

# Minnesota Pollution Control Agency

Celebrating our 25th anniversary and the 20th anniversary of the Clean Water Act

August 3, 1992

## NOTICE TO INTERESTED PARTIES:

On July 28, 1992, the Minnesota Pollution Control Agency (MPCA) determined that the Environmental Impact Statement (EIS) prepared for the Mayo Foundation Medical Waste Incinerator was adequate as defined by the criteria established in the Minnesota Environmental Quality Board (EQB) rules. Agencies may now proceed with decisions on permits or approvals needed by the project. Permitting agencies may wish to consult Minn. Rules pt. 4410.2900 (EQB rules), for information on requirements related to permit decisions. Questions about the impacts or mitigation described in the EIS may be directed to Meri K. Nielsen at (612) 297-1766.

The next step in the process involves developing an Air Emission permit for the project. A 30-day public comment period on the draft Air Emission permit began on July 31, 1992, and will run through August 29, 1992 (see attached notice). Please contact Peter Torkelson of the Air Quality Division, at (612) 296-7260, to receive a copy of the draft Air Emission permit. The MPCA will consider the company's request for the issuance of an Air Emissions permit at a Board Meeting to be held this fall.

We want to express our appreciation to all of you who took the time and effort to submit comments and attend the public meetings on the EIS. Your participation was essential to the quality and depth of the Final EIS approved last week, and to the important improvements identified for the proposed project.

Sincerely,

A handwritten signature in black ink that reads "Paul Hoff". The signature is written in a cursive style with a long horizontal stroke at the end.

Paul Hoff, Director  
Environmental Analysis Office  
Administrative Services Division

PH:pnk



# Minnesota Pollution Control Agency

Celebrating our 25th anniversary and the 20th anniversary of the Clean Water Act

July 21, 1992

To All Concerned Parties:

Enclosed for your information is a copy of the Minnesota Pollution Control Agency (MPCA) Board item for the Mayo Foundation Medical Waste Incinerator Project Final Environmental Impact Statement (EIS), and a copy of the Board agenda.

The Board item will be presented at the MPCA Special Board Meeting on Tuesday, July 28, 1992, beginning at 7:00 p.m. The meeting will be held at the City Hall City Council Chambers, 224 1st Avenue Southwest, Rochester, Minnesota.

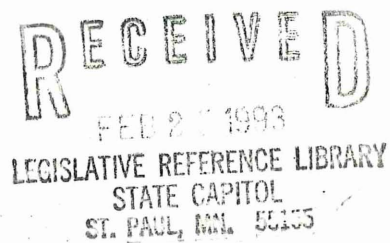
You are welcome to attend this meeting and request to address the Board if you desire. If you have any questions regarding the enclosed Board item or the specifics of the meeting, feel free to contact me at 612/296-7799 or Meri Nielsen, EIS Project Manager, at 612/297-1766.

Sincerely,

Paul Hoff, Director  
Environmental Analysis Office  
Administrative Services Division

PH:pnk

Enclosures



**FINAL AGENDA**

**SPECIAL BOARD MEETING**

for the

**MINNESOTA POLLUTION CONTROL AGENCY  
520 Lafayette Road  
St. Paul, Minnesota 55155**

to be held on July 28, 1992 at 7:00 P.M. at the

**City Hall  
City Council Chambers  
224 - 1st Avenue S.W.  
Rochester, Minnesota 55902**

7:00 P.M.

**I. GENERAL**

1. Call to Order
2. Agenda Review and Adoption

**II. APPEARANCE ITEM**

**ENVIRONMENTAL ANALYSIS OFFICE**

3. Request For Approval Of Findings Of Fact And Adequacy Of The Final Environmental Impact Statement For The Mayo Foundation Medical Waste Incinerator Project

**III. ADJOURN**

MINNESOTA POLLUTION CONTROL AGENCY  
Environmental Analysis Office

Agenda Item Control Sheet

MEETING DATE: July 28, 1992 AGENDA NUMBER: 3  
APPEARANCE ITEM: Yes: X No:            SCHEDULED TIME: 7:00 p.m.  
PREPARED BY: Meri K. Nielsen DATE MAILED: July 21, 1992  
*PK*

TITLE: Request For Approval Of Findings Of Fact And Adequacy Of The Final  
Environmental Impact Statement For The Mayo Foundation Medical Waste  
Incinerator Project

LOCATION: Rochester Olmsted  
City County

TYPE OF ACTION: Determination of Adequacy of Environmental Impact Statement

RECOMMENDED ACTION: Approval and Authorization

ISSUE STATEMENT:

The Environmental Analysis Office has prepared the Final Environmental Impact Statement (EIS) for the proposed Mayo Foundation Medical Waste Incinerator. The Final EIS consists of responses to the timely and substantive comments received on the Draft EIS, a revised project description, a recalculation of the air emission rates, a recalculation of the health and ecological risk assessments, and a discussion on the need for the project. The Final EIS incorporates the Draft EIS and the technical work papers referenced in the Draft EIS. After completion of the Draft EIS the project proposer adopted several of the mitigation recommendations suggested by the Minnesota Pollution Control Agency (MPCA). Specifically, one of the two incinerators was eliminated and steam sterilization and plastics recovery was incorporated into the facility. In addition, activated carbon injection was added to further control emissions of mercury, polychlorinated biphenyls (PCBs), and dioxin.

As the Responsible Governmental Unit (RGU) for the environmental review of this project, the MPCA must now determine if the EIS is adequate based on the criteria contained in Minn. Rules pt. 4410.2800. These criteria are that the EIS: 1) address the issues raised in scoping so that all issues for which information can reasonably be obtained have been analyzed, 2) provides responses to substantive comments received during the Draft EIS review concerning issues raised during scoping, and 3) was prepared in compliance with the procedures of the Minnesota Environmental Policy Act and parts 4410.0200 to 4410.6500 of the Environmental Quality Board Rules. The staff believes that these criteria have been met and recommends the MPCA approve the proposed Findings of Fact and determine that the EIS is adequate.

ATTACHMENTS:

1. Proposed Findings of Fact
2. Minn. Rules pt. 4410.2000 - 4410.2800
3. Status of EPA Regulatory Development Program For Medical Waste  
Incinerators -- Results of Emission Test Program

MINNESOTA POLLUTION CONTROL AGENCY  
Environmental Analysis Office

Request For Approval Of Findings Of Fact And Adequacy  
Of The Final Environmental Impact Statement For The Mayo Foundation  
Medical Waste Incinerator Project

July 28, 1992

ISSUE STATEMENT

The Environmental Analysis Office has prepared the Final Environmental Impact Statement (EIS) for the proposed Mayo Foundation Medical Waste Incinerator. The Final EIS consists of responses to the timely and substantive comments received on the Draft EIS, a revised project description, a recalculation of the air emission rates, a recalculation of the health and ecological risk assessments, and a discussion on the need for the project. The Final EIS incorporates the Draft EIS and the technical work papers referenced in the Draft EIS. After completion of the Draft EIS the project proposer adopted several of the mitigation recommendations suggested by the Minnesota Pollution Control Agency (MPCA). Specifically, one of the two incinerators was eliminated and steam sterilization and plastics recovery was incorporated into the facility. In addition, activated carbon injection was added to further control emissions of mercury, polychlorinated biphenyls (PCBs), and dioxin.

