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Jo Anne Zoff Sellner
Director

Senate

State of Minnesota

January 13, 1999

To: Senator Dan Stevens

From: Peter S. Wattson, Senate Counsel
651/296-3812

Subj: Advisory Opinion on Job Offer from C.E. Rogers Company

You have asked the Subcommittee on Ethical Conduct for a written advisory opinion on whether you face any potential conflicts of interest if you accept a particular kind of private employment. In addition to the written materials you provided to the Subcommittee, you appeared before the Subcommittee at a public hearing on January 12, 1999, and answered questions about the proposed employment and its relationship to your legislative duties. This opinion is based on the information you have provided to the Subcommittee.

1. Job Offer

You have been invited to apply for a position as project manager with the C.E. Rogers Company of Mora, Minnesota. The company has provided evaporation and condensation technology to the milk processing industry for more than 100 years. A newer application of that technology is a process called MVR, or mechanical vapor recompression, which cleans wastewater by first evaporating the water (leaving waste products behind) and then recompressing the vapor in its purified state. The cleaned wastewater may then be reused in a plant or discharged into a waterway. The company has used MVR to treat industrial wastewater from a milk processing plant in California.

The company proposes to use this process in Minnesota to treat municipal wastewater from the city of Mora, where you reside, and would like to hire you to serve as manager for the project. The company has asked the Senate to "thoroughly investigate any potential conflicts of interest that might arise from your part-time employment with C.E. Rogers Company while retaining your Senate seat."

2. Potential Conflicts of Interest

The two conflicts of interest you have identified arise from your previous relationships with the Department of Trade and Economic Development and the city of Mora.

a. Department of Trade and Economic Development

The project will be paid for with money received by the city as a grant from the Department of Trade and Economic Development ("DTED"). The money for the grant came from an appropriation in the 1998 Capital Budget Bill, chapter 404, section 9, subdivision 3.[1] The grant has been awarded to the city because of the desire of DTED to develop and promote innovative ways to treat municipal wastewater.

You are not a member of the Committee on Jobs, Energy, and Community Development, nor the Economic Development Budget Division, through which the DTED budget passes. You did not have any involvement with the appropriation to DTED for the grant program. In fact, you voted against the omnibus bonding bill that included the appropriation when the conference report was before the Senate. JOURNAL OF THE SENATE 7663-64 (Apr. 9, 1998).

b. City of Mora

You have been assisting the city of Mora and C.E. Rogers Company for the last two years as an uncompensated volunteer assisting the city to develop the project and secure the funding. You wrote most of the grant proposal submitted by the city to DTED because Mr. Steve Jones, the city administrator, left Mora to take a position with the city of Montevideo. You have not asked for employment or consultation contracts from any of the parties involved, nor have any been promised. You have not acquired confidential information about the city's side of the contract while working on behalf of the city.

3. Conflict of Interest Law

Our Constitution creates a part-time legislature. The Legislature is prohibited from meeting after the Monday after the third Saturday in May or for more than 120 days in a biennium. The reason we have a part-time legislature is so that we may have a citizen-legislature, filled with members who must spend the greater part of each year earning a living under the laws they have enacted. We have thought this is good, because it helps to keep legislators in touch with the real-

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[1]The authority shall set aside up to $500,000 to provide 50 percent grant funding for the cost of equipment and installation into an existing municipal wastewater treatment system. The project must demonstrate the application of existing technology that currently is not being used in the treatment of municipal wastewater, but has the potential to improve the treatment of wastewater or make the treatment process more cost effective. The authority should work with the pollution control agency to solicit proposals from municipalities willing to share the risks and cost of removing the equipment if it does not perform.

world problems of their constituents. However, it also means that legislators may occasionally have conflicts between their official duties and their private employment.

Our conflict of interest law is primarily a disclosure law. It assumes that a public official will occasionally have conflicts of interest. This is especially true for legislators. When a conflict arises, a public official must disclose the conflict and ask to be excused from taking part in the action or decision in question.

The kinds of conflicts the law is concerned with are financial conflicts, ones where the personal financial interests of the official will be affected by a decision the official makes. The law describes a conflict of interest situation as one where:

> A public official . . . in the discharge of official duties would be required to take an action or make a decision that would substantially affect the official's financial interests or those of an associated business, unless the effect on the official is no greater than on other members of the official's business classification, profession, or occupation . . . .

Minn..Stat. § 10A.07, subd. 1 (1998).

4. Opinion

Since you had no personal financial interest in the appropriation for the grant at the time it was enacted, no conflict of interest question arose. When the question arises now, you are not being asked to make a decision in your capacity as a public official, but rather as a private citizen. You must look to the future, when you may be asked to make decisions as a legislator on further funding for the innovative grant program. For example, if you were asked during the 1999 session to carry a bill or support an appropriation to provide more money for the innovative grant program in order to continue the project in Mora of which you are the project manager, you would have to disclose your personal financial interest in the appropriation and ask to be excused from voting on it. On the other hand, your being employed on one innovative project would not require you to ask to be excused from discussions and votes on innovative projects generally.

The decision on whether the benefit from this employment contract will outweigh the cost of perhaps having to excuse yourself from carrying some bills and voting on some issues, and perhaps being subject to political criticism for accepting the contract, is one I would leave to you.

PSW:ph

cc: Subcommittee members
George McCormick

DANIEL L. STEVENS

1949 Collin Street
Mora, MN. 55051

Phone 320/679-4085
Fax 320/679-3968

January 12, 1999

MINNESOTA SENATE RULES & ADMINISTRATION
Subcommittee on Ethical Conduct

REQUEST AN OPINION IN REGARDS TO CONFLICT OF INTEREST.

Representing a senate district in Minnesota is very interesting and involves us in many things that are not foreseen which requires a high standard of ethical conduct. I am appearing before this committee today to make you aware of my interest in the position of project manager for a company which will be involved in an Innovative Technology Grant project for the Department of Trade and Economic Development.

Several years ago Howard Rogers, President of C.E. Rogers Company, contacted me about a process they had used to treat industrial wastewater. (*Please refer to the articles supporting the evaporation technology which are included in the Grant Application.)* He expressed interest in research and development for the treatment of municipal wastewater. Minnesota does not have a policy for funding research and development for private companies and I support this policy. However, Minnesota does grant funds to public-private projects where a political subdivision or a state college or the University of Minnesota is also involved.

Over the next 2-3 years I assisted the City of Mora and C.E. Rogers Company in setting up two meetings with DTED and one meeting with MPCA . The MPCA has confirmed that approximately $1.5 billion of wastewater infrastructure needs are required in the next 5 years. I have had a working relationship with staff from the MPCA and the Office of Environmental Assistance (*then called the Office of Waste Management*) which dates back to 1985 when I was a township supervisor and later served as a county commissioner. Serving on the Senate Environment and Natural Resources Committee has further developed my interest in the area of wastewater treatment.

I can testify that no special legislation was ever authored by me for the Innovative Technology Grant program created by DTED. This was an initiative of the Administration that is a return to policy of wastewater innovation projects which previously existed on a federal level. (*Please refer to DTED memo from Terry Kuhlman.)* This program was part of the 1998 Bonding Bill which I did not support.

Secondly, the grant funds from DTED will only be used to purchase capital equipment by the city of Mora, costs for utility expenses and any legal costs relative to contracts or consultations with attorneys for this project. The total cost of the project is about $800,000 and only $400,000 are eligible for reimbursement by DTED. The city of Mora will pay for setup costs, laboratory expenses, plant operator, equipment operator and accounting costs totaling about $150,000.

commissioner. Serving on the Senate Environment and Natural Resources Committee has further developed my interest in the area of wastewater treatment.

I can testify that no special legislation was ever authored by me for the Innovative Technology Grant program created by DTED. This was an initiative of the Administration that is a return to policy of wastewater innovation projects which previously [illegible]

C.E. Rogers Company has already spent over $250,000 in R & D costs relating to utilization of evaporation technology in the treatment of wastewater. They are prepared to commit $255,000 more in additional costs in project management, engineering expenses and design support, trailer equipment, equipment setups and project evaluation and report preparation. No state funds are requested for reimbursement of project management expenses.

I can further testify that I have not received any compensation or promises of employment from either the city of Mora or C.E. Rogers Company for the time I spent on this project. I did write most of the grant application because the Mora City Administrator, Steve Jones, took an administrator's position in Montevideo. I informed the staff at DTED and MPCA that I would be writing the grant proposal for the city of Mora and C.E. Rogers Company. The staff at DTED informed me that any costs incurred by the city for grant writing are not eligible for reimbursement or matching funds which was satisfactory with all the parties involved.

The reason that I am requesting a meeting with the committee is my involvement in the grant writing phase of this public-private project. There are some people who will raise questions of conflict of interest whenever any legislator is connected with any state funding. I know that I have acted in an ethical and responsible manner in every way with regards to this project.

C. E. Rogers Company contacted me by letter in late November to ask me to consider applying for the position of project manger. They also requested me to find out if any conflicts of interests would occur from part-time employment with their company and my position as a state senator. I don't think that anyone here today knows whether any potential conflicts of interest will ever arise, however we have rules in place today to excuse senators from voting if any conflict of interest should arise.

As long as we are a citizen legislature and we can and do have outside income sources there will continue to be questions of conflicts of interests. Many of these questions will be politically motivated. However, I can only pledge to be honest and ethical in my position as a state senator.

Thank you for your time and consideration on this matter. I hope this meeting today will in some way help guide us in our standards of fairness, responsibility and ethical behavior in the Minnesota Legislature.

Sincerely,

Dan Stevens

DAN STEVENS
State Senator of District 17

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Senate

State of Minnesota

MEMORANDUM

DATE: December 16, 1998

TO: Senate Ethics Sub-committee

FROM: Senator Dan Stevens DLS

RE: Opinion of conflict of interest requested.

Enclosed you will find a letter to me from C.E. Rogers Company inviting me to apply for a project manager position with their company. Usually any Minnesota Senator could seek employment or work for any company without question. However, I fully understand perceptions of the media and the public if any impropriety is suspected. Since we are a part-time, citizen legislature, outside employment is either required or desired by the majority of us.

I will give you some background and would be more than willing to discuss this at a committee meeting. The city of Mora obtained an innovative technology grant from DTED to purchase some equipment from C.E. Rogers Company for a demonstration project. I have had discussions with all parties involved for over two years and I wrote most of the grant proposal for the city of Mora. The city administrator of Mora left for another job in June and they did not hire another one until October.

I have not asked for, nor have I received any compensation from the city of Mora or C.E. Rogers Company for any of my time or expense. I have not asked for employment or consultation contracts from any parties involved, nor have any been promised. C.E. Rogers Company is a very reputable company that has been in existence for more than 100 years and they are very protective of their company's good name. They are requesting that the Senate "thoroughly investigate any potential of a conflict of interest."

I have also attached a memo from Mn Department of Trade and Economic Development which cites the creation of an innovative technology grant program for wastewater treatment. Also attached is a copy of the grant proposal. There was another applicant in the first round of applications and money still exists for other matching grants. Minnesota cities are facing over $1.5 billion of infrastructure costs for wastewater treatment over the next five years. If existing technology from other industries can be utilized in wastewater treatment and reduce capital or O & M costs all of the taxpayers in Minnesota will benefit.

I have not submitted a resume to C.E. Rogers Company, but I will do so in the near future. Also, I would be inclined to accept the project mangers position if it was offered to me. I sincerely believe that no conflict of interest exists and I will look forward to appearing before your committee to answer any questions.

I realize that most issues come before your committee "after the fact" and I feel that any potential conflicts should be dealt with in an open straight-forward manner beforehand. I would appreciate your consideration of my request for a written opinion at your earliest convenience. Thank you.

C E ROGERS COMPANY

1895 Frontage Rd. P O Box 118 · Mora, Minnesota 55051
320-679-2172

November 25, 1998

Mr. Dan Stevens
1949 Colin Street
Mora, MN 55051

Dear Dan:

We at C. E. Rogers Company would like to express our thanks for the assistance and support which you have provided to us over the last several years. This assistance has been a great help to us in new product development, most specifically on the DTED Grant Application with the City of Mora.

When Mora's city administrator left last June, we had serious concerns that the work we had done on the DTED Grant Application would be delayed or halted. Your willingness to step in to continue this process by arranging meetings with government officials and the drafting of the grant proposal itself was effective and very much appreciated.

