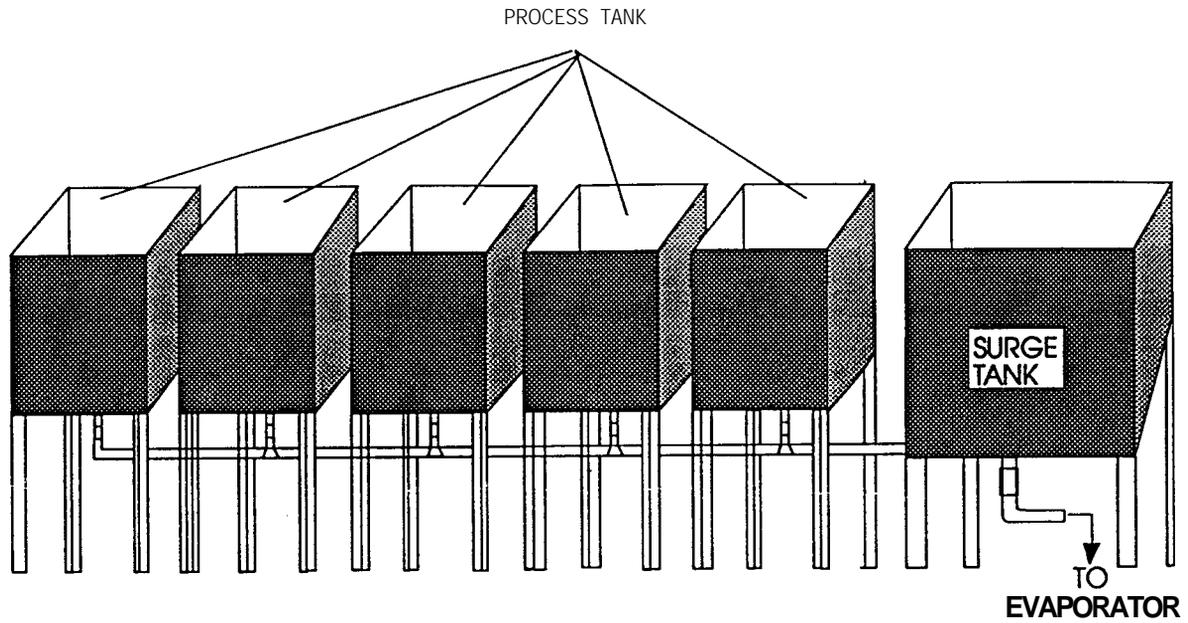


FIGURE : PLATING TANKS

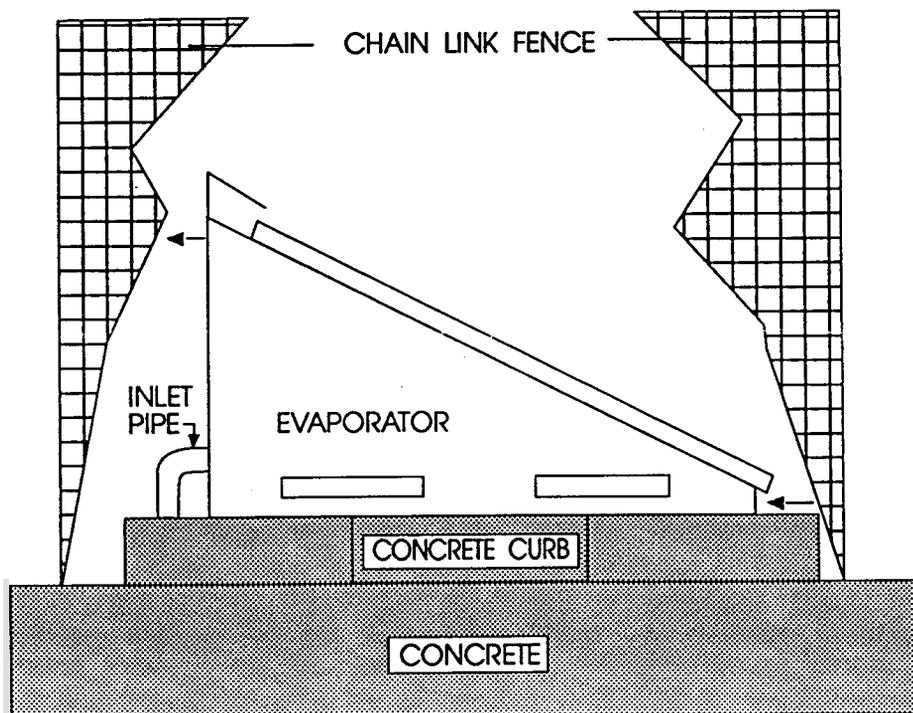


FIGURE : ELEVATION VIEW OF EVAPORATOR INSTALLATION