As the Responsible Governmental Unit (RGU) for the environmental review of this project, the MPCA must now determine if the EIS is adequate based on the criteria contained in Minn. Rules pt. 4410.2800. These criteria are that the EIS: 1) address the issues raised in scoping so that all issues for which information can reasonably be obtained have been analyzed, 2) provides responses to substantive comments received during the Draft EIS review concerning issues raised during scoping, and 3) was prepared in compliance with the procedures of the Minnesota Environmental Policy Act and parts 4410.0200 to 4410.6500 of the Environmental Quality Board Rules. The staff believes that these criteria have been met and recommends the MPCA approve the proposed Findings of Fact and determine that the EIS is adequate.

I. BACKGROUND:

The Mayo Foundation proposes to construct a medical waste treatment facility to replace its currently operating Institute Hills Farm medical waste incinerator. The Institute Hills Farm incinerator is nearing the end of its design life and will not be capable of meeting the new standards contained in the proposed state rules or federal regulations. The major elements of the project include two steam autoclaves to sterilize infectious waste, a plastics

recovery system, and one 25 ton per day incinerator (instead of the two 25 ton per day incinerators originally proposed). The project would include the following pollution control equipment: a dry sorbent injection/fabric filter system, activated carbon injection, and potentially coning of the stack.

The proposed project did not exceed any of the thresholds for the preparation of an Environmental Assessment Worksheet (EAW) pursuant to Minn. Rules pt. 4410.4300, subp. 1 to 34. The Minnesota Pollution Control Agency (MPCA) ordered the preparation of a discretionary EAW pursuant to Minn. Rules pt. 4410.1000, subp. 3.A to determine if the proposed project had the potential for significant environmental effects. The EAW came before the MPCA Board for a decision on the need for an Environmental Impact Statement (EIS) on October 23, 1990, resulting in the issuance of a positive declaration requiring the preparation of an EIS for the project. The EIS was prepared in accordance with Minn. Rules pt. 4410.2000 to 4410.2800. A copy this section of the rules is attached for reference (Attachment 2). The proposed Findings of Fact (Attachment 1) itemizes how the MPCA has fulfilled all of the requirements of the rules during the preparation of the EIS for the Mayo Foundation Medical Waste Incinerator. A summary of the EIS process followed for this project is presented below:

- o A scoping decision document was prepared and noticed in the Environmental Quality Board (EQB) Monitor on October 29, 1990. A scoping meeting was held on November 15, 1990, and the scoping period ended on December 6, 1990. The 11 written and 6 oral comments received were incorporated in the scoping decision document. The scoping decision was adopted by the MPCA Board on February 26, 1991. A copy of the scoping

document, updated with specific references to the sections of the Draft and Final EIS where each item in the scope was addressed, is attached to this Board item (Exhibit A of the Findings of Fact).

o An EIS preparation notice was published in the EQB Monitor on April 15, 1991. Preparation of the Draft EIS occurred from April 15, 1991, to February 14, 1992.

o A notice of the availability of the Draft EIS was published in the EQB Monitor on February 16, 1992. A public meeting to receive comments on the Draft EIS was held on March 11, 1992, and the public comment period ended on March 18, 1992. A total of 30 written and 6 oral comments were received on the Draft EIS.

o A notice of the availability of the Final EIS was published in the EQB Monitor on June 8, 1992. The Final EIS contained a section describing new and revised information and a response to the comments received on the Draft EIS. The comment period ended on June 22, 1992, and eight comment letters were received.

o Pursuant to Minn. Rules pt. 4410.2800, the MPCA, as Responsible Governmental Unit (RGU), must now determine the adequacy of the Final EIS.

## II. DISCUSSION:

The criteria for the determination of adequacy of the EIS are presented in Minn. Rules pt. 4410.2800, subp. 4, which is stated as follows:

Subp. 4. Conditions. The Final EIS shall be determined adequate if it:

- A. addresses the issues raised in scoping so that all issues for which information can be reasonably obtained have been analyzed;
- B. provides responses to the substantive comments received during the Draft EIS review concerning issues raised in scoping; and
- C. was prepared in compliance with the procedures of the act and parts 4410.0200 to 4410.6500.

In reviewing the above criteria for adequacy of the EIS, it is useful to note the purpose of the environmental review process as stated in Minn. Rules pt. 4410.0300, subp. 3 which states, in part:

Environmental documents shall contain information that addresses the significant environmental issues of a proposed action. This information shall be available to governmental units and citizens early in the decision making process.

Environmental documents shall not be used to justify a decision, nor shall indications of adverse environmental effects necessarily require that a project be disapproved. Environmental documents shall be used as guides in issuing, amending, and denying permits and carrying out other responsibilities of governmental units to avoid or minimize adverse environmental effects and to restore and enhance environmental quality.

It is also appropriate to review Minn. Rules pt. 4410.2000, subp. 1, which states:

Subpart 1. Purpose of EIS. The purpose of an EIS is to provide information for governmental units, the proposer of the project, and other persons to evaluate proposed projects which have the potential for significant environmental effects, to consider alternatives to the proposed projects, and to explore methods for reducing adverse environmental effects.

As can be seen, an EIS must include information on the proposed project, a consideration of alternatives, and an identification of mitigative measures. It is not intended to be all-inclusive, nor is it intended to develop definitive answers to legal or technical questions. Rather, the EIS must use information that is reasonably available to provide an accurate analysis of the

environmental impacts as they relate to the issues and alternatives identified in the scoping decision. The EIS contains, as specified in the scoping decision:

- 1) A description of the project including the major facilities to be installed, pollution control equipment, composition of the waste stream, operating practices, utility requirements, and a listing of permits or approvals required;
- 2) A discussion of environmental impacts and mitigation for issues such as cumulative impacts, air quality, public health and ecological risks, radioactive emissions, ash generation and disposal, and wastewater;
- 3) A discussion of economic and social impacts relating to the effects of construction and operation of the facility, property values, economic impacts of health care, and impacts on existing solid waste management in Olmsted County;
- 4) A discussion of alternatives including microwave sterilization, autoclaving, chemical/mechanical treatment, thermal treatment, incineration at the existing Olmsted County incinerator, and the proposed project at alternative sites.

The Final EIS incorporates an evaluation of all issues identified in the scoping decision and contains responses to comments made on the Draft EIS. The EIS must contain a description of the potential environmental impacts, mitigative measures associated with the project, and describe reasonable alternatives to the project using available data. The EQB rules acknowledge that, at times, information desirable for the EIS analysis may be incomplete or unavailable; the rules also define a course of action to follow in such instances. Thus, when the data needed for an evaluation of an environmental impact or alternative are incomplete or unavailable, it must be made clear in

the EIS that the information is lacking and that further study is needed, and in instances where the data is essential for a reasoned choice among alternatives, the EIS must contain a worst-case analysis of the situation. This has been done in the Draft and Final EIS. All issues raised in the scoping process for which information could be reasonably obtained has been analyzed.

It is important to note that some comments received on the Draft EIS applied more appropriately to the permitting processes than to the environmental review process. A permitting process may require significantly more detailed data and review than does the environmental review process. When a new permit for a specific environmental area is required, more detailed data must be available to the permitting agency. The additional specific information could include the specific facility plans and specifications and operating conditions. The project must also be acceptable to the agency (the project must comply with all applicable laws, rules, policies) before a permit can be issued. For this step, the permitting agency has the option to require further study in advance of permitting or to issue the permit with a condition of further study.