Our potential success with the OEA and DTED grant applications as well as indications of a substantial market for our WasteWater evaporation equipment have led us to the conclusion that we should continue this project on a high priority basis. The addition of a dedicated Wastewater Product Manager will be necessary to continue the successful development of this product line. Therefore, we have developed a position description and are currently in the process of advertising and interviewing for this position.

I would like to ask that you seriously consider applying for this position. The knowledge you could bring to this position along with your proven initiative and ability to manage could contribute a great deal to the success of our WasteWater Evaporator program.

I understand that you will continue to have significant obligations relating to your position as a Minnesota State Senator. The Product Management position at C. E. Rogers Company could be developed on a part time basis, which I believe, could allow you to accommodate both of these responsibilities. If this position is of interest to you, I would like to discuss it with you further during the next week or so. In the meantime, I would appreciate it if you would thoroughly investigate any potential conflicts of interest that might arise from your part-time employment with C. E. Rogers Company while retaining your Senate seat.

Thank you again for your assistance on this project. I hope you will give our WasteWater Evaporator Product Manager position some serious consideration. If any questions arise, please do not hesitate to give me a call.

Sincerely,

C. E. ROGERS COMPANY

Donald K. Rogers
Vice President, Operations

cc: Howard Rogers
Renae Parent

MINNESOTA

Trade & Economic Development

Business & Community Development

Date: December 4, 1998

To: Gary Fields, Deputy Director
Department of Trade and Economic Development

From: Terry Kuhlman, Director
Minnesota Public Facilities Authority

Subject: Innovative Technology Grants

A brief background on this initiative. State and Federal grant programs in the 70's and 80's provided an additional 5% in grant funding if wastewater treatment systems were innovative design. This incentive was eliminated along with grant funding in 1989. In discussion over the years with the legislature and MPCA staff the desire to encourage risk taking in developing new cost effective technology to improve the treatment of wastewater was very strong. With the Public Facilities Authority's recommendation DTED drafted a proposal to seek limited funding to accomplish two goals: First to provide the incentive to encourage the private manufacturing sector to cooperate with local units of government to seek the application of existing technology that is not being used in the waste treatment process to find cost effective application known technology to improve wastewater treatment and secondly help Minnesota manufactures of technology find a new market sector or niche for them that may help them create new jobs.

This proposal was approved by the Administration and included in the Governor's Capital Budget in the 1998 session and was passed with a $500,000 appropriation. This is a proposal that we will be seeking additional funding for periodically. For Minnesota to maintain the wastewater capacity that exists today we estimate and annual investment of $250 million annually is needed and to upgrade, expand and sewer unsewered areas the annual investment the annual investment that needs to be made is around $350 million. The actual investment being made is about half that needed just to maintain the status quo. Thus, cost effective technology will always be in demand, sut since the costs are so high to begin with, very little risk taking occurs.

The Public Facilities Authority approved running an RFP to solicit proposals and we notified all the state associations that have anything to do with municipal wastewater (engineers, operators, city officials, environmental groups and etc) to make them aware of the funding availability. This is the normal process that the Authority follows with appropriations such as these. The Authority receive two proposals. The Applications where forwarded to MPCA to review and rank. One application to the City of Mora was approved which applied a new drying technology was recommended for funding by MPCA. The second application was rejected because it was

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not new technology and the chemicals application was no longer an approved chemical By EPA for use in wastewater treatment.

I have enclosed the section of the October board packet. The Authority vote to approve MPCA's recommendation was unanimous. Their remains a balance of $95,000 in the account for future applications which will be accepted at any time. Once Mora's project gets moving, we will try to highlight any successes and seek additional proposals for the remaining funds from other communities and manufactures.

INNOVATIVE TECHNOLOGY GRANT

MVR Evaporation of Municipal Wastewater

Proposal to:
MINNESOTA DEPARTMENT of TRADE and ECONOMIC DEVELOPMENT

City of Mora

Mora Municipal Utilities

C. E. Rogers Company

August 28, 1998

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EXECUTIVE SUMMARY

The MPCA estimates that taxpayers of Minnesota are facing the potential burden of $1.2 billion in costs for wastewater infrastructure over the next five years. If the innovative technology of MVR wastewater evaporation is proven as successful in an actual demonstration of municipal wastewater treatment as it has been in the laboratory there can be significant economic and social values created in Minnesota.

Our rivers and lakes could be cleaner and there could be a reduced threat to public health and to the environment. This could be a significant step in the direction of Minnesota's commitment for "swimmable and fishable" public waters for the future. If this technology proves only to increase the capacity of existing wastewater facilities by reducing the volume of sludge and effluents, the potential savings to the taxpayers of Minnesota could be in the millions of dollars.

The full potential of the economic benefits will be determined by a testing protocol and thorough analysis of data to be developed with the assistance of the MPCA. The testing protocol will also take into consideration the standards being developed by the National Sanitation Foundation.

INTRODUCTION

The Minnesota Public Facility Authority (PFA) request for proposal from municipalities for the cost of equipment and installation into an existing municipal wastewater treatment system has the potential for a new beginning for this industry. This project will demonstrate the feasibility and cost effectiveness of mechanical vapor recompression (MVR) evaporation systems in the treatment of municipal wastewater. The technology of evaporation and condensation is proven and has been utilized in many industries. However, application in the area of wastewater treatment would be very innovative in this industry.

Utilization of this equipment will allow the C. E. Rogers Company to refine and adjust the technology for use on the materials customarily found in the municipal wastewater system. The equipment will also be designed for testing at various stages in the process of the treatment of municipal wastewater at the Mora facility by the plant operator. Thus, the most effective application of the innovative technology would be identified by; (a) improvement of effluent cleanliness (b) the reduction of sludge volume (c) cost effectiveness in comparison to present technology or (d) all of the above.

The C. E. Rogers Company has already proven this innovative technology in the area of industrial wastewater at the California Milk Producers facility with the treatment of up to 300,000 gallons

per day. The results are beneficial for everyone, as CMP reports savings of $500,000 a year by operating the MVR and avoiding wastewater discharge fees. It also reclaims more than 33 million gallons of water a year that can be recycled through the plant, used for irrigation or discharged for recharging local groundwater. (*Please see article from Southern California Edison in the Appendices*)

Project Scope and Objectives

The innovative technology which is to be demonstrated by CER with the city of Mora will determine the amount of improvement possible in; 1) volume reduction of municipal sludge by the concentration of solids which would reduce costs of handling, storage, transporting and land applying or incinerating sludge materials. 2) Allowing for a "clean" condensate or effluent to be discharged directly into a waterway or to be reused in some application such as irrigation. This could eliminate the need for large and expensive holding or evaporation ponds. 3) The reduction of phosphorus and other materials that may threaten public health or contribute to the degradation of the environment.

To accomplish the stated objectives, a well-coordinated joint effort will be required of staff from the private and public sectors. Once the grant is approved, the fabrication of the equipment will begin and installation at the Mora facility will follow within 90 days. After installation, an action plan will be implemented for a thorough demonstration of the MVR equipment at five stages of wastewater treatment. Completion of the demonstration of the MVR equipment will be followed by an analysis of data and reports to the state.

All of this will require 15 months from the acceptance of the grant

proposal due to the number of objectives, private and public staff involved and the subsequent analysis of data and reports to the state.

ACTION PLAN

The purpose of evaluating the MVR evaporator at various stages of the treatment process is to demonstrate its ability to treat either influent wastewater or sludge. This would eliminate the need for some or most of the present stages of municipal wastewater treatment. Site #1 was chosen to determine the feasibility of treating raw sewage after screening. If this were successful, the need for most of the stages of wastewater treatment could be eliminated. Sites #2, #3, #4 were chosen to determine the cost-benefit of sludge concentration and the utilization of the MVR evaporator with high solids concentration influent. This process alone could reduce the need to spend millions of dollars on upgrades of wastewater systems solely for reasons of capacity. Site #5 was chosen to determine the feasibility of the MVR evaporator as an alternative to the Clarifier. This could eliminate a stage of wastewater treatment.

Site One

Site #1 is the Preliminary Treatment Building, which houses the Hydro-Sieve that screens large particles and inert materials such as plastics that can not be processed in the system. At this stage, the influent or raw sewage is normally less than 1/2% solids. This setup for this stage will require some modification to the pipes leading to the initial treatment stage which is the Clarifier, or commonly known as the ditch.

The objective for the setup at this stage is to determine whether the MVR evaporator can treat influent in an efficient and cost-effective process. If so, a municipality using the MVR evaporator may be able to eliminate a large amount of capital expense and operating costs.

Sites Two, Three and Four

Site #2 is the location of the Waste Activator Sludge Line, which carries the first stage of sludge (usually less than 1% solids) from the Clarifier to the Digester. Site #3 is the Digester Line that carries sludge (usually 1% solids) to the Sludge Storage Tank. Site #4 is the line used to pump out the Sludge Storage Tank for land application, (usually 2% solids).

The objective for choosing all three of these sites is to determine the feasibility and cost effectiveness of sludge concentration. If the MVR evaporation process can effectively increase the concentration of sludge from 2% to 4%, the volume of this concentrated sludge will be reduced approximately in half. Lab tests have indicated that sludge can be concentrated to 5-6% solids. With this reduction will come a significant reduction in sludge storage requirements.

Site Five

This site is the Clarifier, which is for Aeration Water or Mixed Liquor Suspended Solids (MLSS) which is the common terminology in the wastewater treatment industry.

The objective of using the MVR evaporator at this site is as an

alternative to the Clarifier. This could eliminate several stages in the processing system and produce a cleaner effluent than the present standard.

Management Plan

Project Organization

As a joint public and private partnership for proving the feasibility and cost effectiveness of the MVR evaporator, several people will have responsibilities for each stage of the project. At the Mora Municipal Utilities (MMU) the certified wastewater treatment operator, John McLouth, will be responsible for the setups at the five test sites with respect to any modifications to the facilities. Mr. McLouth will also have responsibility for directing the demonstration projects and all MMU staff at the facility as the operator.

C. E. Rogers Company (CER) will have a large number of their personnel involved in this project. Howard Rogers, President of CER, and Don Rogers, Vice President of Operations, will be involved at higher levels of decision making and will provide the financial commitment for this project. Engineering and Design will be the responsibility of Steve DeGeest, Vice President of Engineering, and Darwin Schlinger, Process Engineer. Other CER personnel will be involved as necessary. A project manager position is to be filled upon the grant award to coordinate all the tasks and to ensure that one individual is responsible and accountable for the oversight of this project.

Costs

The costs for design, labor, fabrication and materials of the project are detailed on a spreadsheet and included in the appendices. The total cost is $810,000.00. Some of the costs are provided in-kind and others are cash outlays. The largest expense is $375,000* for the MVR evaporator for which the City of Mora is requesting state grant reimbursement. CER will contribute $100,000 in-kind for engineering and design of the MVR evaporator. Mora will also need to expend cash for legal fees, accounting and utility expenses, which may total another $30,000. Mora would also request reimbursement for those expenses. The other expenses incurred by the City of Mora or CER will be absorbed by those entities and are part of the 50% match for the state grant. *(Please see Spreadsheet of all detailed costs in the Appendices.)*

* "The gross receipts from the sale of and the storage, use, or consumption of equipment designed to process, de-water, and recycle biosolids for wastewater treatment facilities of political subdivisions, and materials incidental to installation of that equipment, are exempt." (Article 8, Section 13, subd. 73)

Schedule

The start date will commence upon notification of the award of the state grant to the city of Mora. Once the MVR evaporator has been constructed, it will be installed at the Mora wastewater facility. This should be completed within 120 days after fabrication starts. Once the MVR evaporator is installed, the testing will begin and cycle through all five sites, which represent different stages of wastewater treatment. The testing procedures could take 6-8 months to complete due to the setups and the unknowns that may be encountered with treatment of municipal

wastewater. Finally, the reports will be completed after a detailed analysis of the data, which could take up to 90 days. Altogether the project could be completed in 15 months, but may be completed within 12 months if everything flows smoothly.

RESULTS

If the MVR evaporator is proven to be feasible and cost effective, this innovative technology could have many applications for new or existing municipal wastewater facilities. Small communities which are usually USDA eligible (*eligibility is based on household income and population of the community must be under 10,000*) could utilize a less expensive alternative to the treatment systems presently available.