During the Draft EIS public comment meeting and in written comments received on the Draft and Final EIS, several issues were raised in relationship to the EIS. Those issues have been addressed in the Response to Comments and supplementary sections of the Final EIS and may be further addressed in the permitting process. A brief summary of these issues is presented below:

**1. Incorporation of Alternatives and Mitigation Measures**

Several of the alternatives and mitigation measures presented in the Draft EIS have been adopted by the project proposer. The original project proposed two incinerators with a permitted capacity of 25 tons per day. The revised proposal now incorporates two steam sterilization units (autoclaves), to sterilize infectious waste. Once the infectious waste has

been sterilized, it will be combined with the general waste stream and processed through a plastics recovery system. The plastics recovery system will remove 80 percent of the plastics from the waste stream for recycling. As a result of the incorporation of the alternatives, one of the incinerators has been eliminated.

The mitigation measures that have been incorporated into the project also include activated carbon injection to control mercury and PCB emission, monitoring every 90 days for mercury emissions, monitoring every 36 months for PCB emissions and if necessary coning the stack to increase exit velocities.

## 2. Need for the Facility

Concern has been expressed regarding the need for Mayo to install an incinerator to dispose of the medical waste that it generates. Based on the most up to date information available, the EIS states that there are no feasible and prudent alternatives to including incineration in Mayo's waste management plan. The following factors support that conclusion:

@ There are no prudent and feasible alternatives to incineration for decontaminating pathological, residual chemotherapy waste, animal carcasses, and low-level radioactive wastes. Alternative technologies cannot treat these waste streams.

@ The pathological, residual chemotherapy wastes, animal carcasses and low-level radioactive waste streams need to be incinerated with other waste types (general hospital waste stream) in order to attain good combustion.

@ The existing Olmsted County incinerator (OWEF) does not have the capacity to handle Mayo's waste stream. In 1991, OWEF sent 6000 tons of burnable waste to Olmsted Kalmar Landfill because it could not

handle the waste volume it received. It would be unacceptable to bypass any medical waste to a landfill.

@ The OWEF permit does not allow acceptance of the quantities of infectious waste that Mayo generates.

@ OWEF cannot accept some of the waste streams generated by Mayo: pathological, residual chemotherapy waste, animal carcasses, and low-level radioactive wastes.

@ The no-action alternative is unacceptable. The currently operating Mayo incinerator (Institute Hills Farm) is not capable of meeting new emission limits that will soon be imposed. Furthermore, the equipment requires frequent repair; the integrity of the equipment cannot be maintained indefinitely.

@ The non-recyclable residual from any alternative treatment technologies for infectious waste must still be disposed.

@ The greatest reduction in the volume and toxicity of Mayo's waste would result from: decontamination of infectious waste, elimination from the waste stream (general and decontaminated infectious waste streams) of recyclables, incineration of the residuals, and landfilling of the ash.

@ The cost of off-site disposal of just the low-level radioactive portion of the untreatable waste stream is currently estimated at \$1,880,000 annually compared to \$11,000 if it continues to be incinerated at a Mayo-owned and operated facility permitted by the Nuclear Regulatory Commission (NRC).

@ As of January 1, 1993, Minnesota generators of low-level radioactive waste will not be able to ship their waste out of the six-state region. The catch, however, is that there are no disposal

sites within the region and there will not be a disposal site within the region until 1997 or 1998, at the earliest.

@ The proposed facility would have better pollution control equipment than either Mayo's currently operating combustor or OWEF.

Concern has been expressed over the possibility that the proposed facility may become a regional disposal facility for medical waste. Mayo has stated that they currently plan to accept waste only from Mayo subsidiaries and from Olmsted and Dodge Counties. The proposed facility was proposed to dispose of waste generated by the Mayo Foundation. The environmental review contained in the EIS was completed as if the incinerator were operating 24-hours per day at full capacity, rather than the 8 to 16-hour per day operation planned by Mayo. If in the future Mayo began accepting medical waste from sources not specifically listed in the EIS, no additional environmental review would be necessary. The issue of regional disposal is adequately covered in the EIS and is mainly a permitting decision to be made by the MPCA Board.

### 3. Air Quality

The emission estimates have been revised based upon concerns raised during the comment period for the Draft EIS. The two primary reasons for revising the emissions estimates are as follows:

@ Staff from the Minnesota Department of Health (MDH) expressed concern regarding the statistical treatment of the emissions data. The emission estimates in the draft EIS were based on the upper 95 percent confidence limit of the geometric mean of all data points for a pollutant. The emission estimates were recalculated using the upper 95 percent confidence limit of the arithmetic average. This recalculation was important because the arithmetic average will tend to increase risk estimates, thus making it a more conservative approach.

@ The emission estimates in the Draft EIS did not represent the removal efficiencies of the pollution control equipment (dry sorbent injection/fabric filter system and the activated carbon injection system). This recalculation was important because it shows a more realistic picture of what the emissions from the proposed facility may be like.

The data used to originally predict emission rates in Technical Work Paper 4 "Air Quality Emissions and Deposition" was supplemented with (not replaced by) additional information for better predicting emission rates from the proposed incinerator. This information came from very recently published emissions data in conference proceedings, stack test reports, other states' technical reports, interviews with the manufacturer of Mayo's proposed air pollution control equipment and U.S. Environmental Protection Agency (EPA) staff that is developing the federal medical waste incinerator air emission standards.

Activated carbon injection for control of mercury emissions (as well as organic emissions) has been used extensively in Europe at hazardous waste incinerators, municipal waste incinerators, and medical waste incinerators. Published information on the effectiveness of activated carbon has focused primarily on hazardous waste and municipal waste combustors, because in the United States, most of the regulatory activity has been in controlling these incinerators. The MPCA staff is continuously tracking developments in this field as part of ongoing rule making and permit activities, and is familiar with the effectiveness of activated carbon as the best demonstrated technology for controlling mercury emissions.

The effectiveness of activated carbon for mercury removal at the Mayo medical waste incinerator was confirmed by reviewing the removal efficiencies at two medical waste incinerators where dry sorbent injection/fabric filters and activated carbon were tested, one in Skovde, Sweden, and pilot testing of activated carbon conducted by the EPA (see Attachment 3).

From this review of data from all types of waste combustors, and confirmation of mercury removal efficiencies at tested medical waste incinerators, the MPCA concludes that with the use of activated carbon, Mayo's medical waste incinerator will effectively control mercury emissions.

The proposed facility would have a 75-foot high stack. Concern has been expressed that the proposed stack height is not sufficient. A height of 75 feet was selected based upon Good Engineering Practices, zoning requirements (the Federal Aviation Administration limits the height of structures within 13,000 feet of an airport to 100 feet), and aesthetic impacts. The stack has been determined to be at a level where effects from building wakes are not major, and the 75-foot stack is of sufficient height to ensure attainment of all relevant air quality standards in the area that could be affected by this facility.

#### **4. Human Health Risk Assessment**

The risk estimates have been recalculated to reflect the revised emission rates discussed above. As a result the cancer risk from revised emissions are five and one-half per 1,000,000. This level is well within the acceptable level of one per 100,000 established by the MDH. The MDH is in agreement with MPCA on how the health risk assessment was conducted.

## 5. Ecological Risk Assessment

The ecological risk assessment indicated that the concentration of mercury in Willow Creek Reservoir could range from just below the Minnesota Water Quality Criteria to ten times greater than the criteria. Willow Creek Reservoir, located approximately three kilometers northwest of the site, is a flood control reservoir and it is not intended to supply recreation opportunities. To help to reduce potential mercury impacts to Willow Creek Reservoir, Mayo has volunteered to accept a permit limit that is approximately half of the emissions level used in calculating the ecological risk assessment. Specifically, the ecological risk assessment mercury emission level was .27 milligrams per dry standard cubic meter (mg/dscm) and the permit limit that Mayo has accepted is .15 mg/dscm. There is a linear relationship between emissions and risk, thus, by accepting the lower permit limit, the risk will be reduced by approximately half. In addition, Mayo will install activated carbon injection technology and will conduct source separation prior to incineration, to further reduce mercury emission. Activated carbon injection is the best control technology available for the control of mercury emissions. Mayo will also be required to monitor for mercury emission every 90 days. MPCA staff believes that the EIS adequately addressed the issue of mercury emissions, providing the Board with a basis to consider whether further mitigation of mercury emissions is warranted during the permitting process.

### III. CONCLUSIONS:

As set forth in the proposed Findings of Fact (Attachment 1), the staff has met all the requirements of the EQB rules for EIS preparation. The Final EIS was prepared in compliance with the procedures in Minn. Rules pts. 4410.2000 through 4410.2800 and meets all the adequacy requirements of those rules. All

issues identified in the scoping decision for which information could be reasonably obtained have been analyzed and evaluated. All significant environmental impacts have been identified. The staff has reviewed comments received on the Draft EIS, and responses to substantive comments on the Draft EIS, consistent with the scoping decision for the project, have been incorporated into the Final EIS.

IV. RECOMMENDATION:

The staff recommends that the MPCA determine that the Final EIS for the Mayo Foundation medical waste incinerator project is adequate.

SUGGESTED RESOLUTION

BE IT RESOLVED, that the Minnesota Pollution Control Agency determines that the Final Environmental Impact Statement for the Mayo Foundation medical waste incinerator project in Rochester is adequate and adopts the proposed Findings of Fact (Attachment 1); and

BE IT FURTHER RESOLVED, that the Minnesota Pollution Control Agency authorizes the Commissioner to publish a notice of this determination on this project.

STATE OF MINNESOTA  
MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the Determination of  
Adequacy of the Environmental Impact  
Statement for the Mayo Foundation  
Medical Waste Incinerator

FINDINGS OF FACT  
CONCLUSIONS  
AND ORDER

The matter captioned above came before the Minnesota Pollution Control Agency (MPCA) for decision on July 28, 1992. After affording all interested persons the opportunity to present written and oral data, statements, and arguments to the MPCA, after reviewing the Draft and Final Environmental Impact Statements (EISs), after considering all of the evidence in the records, files, and proceedings herein, the MPCA, being fully advised, hereby adopts the following Findings of Fact and Conclusions:

## FINDINGS OF FACT

## I. PROJECT DESCRIPTION

1. The proposed Mayo Foundation Medical Waste Incinerator Project (project) involves the construction of a single incinerator with a permitted capacity of 25 tons per day, located on a 14.4-acre parcel of property in Olmsted County, northeast of the Rochester Municipal Airport. The proposed project will replace the currently operating Mayo Foundation Institute Hills Farm Incinerator, which is nearing the end of its design life and will not be capable of meeting standards contained in proposed state or federal emission limits.
2. The project would include two stationary steam autoclaves to sterilize infectious waste. Each autoclave is capable of handling approximately 600 pounds or 6.6 cubic meters per hour of infectious waste. The proposed autoclaves are capable of meeting the requirements of Minn. Rules pt. 7035.9120, subp. 3.
3. The project would include a plastics recovery system. Shredded general waste would be combined with shredded infectious waste and processed through the plastics recovery system. The proposed end product would be a shredded substance composed of plastic that could be used in injection modeling of plastic products. If the plastics recovery system operates at an expected removal efficiency of 80 percent, the incinerated waste stream would be reduced by 2.5 tons per day.
4. The project would include activated carbon injection to control emissions of mercury, dioxins, and polychlorinated biphenyls. Activated carbon injection is considered to be the Best Available Control Technology available for the control of these emissions.

5. The following permits and approvals will be required for the project:

<u>Level of Government</u>	<u>Type of Permit</u>	<u>Status</u>
<u>Federal:</u>		
Federal Aviation Administration	Approval to Construct Within Protected Airspace of Instrument Approach Airport	Approved
Nuclear Regulatory Commission	Amendment to Nuclear Regulatory Commission Materials License	In preparation
<u>State:</u>		
MPCA	Air Emissions and Solid Waste Facility Operating Permit	Draft permit to be noticed summer 1992
MPCA	State Disposal System (SDS) Permit for Sewer Extension	Permit is no longer required, Mayo will use the existing municipal system
Minnesota Department of Labor & Industry	Certificate of Boiler Inspection	To be obtained
Minnesota Department of Natural Resources	Ground Water Appropriation Permit	To be obtained
<u>Local:</u>		
Olmsted County	Board of Health Licensure and Exemption from Solid Waste Ordinance	Approved
City of Rochester	Conditional Use Permit	Submitted; on hold for EIS approval
City of Rochester	Rezoning of Site to Industrial Land Use Plan Amendment	Approved
City of Rochester	Sewer System Extension and Connection Review and Approval	Preliminary submitted and approved
City of Rochester	Industrial Discharge Permit	In preparation
City of Rochester	Plat Approval for Site Development	Approved

## II. NEED FOR AN EIS

1. The project did not exceed any of the thresholds for the preparation of a mandatory Environmental Assessment Worksheet (EAW) pursuant to Minn. Rules pt. 4410.4300, subp. 1 to 34. The MPCA ordered the preparation of a discretionary EAW pursuant to Minn. Rules pt. 4410.1000, subp. 3.A. A discretionary EAW was ordered because MPCA staff believed that the project may have the potential for significant environmental effects.
2. A discretionary EAW was prepared on the project and distributed on August 14, 1990. Notice of the availability of the EAW was published in the Environmental Quality Board (EQB) Monitor on August 20, 1990. A public informational meeting was held by the MPCA staff on September 10, 1990, in Rochester. The 30-day public comment period ended on September 19, 1990, and over 20 comment letters were received.
3. The EAW came before the MPCA Citizens Board for a decision on the need for an EIS for the project on October 23, 1990. The MPCA Citizens Board issued a positive declaration requiring the preparation of an EIS in compliance with Minn. Rules pt. 4410.1700, subps. 1 to 7.
4. In compliance with Minn. Rules pt. 4410.0500, subp. 2, the responsible governmental unit (RGU) for the EIS is the MPCA.

## III. EIS SCOPING PROCESS

1. A draft scoping decision document was prepared on the project and distributed to the EQB mailing list and other interested parties on November 8, 1990. A press release containing notice of the scoping meeting was provided to newspapers serving the project area on November 8, 1990.
2. A notice of the MPCA Board decision and the availability of the scoping document was published in the EQB Monitor on October 29, 1990. The scoping period began on October 29, 1990. A scoping meeting was held on November 15, 1990, at 7:30 p.m. in the State Room at the Campus Conference Center in Rochester. The scoping period ended on December 6, 1990.
3. Written comments regarding the scoping EAW were received from nine individuals and incorporated into the scoping decision document. Oral comments and questions were received from 11 individuals at the November 15, 1990, scoping meeting.
4. A scoping decision was adopted by the MPCA Citizens Board on February 26, 1991. The scoping decision contained an anticipated EIS schedule, a listing of the issues to be addressed in the EIS, and a description of alternatives to be addressed in the EIS.
5. An EIS preparation notice was published in the EQB Monitor on April 15, 1991.