Larger cities may be able to utilize the MVR evaporator for sludge concentration, which has the potential to increase their capacity without large expansion costs of the present facility. However, all communities could benefit from discharging a cleaner effluent into our environment. Particular attention will be paid to reduction of phosphorus in the effluent with treatment by this innovative technology.

EVALUATION

To be included in the Reports are an explanation of the protocol followed for the testing of influent, sludge and effluent. Mora has a certified laboratory available at the wastewater facility and MPCA has indicated a willingness to assist in the development of testing procedures. The data from using the MVR evaporator in five different stages of municipal wastewater treatment will provide for a thorough evaluation of this technology in this

industry. If feasible, the final report will also include a list of potential uses for the sludge or effluent that could be alternatives to the present disposal methods.

QUALIFICATIONS

The C. E. Rogers Company is certainly qualified for this project. They have been involved with evaporation and condensation technology in the milk processing industry for more than 100 years. CER has developed MVR evaporators for the milk processing industry and has successfully treated industrial wastewater from a milk processing plant in California. At that facility, 300,000 gallons of industrial wastewater are treated per day in a very cost-effective process. This process recycles over 33 million gallons per year and saves approximately $500,000 a year by operating the MVR evaporator and avoiding wastewater discharge fees. (*Please refer to Appendices for articles about the MVR Evaporator and industrial wastewater treatment)*

CER has also treated other industrial wastewater with excellent results. Ethylene and propylene glycol are anti-freeze solutions that are used at airports for de-icing planes and are problematic in municipal wastewater treatment facilities. A CER evaporator that can process 50 gallons/minute has been installed at Detroit Metro Airport and is now operational. The evaporator is functioning above expectations and exceeding all design specifications.

This evaporator is processing feedstock that has 5% TC (Total Concentration) of glycol and increases the TC to 80% glycol, thus eliminating over 90% of the water from the feedstock. Another CER evaporator for the Salt Lake City Airport has been designed to process 30 gallons/minute and installation will commence in

early September.

Attached to this proposal is the *MVR Pilot Evaporator Description* that explains in detail the design and process of mechanical vapor recompression. This engineer's narrative also includes an *Effluent Analysis Comparison* that shows the dramatic reduction in (BOD) Biochemical Oxygen Demand and Phosphorus. Diagrams and schematics of the MVR evaporator are also included.

The innovative technology that C. E. Rogers Company can bring to the industry of wastewater treatment has the potential to change this industry in an efficient and cost-effective way. This has the potential to benefit all of the people of Minnesota. *(Please refer to description attached to appendices.)*

CONCLUSIONS/NEXT STEPS

The city of Mora should be commended for its willingness to try something innovative today while all aspects of their wastewater facility are operating in an efficient manner and in full compliance with all state and federal regulations. In partnership with C. E. Rogers Company, the city of Mora can accomplish something that has the potential to benefit every resident in Minnesota by further protecting the environment and improving public health and safety.

It is our hope that the Minnesota Department of Trade and Economic Development and the Public Facilities Authority will award an Innovative Technology Grant to the city of Mora. As soon as the PFA determines that the proposal meets all the legal requirements for funding grants, the City of Mora and the C. E.

Rogers Company are in a position to carry this project forward. We feel that this is a superior project with great potential for success.

APPENDICES

- Signature page
- Resolution by the City of Mora
- Commitment letter from C. E. Rogers Company
- Article from *Southern California Edison*
- Article from *Prepared Foods*
- Article from *Environmental Technology*
- MVR pilot evaporator description
- Spreadsheet of all detailed costs of the project
- MVR mobile wastewater evaporator cost estimate
- Mora wastewater facility demonstration site locations
- Financial data for the City of Mora

Signature Page

Mayor Mary Schwartz, City of Mora

John McLouth, Operator for Mora Municipal Utilities

Howard Rogers, President of C. E. Rogers Company

RESOLUTION NO. 98-801

Resolution for Innovative Technology Grant Application

BE IT RESOLVED, that the city of Mora is hereby applying to the Minnesota Public Facilities Authority for an innovative technology grant for wastewater treatment as authorized in Minnesota Laws, 1998, Chapter 404, Section 9, subdivision 3.

BE IT FURTHER RESOLVED, that the proposed project as described in the city of Mora's grant application is intended to demonstrate the feasibility of existing technology that is not currently being used in the treatment of municipal wastewater, but has the potential to improve the quality of the effluent from wastewater treatment or make the treatment process more effective.

BE IT FURTHER RESOLVED, that the total estimated cost of the project is $810,000.00, and if the grant for 50% of the project cost is awarded, the city of Mora in conjunction with C.E. Rogers Inc. through a public-private cooperative agreement commits to undertake the project and pay the remaining 50% of the costs as described in the innovative technology grant application.

I CERTIFY THAT the above Resolution was adopted by the Mora City Council on August 18, 1998.

SIGNED:

Mary Schwartz
Mayor of Mora

WITNESSED:

Dorothea McCallum
Mora City Clerk-Treasurer

C E ROGERS COMPANY

1895 Frontage Rd. / P.O. Box 118 / Mora, Minnesota 55051
320-679-2172

August 25, 1998

Mr. Terry Kuhlman
Executive Director, PFA
Department of Trade and Economic Development
500 Metro Square
121 7th Place East
Saint Paul, MN 55101-2146

Dear Mr. Kuhlman:

The City of Mora, in partnership with the C. E. Rogers Company, is making an application to the Department of Trade and Economic Development for an Innovative Technology Grant. This grant would assist in the application of proven food processing evaporation technology to municipal wastewater treatment.

Over the last several years the C. E. Rogers Company has committed well over $250,000 to research and development relating to the application of our food processing based evaporation technology to wastewater treatment. If this grant request is approved, we will commit an additional $255,000 to this project. This commitment will include $100,000 in design engineering expense of equipment, $40,000 in project management, $30,000 in trailer equipment, $25,000 in equipment setup, $40,000 in project engineering support, and $20,000 in project evaluation and report preparation.

Unless there is a significant reduction in our food-based business, which we do not foresee at this time, the on-going support of this wastewater project will require additional personnel in our Mora based Engineering, Manufacturing and Marketing Departments.

Sincerely,

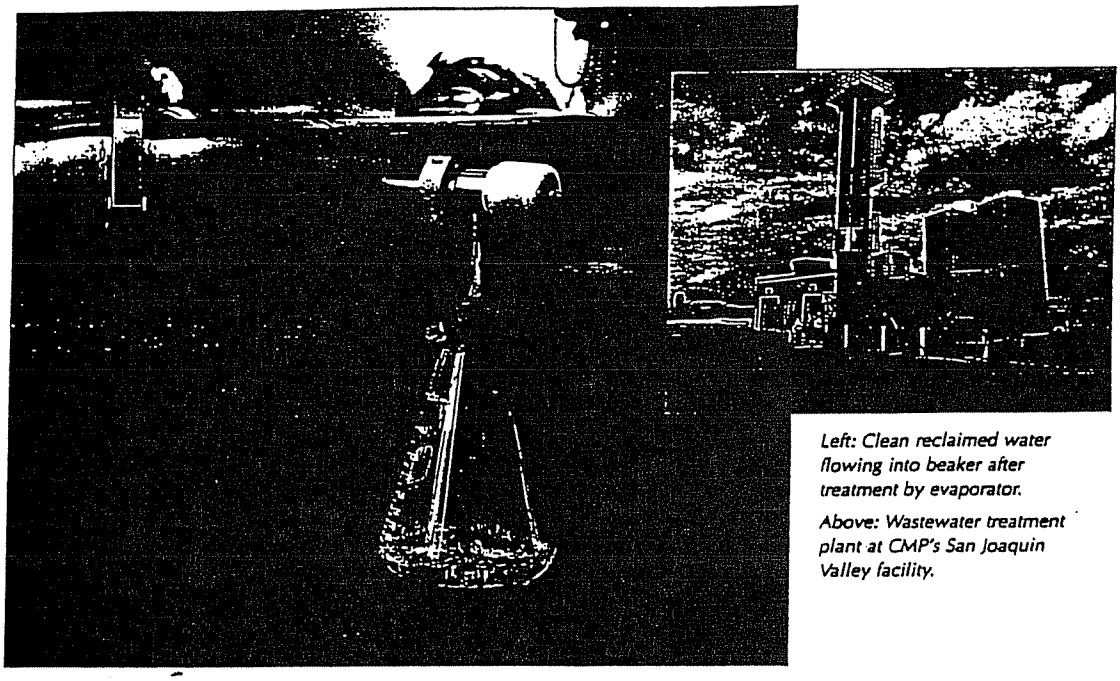
C.E. ROGERS COMPANY

Donald K. Rogers
Vice President, Operations

CMP Treats Wastewater Economically With MVR Evaporator

"Each year, the MVR wastewater plant will save our organization a half a million dollars and reclaim more than 33 million gallons of water."

Keith Gomes,
Executive Vice President,
Operations,
California Milk Producers



Left: Clean reclaimed water flowing into beaker after treatment by evaporator.

Above: Wastewater treatment plant at CMP's San Joaquin Valley facility.

Preferred Plant Site Required On-Site Wastewater Treatment

California Milk Producers (CMP) is a milk-marketing cooperative based in Artesia, California. Its 363 members operate dairies in 10 counties throughout the state. CMP wanted to build a new plant to handle the increased volume of milk from its local members and those relocating to the San Joaquin Valley. They located a site in the San Joaquin Valley city of Tipton — ideal because of its proximity to existing and future dairy operations, highway and rail accessibility, and where CMP would have plenty of room to grow.

First, the co-op had to find an economical solution to treating its wastewater, up to 300,000 gallons daily, since the property has no access to sewer lines. Edison helped CMP evaluate several wastewater treatment options, performed pilot tests to review effectiveness, and helped CMP find the most cost-effective solution to the problem: a mechanical vapor recompression (MVR) evaporation system.

Southern California Edison

Edison's Team Helped CMP Review All Th Options – To Determine The Best Electric Solution

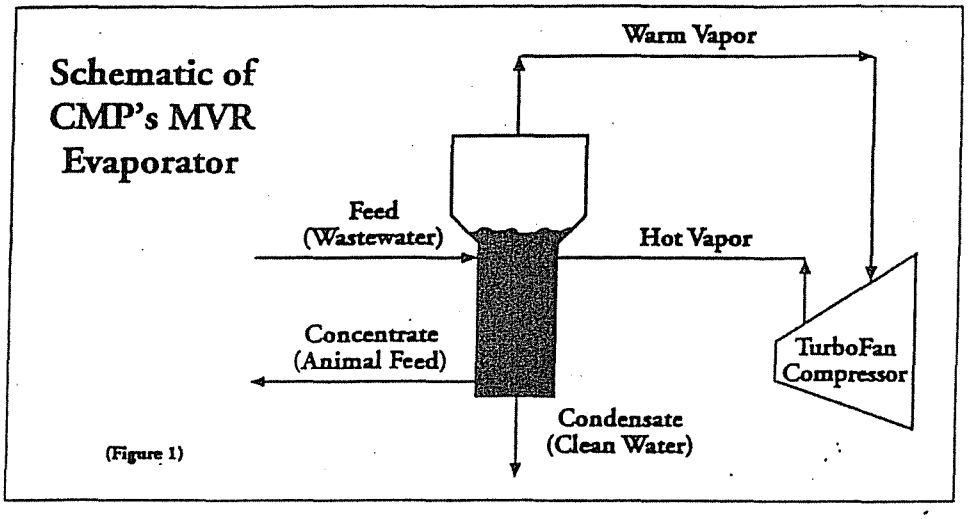
The CMP plant was designed to take delivery of up to three million pounds of whole milk a day, then convert it into butter and milk powder. It would have to discharge up to 200,000 gallons per day of cow water generated by the milk evaporation process and up to 100,000 gallons a day of plant wastewater, consisting mainly of wasted milk product and discharge from the clean-in place system.

The challenge: the Regional Water Quality Control Board required that CMP bring its wastewater to stringent levels low in total dissolved solids and biological oxygen demand before the co-op could release it into ponds.

THE OPTIONS

Several methods of wastewater treatment were evaluated with Edison's help, including evaporation systems, filtration systems and a scaled-down municipal wastewater treatment system.