#### IV. DRAFT EIS

1. Preparation of the Draft EIS occurred from April 15, 1991, to February 14, 1992.
2. The Draft EIS was prepared in a manner consistent with EQB Rules (Minn. Rules pt. 4410.2300) and in accord with the scoping decision. The Draft EIS contained:
  - a) a cover sheet identifying the RGU, the project title, the project location, the contact person for the RGU, the project proposer, an abstract, the date of the public meeting on the Draft EIS, and the date for the end of the comment period;
  - b) a summary which stressed the major findings, areas of controversy, and the issues to be resolved including the choice among alternatives;
  - c) a table of contents;
  - d) a list of preparers;
  - e) a project description identifying the purpose of the project, its size, scope, environmental setting, geographic location, and the anticipated phases of development;
  - f) a list of all known governmental permits and approvals required by the project;
  - g) a discussion of alternatives which were considered;
  - h) a discussion of the environmental, economic, employment, and sociological impacts generated by the project; and
  - i) an identification of reasonable mitigation measures proposed to eliminate or minimize any adverse effects of the project.
3. The Draft EIS was distributed to the mailing list contained in EQB Rules, to the proposer, the governmental units known to have permitting or approval authority over the project, and to persons requesting the EIS. A notice of availability of the Draft EIS was published in the EQB Monitor on February 16, 1992, and a press release was issued to area newspapers and radio and television stations in the Rochester area on February 17, 1992. Approximately 150 copies of the Draft EIS were distributed.
4. The public notice and press release provided a brief description of the project, information on the date, time, and location of the public meeting, the date on which the public comment period would end, and the locations at which copies of the Draft EIS were available for review.
5. A public meeting to receive comments on the Draft EIS was held on March 11, 1992, at 7:00 p.m. in the State Room at the Campus Conference Center in Rochester. The meeting was attended by approximately 60 individuals and oral comments were received from six individuals during the meeting.
6. Comment letters were submitted by 30 citizens, citizens groups, and governmental units during the 30-day comment period that ended on March 18, 1992.

## V. FINAL EIS

1. The MPCA staff prepared a Final EIS pursuant to the requirements in Minn. Rules pt. 4410.2700. Following review of the comments received on the Draft EIS and the new or revised information on the project which became available after completion of the Draft EIS, it was determined that the bulk of the information in the Draft EIS had not changed and that for most sections of the Draft EIS, only minor changes were required. Therefore, a Final EIS including supplemental information, revisions, and responses to substantive comments was prepared as permitted by Minn. Rules pt. 4410.2700, subp. 2.
2. The Final EIS contained:
  - a) a cover sheet identifying the RGU, proposer, and contact persons, an abstract, and the date by which comments on the Final EIS should be received;
  - b) a table of contents;
  - c) an introduction and summary;
  - d) a section describing new and revised information on environmental impacts, mitigation, and alternatives;
  - e) a section presenting a summary of comments on the Draft EIS received at the public meeting and in comment letters, and responses to comments; and
  - f) appendices.
3. The MPCA distributed copies of the Final EIS on June 5, 1992, in a manner consistent with Minn. Rules pt. 4410.2700, subp. 3. Copies were provided to all persons receiving copies of the Draft EIS, all parties who submitted comments on the Draft EIS, and all persons requesting copies of the Final EIS.
4. A notice of availability of the Final EIS was published in the EQB Monitor on June 8, 1992, and a press release was issued to newspapers and radio and television stations in the Rochester area on June 5, 1992. These notices indicated the locations at which copies of the Final EIS were available for review, the date, time, and location of a public information and comment meeting to be conducted by the MPCA Board, and the date on which the comment period on the Final EIS was to expire.

## VI. DETERMINATION OF ADEQUACY

1. The MPCA, as RGU for the Mayo Foundation EIS, is the appropriate governmental unit for making a determination of adequacy pursuant to Minn. Rules pt. 4410.2800.
2. The EIS contained the items identified in the scoping decision document. This included a project description, a list of governmental approvals, and an evaluation of alternatives. Environmental, economic, employment, and sociologic impacts from the project and major alternatives were evaluated where appropriate. All issues for which information could be reasonably obtained were analyzed in the EIS. Exhibit A identifies the relevant portions of the EIS where the requirements of the scoping decision were addressed.

3. A public information and comment meeting on the Final EIS was conducted by the MPCA Board on July 13, 1992, at 6:00 p.m., in the City Council Chambers in Rochester. Comments were received from 16 individuals during the meeting.
4. Eight comment letters on the Final EIS were received during the comment period that ended on June 22, 1992. All copies of comment letters received during the comment period for the Final EIS were provided to MPCA Board members.
5. The determination of adequacy of the Final EIS was made 36 days, excluding weekends and holidays, after the publication of the notice of availability of the Final EIS in the EQB Monitor.
6. The Final EIS provided responses to the substantive comments received during the Draft EIS review concerning issues raised in scoping. These comments and responses were provided in Section 3.3 of the Final EIS.
7. The EIS was prepared in compliance with the procedures of the Minnesota Environmental Policy Act (Minn. Stat. ch. 116D) and the rules of the EQB (Minn. Rules pts. 4410.0200 to 4410.6500).

CONCLUSIONS

1. The information presented in the Final EIS adequately addresses the issues identified in the final scoping decision adopted March 28, 1991.
2. The EIS responds to the substantive comments received during the Draft EIS comment period which was held from February 17, 1992, to March 18, 1992.
3. The proposed action is described in sufficient detail.
4. The EIS adequately analyzes significant environmental impacts.
5. The EIS adequately presents alternatives to the proposed action and their impacts.
6. The EIS adequately presents methods by which adverse environmental impacts can be mitigated.
7. The EIS adequately presents the economic, employment, and sociological effects that cannot be avoided should the proposed action be implemented.
8. The public has had an adequate opportunity to participate in the environmental review process and to provide comments.
9. The EIS has been developed in accordance with the procedures specified in Minn. Stat. ch. 116D and Minn. Rules pts. 4410.0200 to 4410.6500.
10. Based on the criteria established in Minn. Rules pt. 4410.2800 and the requirements of Minn. Stat. ch. 116D, the EIS for the proposed Mayo Foundation Medical Waste Incinerator project is adequate.
11. Any findings of fact that are more properly deemed conclusions and any conclusions that are more properly deemed findings of fact are hereby adopted as such.

MINNESOTA POLLUTION CONTROL AGENCY

Dated: \_\_\_\_\_

\_\_\_\_\_  
Daniel D. Foley, Chair

Dated: \_\_\_\_\_

\_\_\_\_\_  
Charles W. Williams  
Commissioner

## Exhibit A

This exhibit presents the items to be contained in the Mayo Foundation Medical Waste Incinerator Environmental Impact Statement (EIS) as listed in the scoping decision document. Individual items from the scoping document are reproduced in **bold face type** and are followed with specific references to sections of the Draft and Final EIS documents wherein these items were addressed. References are also made to technical reports submitted to the Minnesota Pollution Control Agency (MPCA) by the project proposer or prepared by consulting contractors hired by the MPCA.

### I. PROJECT DESCRIPTION

- A. **Evaluate the current and future composition of the waste stream (solid waste - recyclable/non-recyclable, infectious waste, radioactive waste, and other medial waste). The capacity of the proposed facility will be identified for the proposed life of the facility.**

Information on the waste stream was provided in section 7.1 of the Draft EIS.

Information on the capacity of the proposed facility was provided in chapter 4.0 of the Draft EIS, section 2.5 of the Final EIS, and section 3.3 response to comments I.1, II.1, II.2, III.8 and III.9.

- B. **A description of the general project area, surrounding land uses, and each of the sites considered, will be included in the EIS. This discussion should include, at a minimum, a description of the following: soils, geology, ground water, surface water, vegetation, wildlife, fisheries, and agricultural resources in the vicinity of the proposed project.**

Information on the general project area was provided in chapters 4 and 8 of the Draft EIS.

- C. **Based on information provided by Mayo, its consultant, and engineering firm, the proposed facility design and operating practices will be described, accompanied by site layout drawings intended to identify roads, buildings, waste processing and storage areas, and planned buffer.**

Information on the facility design and operation was provided in section 4.3 of the Draft EIS, section 2.1.6 of the Final EIS, and section 3.3 response to comments II.1 to II.16.

- D. **The EIS will include a narrative description of the pollution control equipment, heat recovery systems, ash handling, and waste handling systems.**

This information was provided in chapter 4.0 of the Draft EIS, and sections 2.1 and 3.3 response to comments V.10 and VI.13 of the Final EIS. Ash handling information was provided in section 7.2 of the Draft EIS and section 3.3 of the Final EIS, response to comments V.3 and V.4.

- E. The EIS project description will also identify necessary utility requirements for the facility, including water supply, wastewater collection, electrical power, and roadway upgrading.

A description of the necessary utilities was provided in section 4.3 of the Draft EIS and section 3.3 response to comments II.14. Information of potential roadway upgrading was provided in section 8.6 of the Draft EIS.

- F. Description of day-to-day operations will include procedures and actions for the acceptance of waste delivered to the proposed Mayo Medical Waste Incinerator.

Information was provided in section 4.3 of the Draft EIS and section 3.3 response to comment II.6 in the Final EIS.

- G. Also included will be a description of the proposed monitoring provisions and closure plans for the facility.

Information on monitoring was provided in section 4.3 of the Draft EIS, sections 2.4.2 and 2.4.3 of the Final EIS, and section 3.3 response to comments III.4, III.7 all of the Final EIS.

- H. A construction schedule and a summary of construction methods will also be included.

A construction schedule was presented in section 4.4 of the Draft EIS.

## II. ENVIRONMENTAL IMPACTS

### A. Cumulative Impacts to Other Nearby Land Uses

The EIS will include an evaluation of cumulative air quality impacts of facility and existing land uses, including airport use, asphalt plants, rock quarries, air traffic, the Olmsted County incinerator, and auto traffic. The EIS will also include the potential for leaching lead and cadmium from the Rochester Wastewater Treatment Facility sludge application site at the airport.

Cumulative impacts were discussed in section 8.2.4 of the Draft EIS and section 3.3 response to comments VI.2, VI.8, and VI.14 of the Final EIS.

### B. Impact of Facility Emissions on Air Quality

1. Existing information relative to ambient air quality in the Rochester area will be described.

Information on ambient air quality was provided in section 8.2.2 of the Draft EIS.

2. Regional climatology, as reflected in meteorological data from the Rochester airport, will be described.

Information on climatology was provided in section 8.2.2 of the Draft EIS.

3. Estimated emissions of criteria pollutants (nitrogen oxides, sulfur oxides, particulates, carbon monoxide, volatile organic carbon compounds, and lead) will be included in the EIS. (Criteria pollutants are those for which specific air quality standards have been adopted.)

Emission estimates for criteria pollutants were provided in section 8.2. of the Draft EIS.

4. Estimated emissions of radioactive materials will be included in the EIS.

A discussion of radioactive wastes and emissions was provided in section 7.1.8 of the Draft EIS and section 3.3 response to comments V.11 to V.13 and VI.11 of the Final EIS.

5. Applicability of Prevention of Significant Deterioration (PSD) and New Source Review requirements, and compliance with state and federal ambient air quality standards will be evaluated in the EIS.

A review of regulatory requirements was presented in section 8.2.1 of the Draft EIS.

6. Estimated emissions of non-criteria pollutants (pollutants for which specific air quality standards have not been adopted) including dioxins and furans, polynuclear aromatic hydrocarbons, acid gases, polychlorinated biphenyl, chlorobenzenes, and heavy metals including mercury, cadmium, chromium, nickel and arsenic. A list of other toxicants which could potentially be emitted by the facility will be developed as part of the EIS.

Emission estimates for non-criteria pollutants were provided in section 8.2 of the Draft EIS. Emission estimates were revised for mercury, cadmium, lead, chromium, dioxin/furan, and PCBs in section 2.2.2 of the Final EIS.

7. Projected deposition and concentrations, at ground levels, of criteria and non-criteria pollutants resulting from emissions from the facility will be calculated, based on available meteorological data and accepted air dispersion analysis methodology, including wet and dry deposition models.

Results of the air dispersion modeling for this project are provided in section 8.2 of the Draft EIS.

8. Pollutants of health concern will be evaluated based on projected ambient concentrations, potential exposure pathways, and toxicological characteristics of each pollutant.

This information was provided as a part of the health risk assessment for this project, section 8.5 of the Draft EIS.

C. Health Risk and Environmental Risk Assessment

1. The EIS will include an expanded health risk assessment of the pollutants identified in B.8, above, which will include an evaluation of acute respiratory irritation, cancer risk, and non-cancer health risk.
  - a. Health Risk assessment methodology (formats and calculations) will follow as closely as possible current U.S. Environmental Protection Agency (U.S. EPA) and pertinent Minnesota Guidelines. State-of-the-art methodologies not yet included in State and Federal Guidelines will be evaluated for use in the EIS.
  - b. The exposure assessment will include evaluation of the dermal, ingestion, and inhalation pathways. Of particular interest are the following pathways: pica; food chain transfer; mother's milk; locally grown foodstuffs; and drinking water.
  - c. Health risk will be calculated in terms of individual and community risk within the evaluation area. Health effects on sensitive sub-populations (the aged, children) will also be evaluated.

The health risk assessment was discussed in section 8.5 of the Draft EIS and section 2.3 of the Final EIS. In addition, information on the health risk assessment was provided in section 3.3 response to comments VII.1 to VII.22 and X.1 to X.16 of the Final EIS.

2. The EIS will include an ecological risk assessment which will evaluate the environmental fate of emissions from the facility and impacts of those emissions on the terrestrial and aquatic ecosystem. The ecological risk assessment will utilize methodologies consistent with current U.S. EPA and pertinent Minnesota Guidelines. The toxicants identified for evaluation in the health risk assessment will be evaluated in the ecological risk assessment.

The ecological risk assessment was discussed in section 8.5 of the Draft EIS and section 2.4 of the Final EIS. In addition, the ecological risk assessment was addressed in section 3.3 response to comments VII.1 to VII.22 of the Final EIS.

**D. Other Issues**

1. **The EIS will include an evaluation of medical waste handling including delivery of material to the site and storage at the facility.**

Information on medical waste handling was provided in section 4.3 of the Draft EIS and section 2.1.6 of the Final EIS.

2. **The EIS will include an evaluation of potential transportation hazards, including impacts to roadways and the airport.**

Information on transportation was provided in section 8.6 of the Draft EIS.

3. **The EIS will include an evaluation of potential impacts of facility emissions on ground water and surface water.**

Information on potential impacts to ground water and surface water was provided in sections 4.2 and 8.3 of the Draft EIS. Information was also provided in sections 2.4 and 3.3 response to comments VI.1 and VI.3 in the Final EIS.

4. **The EIS will include a discussion of Federal Aviation Administration (FAA) and U.S. EPA requirements pertaining to stack height.**

A discussion of FAA requirements and stack height was provided in section 8.2.1 of the Draft EIS and section 3.3 response to comments II.3 to II.5 of the Final EIS.