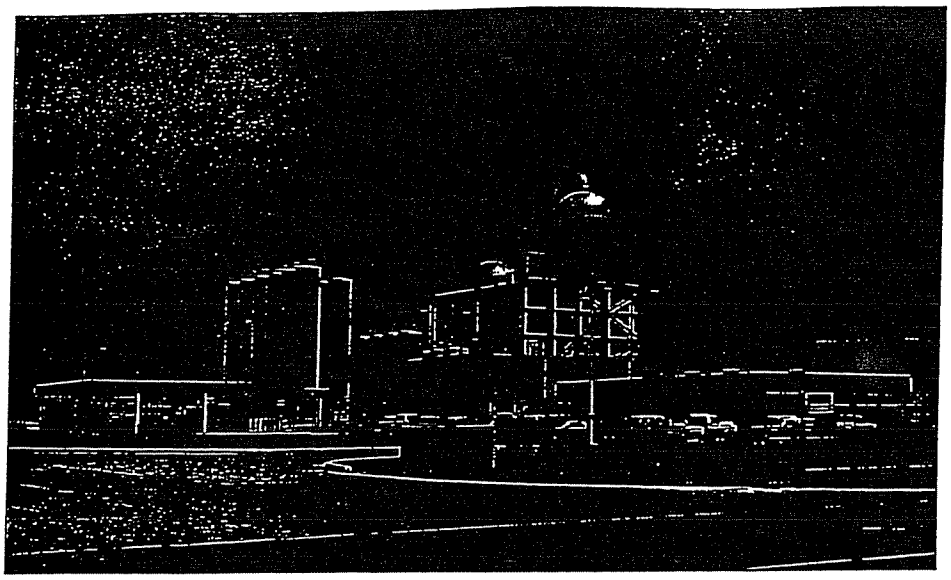
Pilot tests were performed on an MVR evaporator system and two membrane filtration systems. Although the results revealed that energy costs would be lower with a membrane filtration system, other factors made the MVR more cost-effective for CMP. The decision was based largely on CMP's familiarity with evaporation processes, ease of operation, fewer byproduct streams and the ability to sell the concentrate as animal feed. To do the job, CMP bought a single-effect, falling-film MVR evaporator system with a 600 horsepower centrifugal compressor.



(Figure 1)

THE DECISION – AN MVR EVAPORATOR

The MVR is started using steam supplied by a boiler to heat the wastewater to the boiling point. Once the wastewater begins to evaporate, the boiler is no longer needed and the centrifugal compressor takes over the evaporation process. As shown in Figure 1, vapor from the wastewater is compressed with the turbofan compressor to a higher pressure and temperature. Then it is introduced on the heating side of the evaporator heat exchanger where it condenses, giving up its latent heat to the wastewater. Each pound of heating vapor that condenses causes a pound of water to evaporate from the wastewater.

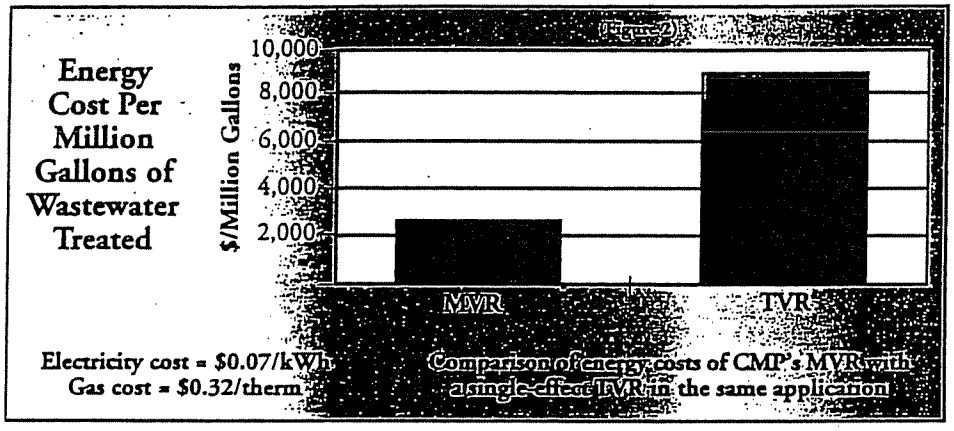


CMP's new facility is conveniently located with plenty of room f future growth.

RESULTS

CMP saves approximately $500,000 a year by operating the MVR and avoiding wastewater discharge fees. It also reclaims more than 33 million gallons of water for local groundwater recharge and irrigation. CMP's wastewater system, including all pumps, agitators, the MVR compressor motor and aerators, etc., uses about 41 kWh per 1,000 gallons of wastewater treated. It costs about a penny a gallon to operate, including energy, labor and materials.

- Doesn't require condensing the main process vapors, reducing or eliminating the need for cooling water. This is especially beneficial in areas where water is not abundant.
- Requires less space than a conventional multiple-effect, steam-driven system.
- Substantially reduces steam heating requirements, thereby reducing air pollution emissions from the combustion of fuel.



Comparison of energy costs of CMP's MVR with a single-effect TVR in the same application

ADVANTAGES OF MVR EVAPORATOR SYSTEMS

- Consumes significantly less energy than conventional, steam-driven evaporators (see Figure 2).
- Can be more cost-effective than thermal vapor recompression (TVR) evaporators (see Figure 2).

APPLICATIONS

The MVR evaporator can be used for almost any medium to large-scale concentration, evaporation or water-removal process. The industries that use these processes most frequently are:

- Food Processing
- Fruit Juice Processing
- Dairy Processing
- Malt/Grain Beverage Processing
- Chemical Processing
- Pulp and Paper Processing
- Pharmaceutical Processing

FOR MORE INFORMATION

For details about how Edison can help your business with a mechanical vapor recompression evaporator or other electric technology, call your Edison sales representative or (818) 812-7345. Your representative can schedule an appointment for you to visit CMP's MVR wastewater treatment system, talk with CMP personnel about their experience with the operation, and view the continuous monitoring system that records and displays the electricity use, wastewater throughput and energy-efficiency of the system.

ENVIRONMENTAL SOLUTIONS

Southern California Edison

5108-0795

Wastewater Evaporator Treats 50,000 Lbs. Per Hour

STEVE BERNE, Associate Editor

When a company uses and generates enough water discharge to be declared its own utility, choosing systems to handle the water is critical.

California Milk Producers (CMP), Artesia, Calif., first saw the need for a second plant back in early 1988. After five years of feasibility and due-diligence studies and 15 months of construction, the South Valley plant in Tipton, Calif., began producing butter and milk powder in July 1994. The plant boasts a dry storage capacity of 10 million lbs. of powdered milk products and a cold storage limit of 5 million lbs. of butter.

Processing up to 3 million lbs. of milk per day into butter and powder utilizes, and generates, a massive amount of water. Handling the incoming milk, process cooling water, CIP discharge, condensed cow water and other fluid flows required forethought, planning and a unique approach to wastewater treatment.

"Due to the amount of water we use, we've actually been declared our own utility by the state," says Keith Gomes, executive vice president of operations. "This means we are strictly regulated and have to abide by the laws that govern discharge utilities."

A vast stainless steel pipeline system, six CIP systems and three HTST pasteurizing systems connect raw milk receiving to refrigerated silos, to separators and evaporator, to cream and condensed silos, butter churn, and cream and condensed load out. All are controlled by computers engineered and installed by Scherping Systems.

Separation equipment, separating the cream out of the whole milk, consists of two Westfalia MSD-300 machines. Each has a capacity of up to 80,000 lbs. per hour of skim milk for powder production. These CIP-cleaned machines feature fully automated operation, flat belt drives eliminating gears and a noise abatement package.

Separated cream is pasteurized and cooled before shipping or churning. The butter operation includes one Westfalia BUC-3000 continuous butter churn that produces 10,000 lbs. per hour.

HEART OF THE OPERATION

Critical to any powder operation are its evaporators and dryers. CMP's Tipton plant commissioned a thermal vapor recompression (TVR) evaporator from C.E. Rogers Co. to condense whole milk, buttermilk or the separated skim milk. The six-effect falling film evaporator has a capacity of 140,000 lb. per hour. "There are almost 28 miles of stainless steel tubing in the TVR evaporator," notes Gomes.

The evaporator is capable of condensing 100,000 lbs. per hour of whole milk to 26,000 lbs. of 48% total solids (TS) whole milk condensed. The same amount of buttermilk can be condensed to 20,000 lbs. at 44% TS. After separation, in the case of skim milk, the evaporator receives 140,000 lbs. at 8.8% solids, pasteurizes and removes 115,000 lbs. of cow water to make 25,000 lbs. condensed skim at 48% solids.

Condensed product is then pumped at 4,800 psi through four spray nozzles into a

■ **C.E. Rogers' VRS vertical spray dryer exhausts air used to produce milk powder at a rate of 88,000 cubic ft. per minute to the atmosphere.**

Call the Brigade

Fire in any food manufacturing facility can mean disaster. Somehow though, it's even worse when the plant is less than four months old. Such was the case when an accident caused a Nov. 8, 1994 fire that threatened to keep the new C.E. Rogers VRS milk dryer from processing its average of 13,000 lbs. per hour of dried skim milk during the holiday season.

The fire damaged the baghouse (structure which filters exhaust from the drying chamber), interior of the dryer, inlet fan, and corresponding duct work and electrical systems.

Undaunted by concerns over lost holiday production, CMP and C.E. Rogers combined forces on a common goal—to dry product before Thanksgiving. Through teamwork and dedication by both firms, CMP was producing milk powder again 13 days later.

Both companies had teams working around the clock, repairing and re-installing equipment and services to meet the Thanksgiving goal. "It was a real achievement," says Keith Gomes, CMP executive vice president of operations. "And as it turns out, we processed a record amount of milk this holiday season."

C.E. Rogers VRS vertical spray process dryer. Fresh air entering the dryer passes through a heat recovery heat exchanger to capture heat from the 185°F exhaust air. The preheated air is further heated to 390°F where it combines with the milk.

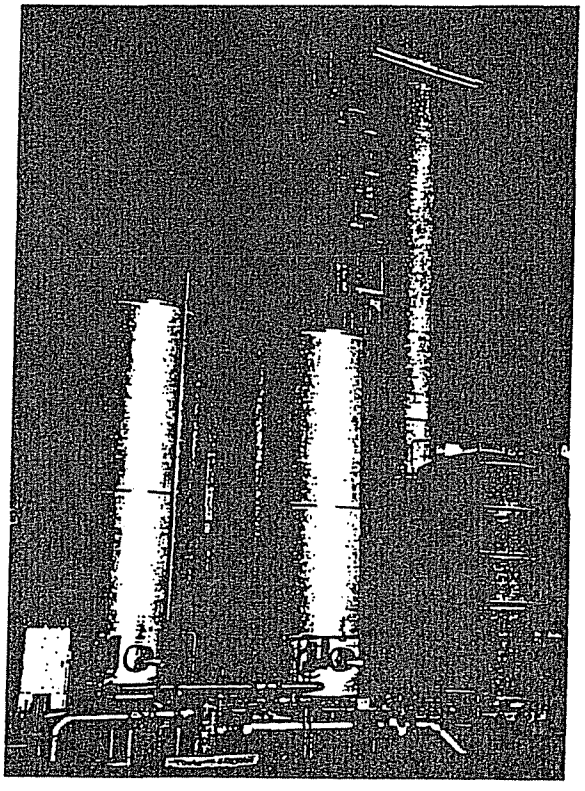
"The heat recovery system at the fresh air intake reduces our BTU requirement per pound of powder from 1,666 to 1,200 BTU per pound of powder," says Gomes. "This has resulted in significant cost savings in natural gas use."

Capacity of the dryer is dependent on product. Skim milk enters the dryer at 25,083 lb. per hour with 48% TS resulting in 12,777 lb. per hour of powder at 96.5% TS.

WASTEWATER TREATMENT

"Our plant is a 'greenfield' system," says Gomes. "All our water needs come from our own 600-foot-deep wells, each pumping 750 gallons per minute." CMP's wastewater treatment systems handle 300,000 gallons of "process" and cow water (condensate coming off the evaporator) per day.

Seven treatment ponds covering 20 acres have a capacity for more than 47.5 million gallons of water. Five ponds are "earthen" and two are lined with aerators.



In-line conductivity meters divert wastewater flow to this C.E. Rogers MVR wastewater evaporator when electrical conductivity levels exceed 500 in the flow.