5. **Radioactive emissions will be reviewed for consistency with existing and proposed Federal Rules.**

Information on radioactive emissions was provided in section 7.1.8 of the Draft EIS and section 3.3 response to comments III.5, III.6, IV.8, V.11 to V.13, and VI.11 of the Final EIS.

6. **The EIS will include a description of the Mayo medical waste incinerator ash storage plan. The state incinerator ash management requirements will be discussed in the EIS. The projected chemical composition of the ash will also be reviewed. Information on ash was provided in section 7.2 of the Draft EIS and section 3.3 response to comments II.11, III.1, V.3, V.4, V.15, in the Final EIS.**

7. **The EIS will include an evaluation of the expected industrial wastewater discharge, including how often a discharge will occur, the pollutant loading to the sewer system, the impact on the operation of the Rochester treatment plant, and the effect on the treatment plant's sludge and effluent.**

Information on wastewater was provided in section 8.3.2.6 of the Draft EIS and section 3.3 response to comment IV.4 in the Final EIS.

### III. ALTERNATIVES

#### A. Alternatives to Incineration

1. Evaluate other technologies and their associated risks.

Information on alternative treatment technologies (including the list below) was provided in section 6.1 of the Draft EIS and section 3.3 response to comments IV.1 to IV.9 in the Final EIS.

The no action alternative was discussed in section 6.6 of the Draft EIS.

- a. microwave sterilization
- b. autoclaving
- c. chemical/mechanical treatment, i.e., hydropulping
- d. recycling and reuse
- e. incineration at the Olmsted County MSW incinerator
- f. thermal heat treatment
- g. combinations of the above alternatives
- h. no action; continued use of existing facility, use of non-Mayo facility

2. The EIS will include a comparative analysis of the impacts associated with the airport site, the Campus Drive site, and the Institute Hills Farm site.

Information on alternative sites for the proposed project was provided in section 6.4 of the Draft EIS.

For each major alternative the analysis will include a succinct discussion of any direct or indirect, adverse or beneficial, effect generated.

#### B. Facility Capacity

Identify alternative design capacities for the project, in conjunction with the discussion of alternatives.

- 1. Evaluate the effect of recycling 35 percent of general waste and combustion of the remainder in a smaller facility.
- 2. Evaluate the effect of utilizing an alternate facility during downtime, with appropriate downsizing of the proposed facility.

Information on alternative incinerator capacities resulting from recycling and downsizing was provided in section 6.5 of the Draft EIS.

**IV. ECONOMIC, EMPLOYMENT, AND SOCIOLOGICAL IMPACTS**

The economic, employment, and sociological impacts listed below were discussed in chapter 9.0 of the Draft EIS and section 3.3 response to comments VIII.1 to VIII.4 in the Final EIS.

- A. Projected employment associated with construction and operation of the facility.
- B. Impacts of the facility on nearby property values.
- C. Impacts of facility costs on the economic aspects of health care.
- D. Impacts of the facility on existing solid waste management programs in Olmsted County (county incinerator, Dodge County landfill, Olmsted County recycling program).

**V. MITIGATION MEASURES**

This section will identify those measures that could reasonably eliminate or minimize any adverse environmental, economic, employment, or sociological effects of the proposed project.

Information on mitigation measures was provided in chapter 10 of the Draft EIS and sections 2.4 and 3.3 response to comments IX.1 to IX.4 in the Final EIS.

## 4410.2000 PROJECTS REQUIRING AN EIS.

Subpart 1. Purpose of EIS. The purpose of an EIS is to provide information for governmental units, the proposer of the project, and other persons to evaluate proposed projects which have the potential for significant environmental effects, to consider alternatives to the proposed projects, and to explore methods for reducing adverse environmental effects.

Subp. 2. Mandatory EIS categories. An EIS shall be prepared for any project that meets or exceeds the thresholds of any of the EIS categories listed in part 4410.4400.

Subp. 3. Discretionary EIS. An EIS shall be prepared:

A. when the RGU determines that, based on the EAW and any comments or additional information received during the EAW comment period, the proposed project has the potential for significant environmental effects; or

B. when the RGU and proposer of the project agree that an EIS should be prepared.

Subp. 4. Connected actions and phased actions. Multiple projects and multiple stages of a single project that are connected actions or phased actions must be considered in total when determining the need for an EIS and in preparing the EIS.

In connected actions and phased actions where it is not possible to adequately address all the project components or stages at the time of the initial EIS, a supplemental EIS must be completed before approval and construction of each subsequent project component or stage. The supplemental EIS must address the impacts associated with the particular project component or stage that were not addressed in the initial EIS.

For proposed projects such as highways, streets, pipelines, utility lines, or systems where the proposed project is related to a large existing or planned network, for which a governmental unit has determined environmental review is needed, the RGU shall treat the present proposal as the total proposal or select only some of the future elements for present consideration in the threshold determination and EIS. These selections must be logical in relation to the design of the total system or network and must not be made merely to divide a large system into exempted segments.

When review of the total of a project is separated under this subpart, the components or stages addressed in each EIS or supplement must include at least all components or stages for which permits or approvals are being sought from the RGU or other governmental units.

Subp. 5. Related actions EIS. An RGU may prepare a single EIS for independent projects with potential cumulative environmental impacts on the same geographic area if the RGU determines that review can be accomplished in a more effective or efficient manner through a related actions EIS. A project must not be included in a related actions EIS if its inclusion would unreasonably delay review of the project compared to review of the project through an independent EIS.

MS s 116D.04; 116D.045

13 SR 1437

Subpart 1. Purpose. The scoping process shall be used before the preparation of an EIS to reduce the scope and bulk of an EIS, identify only those issues relevant to the proposed project, define the form, level of detail, content, alternatives, time table for preparation, and preparers of the EIS, and to determine the permits for which information will be developed concurrently with the EIS.

Subp. 2. EAW as scoping document. All projects requiring an EIS must have an EAW filed with the RGU. The EAW shall be the basis for the scoping process.

For projects which fall within a mandatory EIS category or if a voluntary EIS is planned, the EAW will be used solely as a scoping document. For such projects, the RGU shall prepare and circulate with the EAW a draft scoping decision document that addresses the contents specified by subpart 6 to the extent that information is already available. The purpose of the draft scoping decision document is to facilitate the delineation of issues and analyses to be contained in the EIS. The information in a draft scoping decision document shall be considered as preliminary and subject to revision based on the entire record of the scoping process.

If the need for an EIS has not been determined the EAW will have two functions:

A. to identify the need for preparing an EIS pursuant to part 4410.1700; and

B. to initiate discussion concerning the scope of the EIS if an EIS is ordered pursuant to part 4410.1700.

Subp. 3. Scoping period. If the EIS is being prepared pursuant to part 4410.2000, subpart 2 or 3, item B, the following schedule applies:

A. The 30-day scoping period will begin when the notice of the availability of the EAW is published in accord with part 4410.1500, items A and B. This notice and press release shall include the time, place, and date of the scoping meeting.

B. The RGU shall provide the opportunity for at least one scoping meeting during the scoping period. This meeting shall be held not less than 15 days after publication of the notice of availability of the EAW. All meetings shall be open to the public.

C. A final scoping decision shall be issued within 15 days after the close of the 30-day scoping period.

Subp. 4. Scoping period for some discretionary EIS's.; If the EIS is being prepared pursuant to part 4410.2000, subpart 3, item A, the following schedule applies:

A. At least ten days but not more than 20 days after notice of a positive declaration is published in the EQB Monitor, a public meeting shall be held to review the scope of the EIS. Notice of the time, date, and place of the scoping meeting shall be published in the EQB Monitor, and a press release shall be provided to a newspaper of general circulation in the area where the project is proposed. All meetings shall be open to the public.