About 200,000 gallons goes for use in CIP systems, the boiler feed water makeup, the evaporative condensers and cooling tower water makeup, and for landscape irrigation. Any excess is pumped directly to the earthen ponds for percolation, evaporation and irrigation to neighboring farms or the local irrigation district.

The remaining 100,000 gallons per day consists of process wastewater. This includes wash water entering floor drains, CIP discharge and other such processes. Process wastewater must be treated before it can be sent to the ponds due to its high electric conductivity (EC) state.

"We closely monitor the EC, which is a measure of the particulate matter in the water, with in-line conductivity meters," says Gomes. "We're only allowed to release water to the ponds with a maximum of 500 EC over the incoming water EC."

Traditional wastewater treatment methods include a combination of dissolved air flotation, ultra-filtration and reverse osmosis to remove particulates. "Instead, we went with a system that we were a lot more familiar with," notes Gomes. CMP installed a wastewater evaporator from C.E. Rogers.

The mechanical vapor recompression (MVR) evaporator handles 50,000 lbs. per hour, evaporating 45,000 lbs. of condensate and discharging 5,000 lbs. of concentrated waste. "The condensate gets pumped to the two lined ponds for polishing before it is released to the earthen ponds and the concentrate is used for animal feed."

According to Gomes, Tipton's wastewater treatment systems does require more attention than other types of systems. However, there is a substantial payoff. "Our total discharge cost is projected to be $300,000 as compared to $800,000 at our Artesia plant. A half million dollar savings is well worth the extra effort." PF

For more information on the processing systems mentioned, circle the appropriate numbers opposite last page.

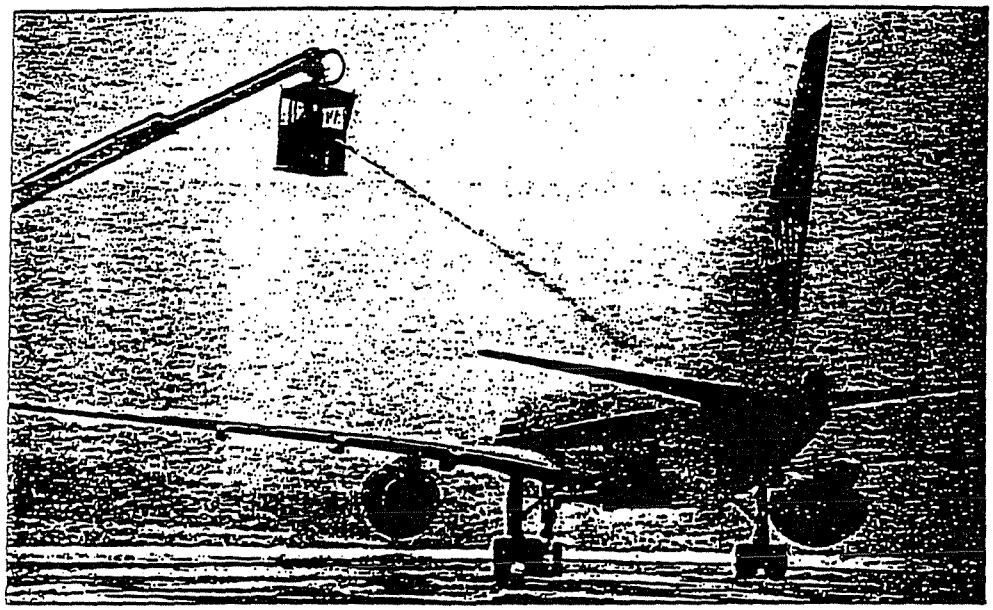
Scherping Systems.....Circle 247
Centrico Inc.....Circle 248
C.E. Rogers Co.....Circle 249

Controlling Glycol in Runoff

Denise L. No
Associate Edi

The chemical glycol turns from an aircraft de-icing agent into a critical contaminant when it reaches the ground and mixes with storm water runoff. With high levels of BOD, glycol has gi rise to regulations requiring control measures at airports. The result is an increasing number technologies to control, collect and recover it.

Glycol, a liquid chemical that forms the basis of substances for de-icing and anti-icing airplanes, plays an important role in flight safety. Left unchecked, however, glycol represents an environmental hazard. Mixing with storm water runoff from airports, glycol can end up in surrounding waterways. With an extremely high biochemical oxygen demand (BOD), the presence of glycol creates a hazard to marine life. It also creates an odor problem, for as it decomposes, it gives off a noticeable, foul odor. These impacts have generated regulatory activity and permitting issues, forcing airports to formulate control measures—a demand that spawned the development of a variety of collection, reprocessing and recovery technologies.



An aircraft sits for its de-icing treatment at the Pittsburgh International Airport. (Photography by Christopher L. Zizak, US Airways.)

About 11.5 million gallons of glycol are used in de-icing applications each year, according to a 1992 survey of 96 airports by the Federal Aviation Administration (FAA). The volume ranges from just several gallons at small airports, to 780,000 gallons at the Detroit Metropolitan Airport. Anywhere from 1,000 to 4,000 gallons are used to de-ice and anti-ice one large aircraft.

De-icing and Anti-Icing Substances

Substances for de-icing (removal of contaminants from surfa areas) and anti-icing (protection from accumulation of contam nants) come in the form of both fluids and solids. Solid de-icer including potassium acetate, magnesium acetate, calcium acet and urea, are used to de-ice airport runways. The fluid form which are used to de-ice and anti-ice the aircra include ethylene glycol and propylene glycol. Eth ylene glycol de-icers are the more tradition choice, but use today tends more toward propy lene glycol because it's less toxic, according t Patrick Sullivan, general manager of Michiga Recovery, a chemical recycling facility in Romu lus, MI. Propylene is also more costly.

Glycol serves to depress the freezing point therefore, the percentage of glycol used depends on the outdoor temperature. The different types of fluids have various holdover times and are used for de-icing, anti-icing or a combination of both. The holdover time is the amount of time the residual fluid will protect the aircraft. A Type I fluid, a thin film consisting of glycol or a glycol-water mix, is generally used for de-icing and as a short-term anti-icer. Holdover time is only six to 15 minutes in light snow. Thickeners are added to Type II fluids, which, depending on the concentration of glycol, can be used as both de-icers and anti-icers. Glycol used in a 50/50 mix is a de-icer; in its concentrated form, it's used as an anti-icer. Holdover time can be 45 minutes or more in a light snow condition. Both types have rust inhibitors, corrosion inhibitors and surfactants.

Type III fluids are used for anti-icing, specifically for lower rotation speed aircraft, such as commuter airplanes. The thickeners break down due to the velocity; Type III fluids differ from Type II in that the velocity is set at a lower sheer point for Type III. Type IV is essentially an enhancement of Type II, with a longer holdover time, of 50 to 70 minutes in light snow.

High Volume, High BOD, High Risk

According to the FAA's 1992 study, 50 percent of Type I de-icing fluid that is sprayed onto the aircraft falls onto the ground, and 75 percent of spent de-icing substances end up in storm sewers. These figures, coupled with glycol's high BOD, add up to

serious environmental hazards. Ethylene glycol, a hazardous substance per the Clean Air Act of 1990, has BOD concentrations from 400,000 to 800,000 mg/L and propylene glycol up to 1,000,000 mg/L, according to EPA. An acute toxicity of ethylene is 10,000 mg/L. Such high BOD levels in storm water runoff from airports create hazards for aquatic life in receiving waters. These environmental hazards come with a monetary price as well. One costly cleanup was required at Griffen Air Force Base in New York, according to Dan Harris, product manager with Vactor Manufacturing Inc., an equipment manufacturer in the sewer cleaning industry. "At Griffen Air Force Base, the Air Force had to pay $8.2 million to clean up the glycol mess—that wasn't a fine, it was the cost of the clean up," Harris says.

Permitting Programs

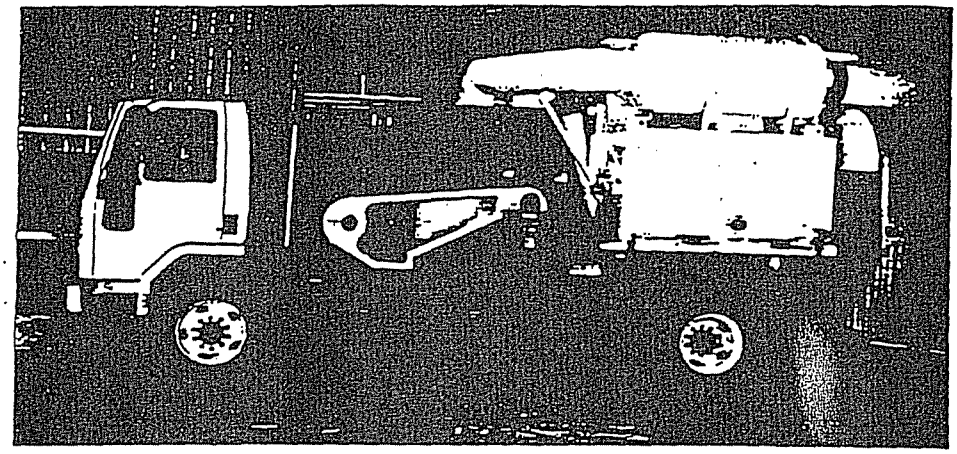
In 1990, EPA initiated the National Pollutant Discharge Elimination System (NPDES) storm water permitting program to address runoff from industries including air transportation. EPA has issued general permits which establish guidelines for regulating industrial storm water discharges, including those from airports. Affected industries have three permitting options—Individual Permit, Baseline Permit and Multi-Sector Permit. The Multi-Sector Permit (60 FR 50804), in effect in 11 states as of 1995, requires airports to develop a storm water pollution prevention plan to minimize the discharge of de-icing pollutants during de-icing activities.

If an airport under the Multi-Sector permit uses more than 100,000 gallons of concentrated glycol per year, it must also monitor its storm water discharge. The permit also includes monitoring targets for: BOD, 30 mg/L; COD, 120 mg/L; ammonia, 19 mg/L; and pH, between 6 and 9 standard units. If the airport meets these performance targets after the second year, "they don't have to do any more monitoring for the life of the permit," says Bill Swietlik, manager of the storm water permitting program at EPA's Office of Wastewater Management. "Presumptively, they are discharging low amounts and are not an environmental risk."

Swietlik also emphasizes that these are monitoring and performance targets, not discharge limits. According to Swietlik, the airports conduct monitoring in the second year of the permit. "The reasoning is that in the first year, they will be setting up their storm water controls. Monitoring the second year provides an opportunity to assess how well the controls are working." The airports monitor on a quarterly basis. They assess their data in year three and reassess their controls if above the targets. In year four comes another round of monitoring; if numbers are still above the targets, the airport must further reassess their control measures.

Exploring Control Methods

These control measures can be as basic as product substitution—substituting more propylene glycol for ethylene glycol, which is the more toxic of the two. Another option, especially for smaller airports or those in warmer locales that use minimal volumes of glycol, is to pipe the storm water-glycol mix off directly to wastewater treatment plants. Even with larger volumes, some airports collect, store, then release it to the treatment plants. Pittsburgh International Airport has collection ponds covered with a rubber coating, according to Ron Thomas, first officer with US Airways. "The containment centers store it and release it in controlled amounts, letting it trickle out to the wastewater treatment plants," says Thomas. For some airports, this is a direct response to refusals by some municipalities to take airport discharge because of glycol's high BOD concentration. "Some municipalities are refusing to handle discharge from airports, or they will only handle storm water with glycol of a certain parts per million (ppm) limit," says Michigan Recovery's Sullivan. Airports can circumvent that by metering the contaminated material then mixing it with enough storm water to lower the BOD concentration.



Glycol collection trucks serve as one measure to control glycol at airports. After an aircraft has been de-iced, the truck vacuums the fluid into a debris chamber through an eight-foot wide rear pick-up head. (Photo courtesy Vactor Manufacturing Inc.)

Containment structures are used for not only storing but treating the glycol runoff as well. Airports with a considerable amount of open space can construct large storm water retention basins with companion conveyance systems, composed of gutters and ditches, that transport the glycol and melting snow and stormwater runoff into the basins. Dulles International Airport in Washington D.C. is building such a system. The glycol is treated in the basins themselves via natural, microbial activity. After several days in the basins, the contents are released to waterways.

A control measure that is considered to be pollution prevention is the use of de-icing pads or centralized de-icing locations. These structures allow airports to collect the glycol discharges so they don't end up in local receiving water and storm water runoff systems. The recently constructed Denver airport, for example, has three main de-icing pads complete with recycling systems. The pad is surrounded by storm sewer inlets, and a pipe system pumps the collected fluid into a recycling facility. The Salt Lake City airport is currently constructing a $20 million remote pad and collection system. Concerns about this method include additional fluid and dust entering the collection system, such as rain and jet fuel, making processing and recycling more costly. In addition, each gate or point of de-icing would need one; de-icing pads that are used by many airlines can create a bottleneck effect and affect departure times.

Another increasingly common and less capital intensive control measure is the use of temporary absorbent booms to contain de-icing compounds on the pavement. After the aircraft leaves the makeshift de-icing pad, a vacuum truck is used to pick up the excess glycol on the tarmac. The trucks follow the airline de-icers, collect the fluid and pump it into a tanker truck.

Glycol collection trucks from Streator, IL-based Vactor Manufacturing, for example, are outfitted with a bar that sprays an emulsifying agent from a heated tank onto the pavement. The emulsifying agent breaks the cohesion between the glycol and the pavement, allowing the system to vacuum the fluids into the debris chamber through the eight-foot wide rear pick-up head. A 20,000 cfm blower delivers a recovery velocity of 20,000 feet per minute at the nozzle. The change in air pressure and density in the debris chamber causes most of the fluid to separate from the air stream and fall to the floor. In case some fluid remains, the air is routed through two cyclonic separators on top of the truck. The air is spun as it enters the larger chambers, and the fluids are spun out of the air stream and deposited in side tanks on the truck. The glycol-free air is then routed to the fan and exhausted back to the atmosphere.

Measures Under Development

Aside from the more common control measures currently being used, there are also experimental methods under development. One such measure is a double-gantry spray system, constructed with a gantry, or bridgelike frame, on either

side of a taxiway or near a runway. The gantries serve to support high and low pressure nozzles that are also built into trenches underneath the frames. After the plane is parked under the frame, the nozzles blast heated air at 40 to 500 pounds per square inch. A small volume of water and glycol may be added to the air stream to remove a dense buildup of snow and ice. Gutters collect the runoff and pump it into a central collection vessel for treatment on site or release to a wastewater treatment plant. This type of system collects about 90 percent of the dripping glycol and costs about $5 to $10 million to install. And because the system applies the treatment close to the departure runway, it can extend an aircraft's holdover time.

Other developmental technologies include infrared heating, hot water pretreatment and hot air pretreatment. Using the infrared heating method, an aircraft parks underneath a roof-like structure and special heating devices heat the water on the surface of the plane. As soon as the water is out of the heat's line of sight, however, the heating energy is lost. If the temperature is below freezing, the plane's surface will freeze once again. This method generally is not effective with snow. Since snow has a different structure, it tends to diffuse and reflect the energy, rather than absorb it.

Hot air pretreatment has been used successfully in the military, according to US Airways' Thomas. One limitation is that it works better when it's colder. "There's not as much adhesion. Since there is not as much water content in the snow, it tends to blow easier," Thomas says. An outgrowth of hot air pretreatment is a hybrid forced air glycol device. This method combines the pressure from the air and the substance from the fluid, using much less fluid and overcoming the limitation of air used alone. Hot water pretreatment is used as a first step in a series of de-icing and/or anti-icing measures. This method can be used as a de-icer down to 27 degrees, as long as an anti-icer will be applied.

Processing and Recycling

Beyond control measures, processing and recycling options can mitigate the environmental impacts of glycol. While it cannot be reprocessed back into glycol for de-icing agents, it can be turned into materials for use in other manufacturing applications. "One problem with recycling the glycol back into glycol is that the fluids are mixed," says Thomas. "Once Type I and Type II fluids are mixed, you have to make sure the packages from each, which include corrosion inhibitors and surfactants, don't interfere with each other. There are a lot of things that have to be balanced." The liability issue, however, is at the heart of the matter. "It would only take one catastrophe, and you would lose any savings on the recycling," Thomas says.

Michigan Recovery recycles glycol from airpc into products that are resold as substitutes for gin glycol in manufacturing applications, such the paint and coatings industry, as a raw mater for resin manufacturing and as a coolant for t automotive industry. The material it markets is percent glycol. The drive to recycle, according Sullivan, is caused primarily by the BOD and od problem, but also by "the loss of value of the flui Airlines pay more than $5 per gallon for the glyc de-icers. Recycling not only prevents glycol fro polluting waterways, but it also saves on the manu resources to make the fluid."

The technologies involved in the recover process include filtration and the use of membrane to separate water from the glycol. The two trouble some areas in the process are separating wate from glycol and separating the non-glycol additive (surfactants and corrosion inhibitors) from the de-icing fluid. At Michigan Recovery, the processing steps include filtration, chemical treatment to precipitate some of the additives and vacuum distillation to separate the water from the fluid and to distill the fluid itself. Michigan Recovery operates only one glycol recovery facility, but its parent company, EQ-The Environmental Quality Co., has a contract to design a glycol collection and recycling system at the Salt Lake City International Airport.

The cost involved in the recovery process depends on the end product, says Sullivan. For example, antifreeze (about 50 percent glycol, 50 percent water) contains more water than other glycol product, and water removal is time consuming. Tight quality control requirements also have to be met. Material intended for the resin industry, for instance, "has to be white and clear, and only contain less than one percent water," he says.

The biggest cost is the energy cost to boil the water, according to Sullivan. Michigan Recovery is currently using systems that make the process more efficient, such as recompressive technologies (recompression of vapors) and high vacuum for the distillation, but the facility continues to seek technologies to further reduce costs.

Results of Control Efforts

EPA will study the results of control efforts at airports and the permitting program beginning in 1998. With storm water permitting programs just recently put in place, it will be two to three years before EPA can fully assess the results, according to Swietlik. EPA's study of storm water runoff at airports will look at: 1) effectiveness of control measures; 2) need for guidelines; 3) alternative de-icing controls; 4) numeric performance standards; 5) cost of controls; 6) status and trends of de-icing discharges.

For more information, contact Denise Noble, Environmental Technology, (770) 937-0222.

Reader Rating. Please circle the appropriate number on the Reader Service Card to indicate your level of interest in this article/topic.
High 337 *Medium* 338 *Low* 339

C. E. ROGERS COMPANY
MVR PILOT EVAPORATOR DESCRIPTION

The Need:

Every year, C.E. ROGERS Company receives many inquires about treating wastewater. As wastewater discharge regulations become more restrictive and costly, many companies are looking for new ways to clean up their wastewater. C.E. ROGERS Company believes that there are many applications (wastewater streams) that could be divided into two separate components by using evaporation technology.

1. Clean water can be reused in their processes, or discharged into wastewater treatment plants without exceeding regulated limits. This can lower the overall discharge cost and minimize the amount of treatment required at local wastewater plants.
2. In many cases the concentrated sludge can be used for fertilizer, animal feed or other products thus reducing the amount of sludge sent to landfills and treatment plants.

Over the last several years, C. E. ROGERS Company has researched many of these applications. Labs testing for many of these applications have yielded very positive results. However, we can not justify the cost for a full-scale unit, nor can we justify the cost of transporting the wastewater to an industrial sized evaporator for testing. Our next step is to build a mobile evaporator that can be used for testing at any wastewater site. This mobile evaporator will be able to test wastewater at many different sites and produce results typical of a full-scale evaporator while minimizing the cost of testing.

The Design:

The Pilot MVR (Mechanical Vapor Recompression) Evaporator is designed to test a wastewater stream of 6 gallons/min or 7,200 gallons/day. A 400-gallon tank and pump will be used to supply the wastewater to the evaporator. An electric steam boiler will provide the heat energy required to start and maintain the evaporation process. Steam from the boiler is used to transfer heat to the wastewater before entering the evaporator. A vacuum pump is provided to lower the boiling point of the wastewater inside the evaporator, which reduces the energy requirement. As the liquid contained in the wastewater boils, it is transformed into a gas or vapor. The solids contained within the wastewater flow to the bottom of the evaporator were they are pumped to a 400-gallon tank or returned to the evaporator to remove more liquid. Meanwhile, the vapor is sent to a compressor where it is recompressed (heat energy added) and reused as the heat source to help boil the incoming wastewater inside the evaporator. Therefore, the compressor is used to increase the efficiency of the process by recovering the heat removed from the wastewater as it boils inside the evaporator. This process continues until all the heat energy from the vapor is depleted. When this occurs, the vapor transforms from a gas back to a liquid in the form of condensate. This condensate liquid is nothing more than the water removed from wastewater entering the evaporator. The condensate water is then pumped to a 400-gallon tank or discharged depending upon the quality of the water. A separator is used to separate the gas or vapor from the concentrated liquid (sludge). The 400-

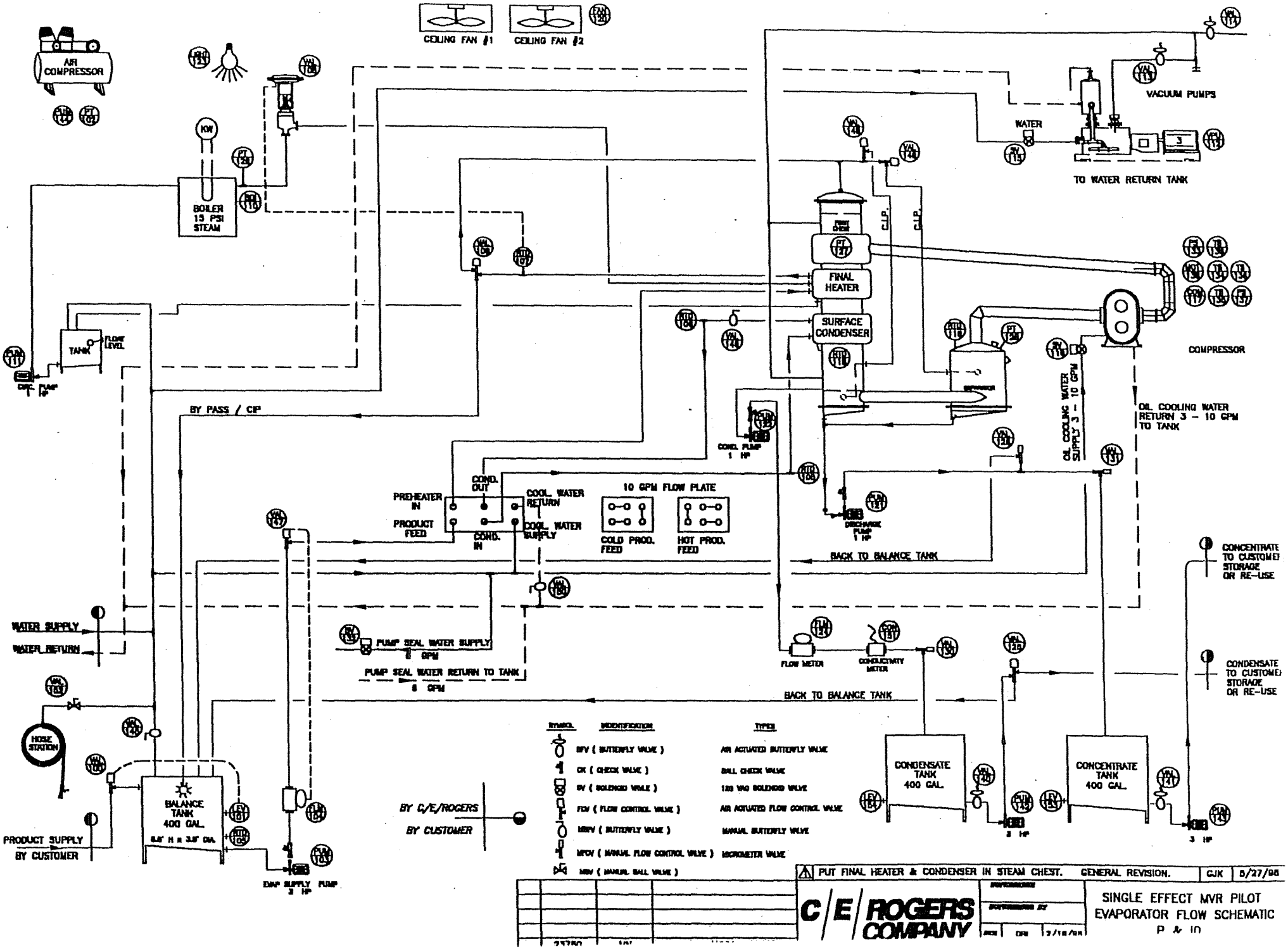
C.E. Rogers Company / 1895 Frontage Road / P.O. Box 118 / Mora, MN 55051

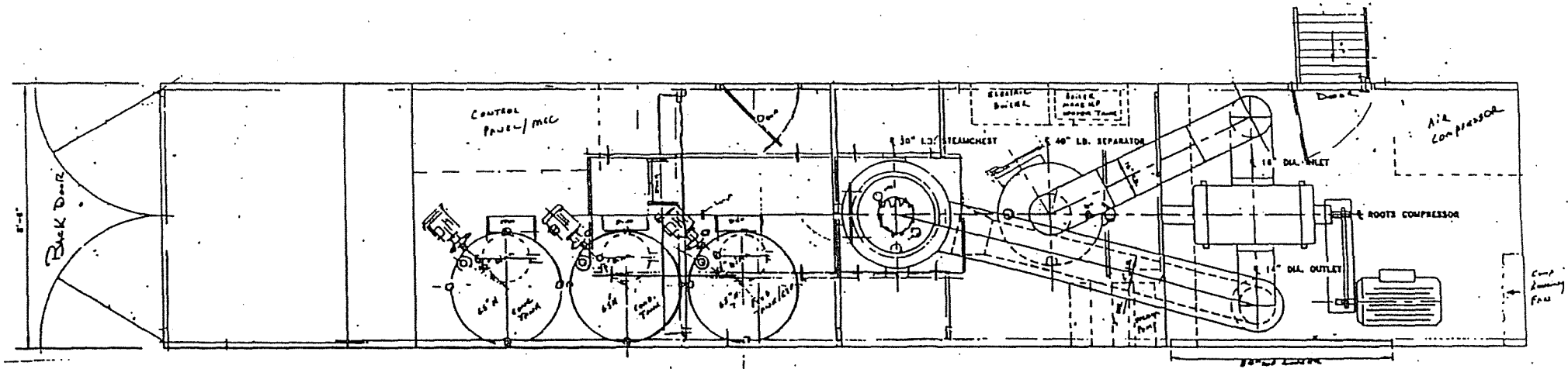
gallon tanks allow the equipment to be run for approximately 1.1 hours before the liquid needs to be discharged from these holding tanks. All the equipment can be cleaned at the end of the tests using a built in CIP (Clean In Place) system. The equipment and components will be mounted in an enclosed semi trailer approximately 47 foot long, 8 foot 6inches wide, and 13 foot 6 inches high. A 350-kW/hour stand-alone diesel generator will supply the electricity needed to operate the equipment. Any testing that is conducted during operation will be recorded, analyzed, and used for making modifications to the pilot unit and possible future full-scale evaporators.

EFFLUENT ANALYSIS COMPARISON

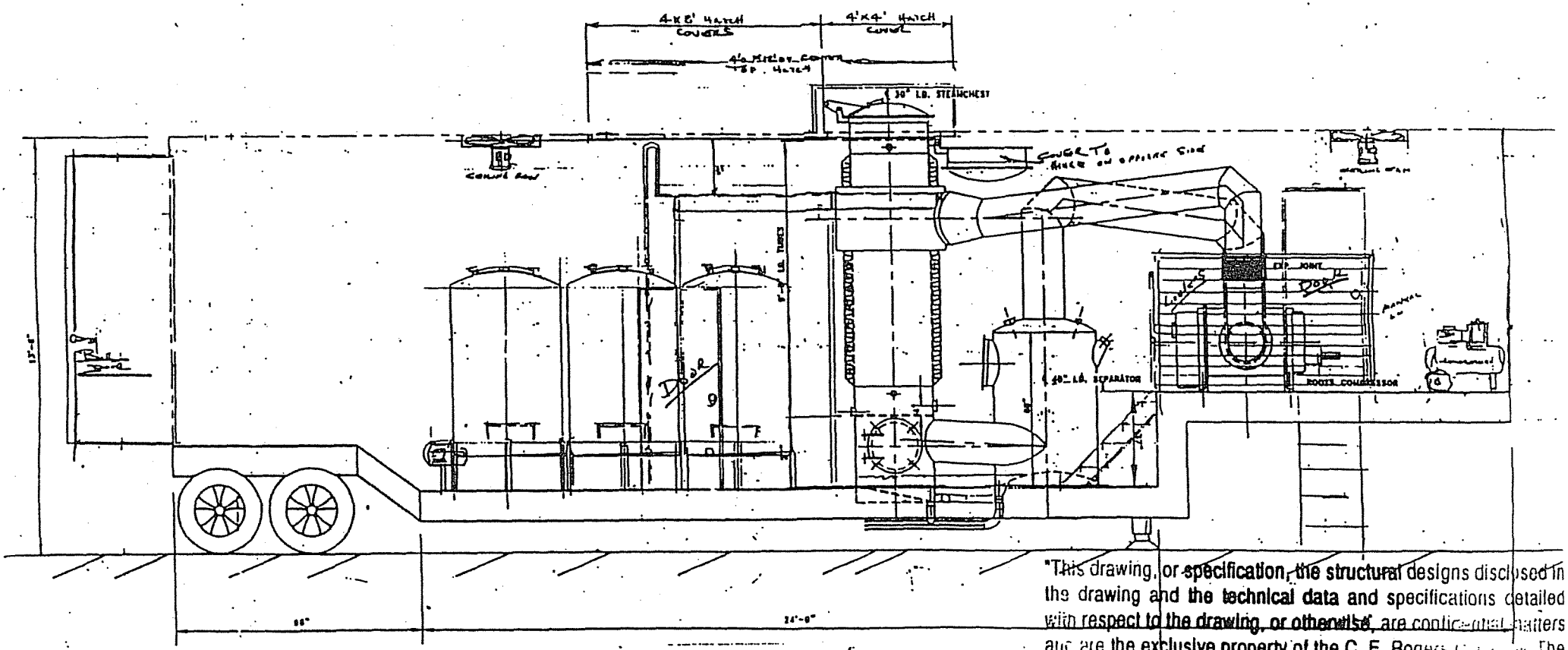
MORA MUNICIPAL WASTEWATER PLANT EFFLUENT
&
C. E. ROGERS EVAPORATED CONDENSATE WATER

Analysis	Mora Waste Water Effluent (Min./Max., 4 Month Average)	C. E. Rogers Condensate Water from evaporation: (Single Test)
Biochemical Oxygen Demand	7.17 / 10.25 mg/L	2.0 mg/L
pH	6.9 / 7.27 SU	8.2 SU
Phosphorus, Total	2.88 mg/L	< 0.1 mg/L
Oxygen, Dissolved	7.95 mg/L	
Solids, Total Suspended	9.56 / 14.25 mg/L	
Bicarbonate		6.3 mg/L
Sulfate		< 4.0 mg/L
Nitrogen, Ammonia		28.8 mg/L
Nitrogen, Total Kjeldahl		28.6 mg/L
Chemical Oxygen Demand		< 5.0 mg/L
Solids, Total Dissolved		4.0 mg/L
Iron		0.012 mg/L
Calcium		< 0.2 mg/L
Magnesium		0.06 mg/L
Potassium		0.18 mg/L


CEILING FAN #1
CEILING FAN #2
AIR COMPRESSOR
BOILER 15 PSI STEAM
VACUUM PUMPS
WATER
TO WATER RETURN TANK
FINAL HEATER
SURFACE CONDENSER
COMPRESSOR
OIL COOLING WATER SUPPLY 3 - 10 GPM
OIL COOLING WATER RETURN 3 - 10 GPM TO TANK
TANK
FLOW LEVEL
BY PASS / CIP
CONDL PUMP 1 HP
PREHEATER IN
PRODUCT FEED
COND. OUT
COND. IN
COOL. WATER RETURN
COOL. WATER SUPPLY
10 GPM FLOW PLATE
COLD PROD. FEED
HOT PROD. FEED
DISCHARGE PUMP 1 HP
BACK TO BALANCE TANK
CONCENTRATE TO CUSTOMER STORAGE OR RE-USE
WATER SUPPLY
WATER RETURN
PUMP SEAL WATER SUPPLY
GPM
PUMP SEAL WATER RETURN TO TANK
6 GPM
FLOW METER
CONDUCTIVITY METER
BACK TO BALANCE TANK
CONDENSATE TO CUSTOMER STORAGE OR RE-USE
HOSE STATION
BALANCE TANK 400 GAL.
6.6' H x 3.8' DIA.
PRODUCT SUPPLY BY CUSTOMER
EMP SUPPLY PUMP 3 HP
BY C/E/ROGERS
BY CUSTOMER
CONDENSATE TANK 400 GAL.
CONCENTRATE TANK 400 GAL.
2 HP
3 HP
SYMBOL
IDENTIFICATION
TYPES
BFV (BUTTERFLY VALVE)
AIR ACTUATED BUTTERFLY VALVE
CK (CHECK VALVE)
BALL CHECK VALVE
SV (SOLENOID VALVE)
120 VAC SOLENOID VALVE
FCV (FLOW CONTROL VALVE)
AIR ACTUATED FLOW CONTROL VALVE
MBFV (BUTTERFLY VALVE)
MANUAL BUTTERFLY VALVE
MFCV (MANUAL FLOW CONTROL VALVE)
MICROMETER VALVE
MBV (MANUAL BALL VALVE)
PUT FINAL HEATER & CONDENSER IN STEAM CHEST. GENERAL REVISION.
GJK
5/27/98
C/E/ROGERS COMPANY
SINGLE EFFECT MVR PILOT EVAPORATOR FLOW SCHEMATIC
P & ID



PLAN VIEW



ELEVATION VIEW

C/E/ROGERS MOBILE PILOT EVAP

MnDTED Innovative Technology Grant
City of Mora / C. E. Rogers Co.

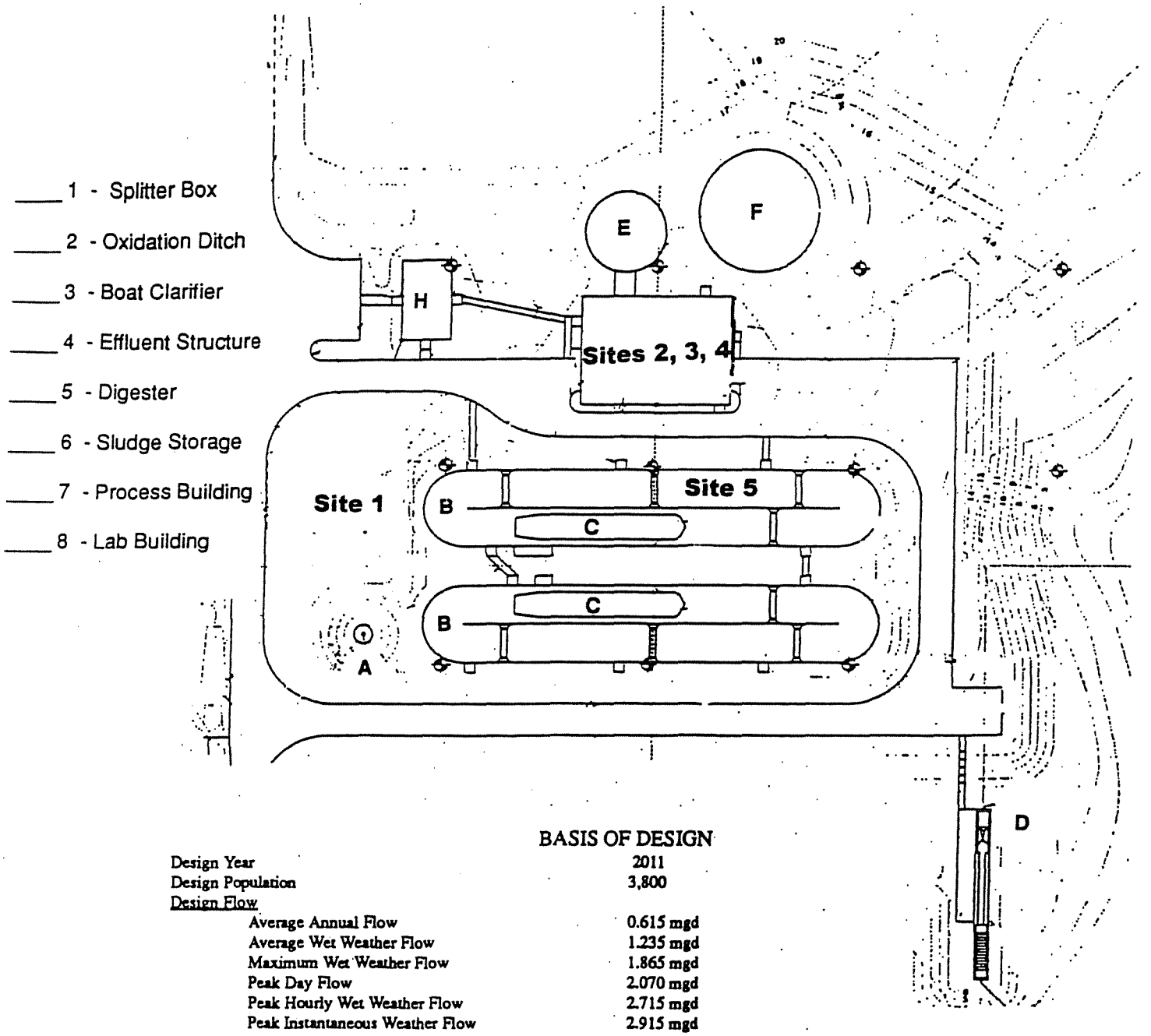
	Project Cost	Cost Distribution			Detail				
	Amount	Grant	Mora Match	CER Match	Hours	"@ $/hr	Labor	Other Exp	Total Detail
Various Stage Setups	$25,000	$0	$0	$25,000	470	$50	$23,500	$1,500	$25,000
Project Manager	$40,000	$0	$0	$40,000	438	$80	$35,000	$5,000	$40,000
Project Eng. and Lab Pers.	$40,000	$0	$0	$40,000	600	$65	$39,000	$1,000	$40,000
Report Preparation	$20,000	$0	$0	$20,000	300	$65	$19,500	$500	$20,000
Trailer - MVR Evaporator	$30,000	$0	$0	$30,000	60	$50	$3,000	$27,000	$30,000
MVR Evap-Engrg Design	$100,000	$0	$0	$100,000	1200	$75	$90,000	$10,000	$100,000
MVR Wastewater Evaporator	$375,000	$375,000	$0	$0	0	$50	$0	$375,000	$375,000
Setups-Material and Labor	$40,000	$0	$40,000	$0	600	$50	$30,000	$10,000	$40,000
Space and Equip Cert. Lab	$40,000	$0	$40,000	$0	0	$75	$0	$40,000	$40,000
Plant Operator	$35,000	$0	$35,000	$0	515	$65	$33,500	$1,500	$35,000
Equipment Operator	$25,000	$0	$25,000	$0	480	$50	$24,000	$1,000	$25,000
Accounting Expenses	$5,000	$5,000	$0	$0	113	$40	$4,500	$500	$5,000
Legal Expenses	$20,000	$20,000	$0	$0	152	$125	$19,000	$1,000	$20,000
Utilities	$15,000	$5,000	$10,000	$0	0	$25	$0	$15,000	$15,000
Totals	**$810,000**	**$405,000**	**$150,000**	**$255,000**					
Match Totals		$405,000	$405,000						

MVR Mobile Wastewater Evaporator Cost Estimate

		Eng/ Cad Hrs		Material	Shop Hrs		Subtotal	Setup		
		Est		Estimate	Est		Estimate	Estimate		
	Component Category	Hrs	Rate		Shop Hrs	$5.00		RC Hrs	$55.00	Cost Totals
1	Major Vessels									0
	A. Chests and separators			33300	850	42250	75550	100	5500	84050
	B. Side and header/straight tube heaters			0	0	0	0	0	0	0
	C. Vapor Heater			0	0	0	0	0	0	0
	Total			33300	850	42250	75550	100	5500	84050
2	Structural						0	0	0	0
	A. Deck, deck drains			4000	70	3850	7850	50	2750	10600
	B. Stairs			2500	20	1100	3600	10	550	4150
	Total			38,500	90	34,950	11450	60	3300	14750
3	Vapor Lines						0	0	0	0
	A. Vapor Lines			5000	70	3850	8850	40	2200	11050
	Total			5000	70	3850	8850	40	2200	11050
4	Condenser						0	0	0	0
	A. Condenser Vessel			5000	80	4400	9400	20	1100	10500
	B. Tailpipe and sump			0	0	0	0	0	0	0
	C. Pumps, valves/large Fisher Pipe), piping			0	0	0	0	0	0	0
	D. Cooling Tower(includes level sensor)			0	0	0	0	0	0	0
	Total			5000	80	4400	9400	20	1100	10500
5	Vacuum Pumps						0	0	0	0
	A. Pumps (includes seal H20 piping & control)			7900	10	550	8450	30	1650	10100
	Total			7900	10	550	8450	30	1650	10100
6	Vent, Vacuum, Steam and Steam Trap Piping						0	0	0	0
	A. S/S Pipes(Fisher) valves and fittings			3000	20	1100	4100	50	2750	6850
	B. Black Pipe, valves&fittings(includes traps,strainers)			3000	20	1100	4100	20	1100	5200
	Total			6000	40	2200	8200	70	3850	12050
7	Pre-Heater						0	0	0	0
	A. Raw surge tank, mix tank			3000	0	0	3000	10	550	3550
	B. Plate heater, triple tube,etc.			7000	0	0	7000	40	2200	9200
	C. Steam heater			0	0	0	0	0	0	0
	Total			10000	0	0	10000	50	2750	12750
8	Final Heater						0	0	0	0
	A. Balance/Divert tank			0	0	0	0	0	0	0
	B. Heater			0	0	0	0	0	0	0
	Total			0	0	0	0	0	0	0
9	HTST System						0	0	0	0
	A. Hold tube (includes HTST valves&control)			0	0	0	0	0	0	0
	Total			0	0	0	0	0	0	0
10	Hotwell						0	0	0	0
	A. Hotwell tanks			0	0	0	0	0	0	0
	Total			0	0	0	0	0	0	0
11	Compressor-MVR						0	0	0	0
	A. Compressor			50000	0	0	50000	20	1100	51100
	B. Motor			16000	0	0	16000	10	550	16550
	C. Variable Frequency Drive			16000	0	0	16000	20	1100	17100
	D. Misc Expansion joints, etc.			10000	0	0	10000	40	2200	12200
	Total			92000	0	0	92000	80	4950	96850
12	Thermocompresser - TVR						0	0	0	0
	A. Thermocompresser, insulation and jacket			0	0	0	0	0	0	0
	Total			0	0	0	0	0	0	0
13	Stainless Steel OD Piping						0	0	0	0
	A. Stainless tube, fittings, valves			10000	0	0	10000	100	5500	15500
	B. Inter-effect, condensate and pre-heater purrow			10000	0	0	10000	20	1100	11100
	C. Miscellaneous			0	0	0	0	0	0	0
	Total			20000	0	0	20000	120	6900	26900
14	CIP System			0	0	0	0	0	0	0
	A. Tanks			5000	0	0	5000	30	1650	6650
	B. Spray devices			5000	0	0	5000	30	1650	6650
	C. Heater			0	0	0	0	0	0	0
	Total			10000	0	0	10000	60	3300	13300
15	Panelboard/Controls						0			0
	A. Cabinet			2000	0	0	2000	20	1100	3100
	B. Data logger/display/recorder, controllers			6000	0	0	6000	20	1100	7100
	C. PLC/Operator interface/computer			0	0	0	0	0	0	0
	D. Sol valves/poly-flo tub.R.ar req,gauges,remote s/s, sol cab			0	0	0	0	0	0	0
	E. Transmitters(RTD, flow, press, level, etc.)			6000	0	0	6000	20	1100	7100
	F. Pneumatic controller/welded cable conn,s/s junc box			2000	0	0	2000	20	1100	3100
	G. MCC & VFDs			20000	0	0	20000	0	0	20000
	Total			36000	0			80	4400	40400
16	Product Cooling System						0			0
	A. Raw surge tank			0	0	0	0	0	0	0
	B. Plate heater/triple tube, etc.			0	0	0	0	0	0	0
	C. Steam heater			0	0	0	0	0	0	0
	Total			0	0			0	0	
17	Seal Water Piping for Evap Pumps						0			0
	A. Seal Water Piping			0	0	0	0	0	0	0
	Total			0	0					
18	Flash Cooler			0	0	0	0	0	0	0
	A. Vessel, structural deck, ladder			0	0	0	0	0	0	0
	B. Vapor lines			0	0	0	0	0	0	0
	C. Condenser			0	0	0	0	0	0	0
	D. Vacuum pump			0	0	0	0	0	0	0
	E. Thermocompressor			0	0	0	0	0	0	0
	F. Piping			0	0	0	0	0	0	0
	G. Pumps			0	0	0	0	0	0	0
	Total			0	0	0	0	0	0	0
19	Miscellaneous			0	0					0
	A. Trailer			30000		0	30000	0	0	30000
	B. Thayer Feeder			0	0	0	0	0	0	0
	C. Surge Hopper			0	0	0	0	0	0	0
	D. Baghouse			0	0	0	0	0	0	0
	E. Jacketed Tank			0	0	0	0	0	0	0
	F. Pumps			0	0	0	0	0	0	0
	G. Blowers			20000	0	0	20000	0	0	20000
	H. Miscellaneous			7000	0	0	7000	0	0	7000
	Total			57000	0	0	57000	0	0	57000
20	Freight				0	0	0	0	0	0
	Total			6000	0	0	6000	0	0	6000
21	Engineering		75	0	0	0	0	0	0	0
	Total	600	60000	0	0	0	60000	0	0	60000
22	Drafting		65	0	0	0	0	0	0	0
	Total	600	39000	0	0	0	39000	0	0	39000
23	Start-up (Engineering)		75	0	0	0	0	0	0	0
	Total	20	1500	0	0	0	1500	0	0	1500
24	Warranty		0	0	0	0	0	0	0	0
	Total	0	0		0	0	0	0	0	0

Carsand

	Design Engineering	800	$80,000							$80,000
	Drafting	600	$39,000							$39,000
	Material			$296,700						$296,700
	Shop Labor				1,240	$68,200				$68,200
	Subtotal						$203,850			
	Setup									
	Labor Setup								$39,600	
	Z1 Mobilization								$0	
	Z2 Subsistence								$0	
	Z3 Motel								$0	
	Z4 Travel Expenses								$0	
	Z5 Expendables								$0	
	Z6 Equipment Rental								$0	
	Z7 Installation Supervision								$0	
	Z8 Miscellaneous								$0	
	Total Installation									$39,600
	Start-up (Engineering)	20	$1,500							$1,500
	Pre Sale Engineering									$0
	Total Cost									$869,000



BASIS OF DESIGN

Design Year	2011
Design Population	3,800
Design Flow	
Average Annual Flow	0.615 mgd
Average Wet Weather Flow	1.235 mgd
Maximum Wet Weather Flow	1.865 mgd
Peak Day Flow	2.070 mgd
Peak Hourly Wet Weather Flow	2.715 mgd
Peak Instantaneous Weather Flow	2.915 mgd

Organic Loading (BOD)	30 day Ave	Max Day
1991 Domestic	1376 lbs./day	5055 lbs./day
Domestic Reserve	173 lbs./day	433 lbs./day
Industrial Reserve	101 lbs./day	152 lbs./day
TOTAL	1650 lbs./day	5640 lbs./day

Solids Loading	30 day Ave	Max Day
1991 Domestic	1002 lbs./day	3008 lbs./day
Domestic Reserve	173 lbs./day	433 lbs./day
Industrial Reserve	95 lbs./day	144 lbs./day
TOTAL	1270 lbs./day	3585 lbs./day

Effluent Standards

Substance or Characteristic	Limiting Concentration
5-day Biochemical Oxygen Demand	25 mg/l
Total Suspended Solids	30 mg/l
PH	6-9
Fecal Coliform Group Organisms	
Organisms/100ml	200 *MPN/100ml
Dissolved Oxygen	5 mg/l
Chlorine residual	0.1 mg/l

*Applicable from March 1 - October 31