B. Within 30 days after the positive declaration is published in the EQB Monitor, the RGU shall issue its final decision regarding the scope of the EIS. If the decision of the RGU must be made by a board, council, or other similar body which meets only on a periodic basis, the decision may be made at the next regularly scheduled meeting of the body following the scoping meeting but not more than 45 days after the positive declaration is published in the EQB Monitor.

Subp. 5. Procedure for scoping. Written comments suggesting issues for scoping or commenting on the EAW must be filed with the RGU during the scoping period. Interested persons may attend the scoping meeting to exercise their right to comment.

Governmental units and other persons shall be responsible for participating in the scoping process within the time limits and in the manner prescribed in parts 4410.0200 to 4410.6500.

Subp. 6. Scoping decision; contents. The scoping decision at the least shall contain:

A. the issues to be addressed in the EIS;

B. time limits for preparation, if they are shorter than those allowed by parts 4410.0200 to 4410.6500;

C. identification of the permits for which information will be gathered concurrently with EIS preparation;

D. identification of the permits for which a record of decision will be required;

E. alternatives that will be addressed in the EIS;

F. identification of potential impact areas resulting from the project itself and from related actions which shall be addressed in the EIS; and

G. identification of necessary studies requiring compilation of existing information or the development of new data that can be generated within a reasonable amount of time and at a reasonable cost.

Subp. 7. Change in form of EIS. The form of an EIS may be changed during scoping if circumstances indicate the need or appropriateness of an alternative form.

Subp. 8. Amendments to scoping decision. After the scoping decision is made, the RGU shall not amend the decision without the agreement of the proposer unless substantial changes are made in the proposed project that affect the potential significant environmental effects of the project or substantial new information arises relating to the proposed project that significantly affects the potential environmental effects of the proposed project or the availability of prudent and feasible alternatives to the project. If the scoping decision is amended after publication of the EIS preparation notice, notice and a summary of the amendment shall be published in the EQB Monitor within 30 days of the amendment.

Subp. 9. EIS preparation notice. An EIS preparation notice shall be published within 45 days after the scoping decision is issued. The notice shall be published in the EQB Monitor, and a press release shall be provided to at least one newspaper of general circulation in each county where the project will occur. The notice shall contain a summary of the scoping decision.

Subp. 10. Consultant selection. The RGU shall be responsible for expediting the selection of consultants for the preparation of the EIS.

Subp. 11. Modification of project; termination of EIS process. After initiation of scoping for an EIS, if the proposed project is modified so that an EIS is no longer mandatory, or the reasons for ordering an EIS no longer apply, the RGU may terminate the EIS process through the procedures of this subpart.

The RGU shall send written notice of its intent to terminate the EIS to all persons who submitted comments on the EIS scope and to all persons on the EAW distribution list under part 4410.1500. The notice shall summarize the reasons for the intended termination of the EIS, identify a contact person to whom comments may be sent, and announce the end of the comment period. The EQB staff shall publish notice in the EQB Monitor, and a press release shall be supplied by the RGU to at least one newspaper of general circulation in the area of the project.

A period of not less than 30 days from the date of publication of the notice in the EQB Monitor shall be provided for interested persons to comment on the need for an EIS on the modified project. The RGU shall determine the need for an EIS on the modified project in accordance with part 4410.1700.

MS s 116D.04; 116D.045

13 SR 1437

#### 4410.2200 EIS INTERDISCIPLINARY PREPARATION.

An EIS shall be prepared using an interdisciplinary approach which will ensure the integrated use of the natural, environmental, and social sciences. The RGU may request that another governmental unit help in the completion of the EIS. Governmental units shall provide any unprivileged data or information, to which it has reasonable access, concerning the subjects to be discussed and shall assist in the preparation of environmental documents on any project for which it has special expertise or access to information.

MS s 116D.04 subd 5a

#### 4410.2300 CONTENT OF EIS.

An EIS shall be written in plain and objective language. An RGU shall use a format for an EIS that will encourage good analysis and clear presentation of the proposed action including alternatives to the project. The standard format shall be:

A. Cover sheet: the cover sheet shall include:

- (1) the RGU;
- (2) the title of the proposed project that is the subject of the statement and, if appropriate, the titles of related actions, together with each county or other jurisdictions, if applicable, where the project is located;
- (3) the name, address, and telephone number of the person at the RGU who can supply further information;
- (4) the name and address of the proposer and the name, address, and telephone number of the proposer's representative who can supply further information;

(5) a designation of the statement as a draft, final, or supplement;

(6) a one paragraph abstract of the EIS; and

(7) if appropriate, the date of the public meeting on the draft EIS and the date following the meeting by which comments on the draft EIS must be received by the RGU.

B. Summary: the summary shall stress the major findings, areas of controversy, and the issues to be resolved including the choice among alternatives.

C. Table of contents: the table shall be used to assist readers to locate material.

D. List of preparers: this list shall include the names and qualifications of the persons who were primarily responsible for preparing the EIS or significant background papers.

E. Project description: the proposed project shall be described with no more detail than is absolutely necessary to allow the public to identify the purpose of the project, its size, scope, environmental setting, geographic location, and the anticipated phases of development.

F. Governmental approvals: this section shall list all known governmental permits and approvals required including identification of the governmental unit which is responsible for each permit or approval. Those permits for which all necessary information has been gathered and presented in the EIS shall be identified.

G. Alternatives: the alternatives section shall compare the environmental impacts of the proposal with other reasonable alternatives to the proposed project. Reasonable alternatives may include locational considerations, design modifications including site layout, magnitude of the project, and consideration of alternative means by which the purpose of the project could be met. Alternatives that were considered but eliminated shall be discussed briefly and the reasons for their elimination shall be stated. The alternative of no action shall be addressed.

H. Environmental, economic, employment, and sociological impacts: for the proposed project and each major alternative there shall be a thorough but succinct discussion of any direct or indirect, adverse, or beneficial effect generated. The discussion shall concentrate on those issues considered to be significant as identified by the scoping process. Data and analyses shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced. The EIS shall identify and briefly discuss any major differences of opinion concerning impacts of the proposed project and the effects the project may have on the environment.

I. Mitigation measures: this section shall identify those measures that could reasonably eliminate or minimize any adverse environmental, economic, employment, or sociological effects of the proposed project.

J. Appendix: if a RGU prepares an appendix to an EIS the appendix shall include, when applicable:

(1) material prepared in connection with the EIS, as distinct from material which is not so prepared and which is incorporated by reference;

(2) material which substantiates any analysis fundamental to the EIS; and

(3) permit information that was developed and gathered concurrently with the preparation of the EIS. The information may be presented on the permitting agency's permit application forms. The appendix may reference information for the permit included in the EIS text or the information may be included within the appendix, as appropriate. If the permit information cannot conveniently be incorporated into the EIS, the EIS may simply indicate the location where the permit information may be reviewed.

MS s 116D.04 subd 5a

#### 4410.2400 INCORPORATION BY REFERENCE IN RGU.

An RGU shall incorporate material into an EIS by reference when the effect will be to reduce bulk without impeding governmental and public review of the project. The incorporated material shall be cited in the EIS, and its content shall be briefly described. No material may be incorporated by reference unless it is reasonably available for inspection by interested persons within the time allowed for comment.

MS s 116D.04 subd 5a

#### 4410.2500 INCOMPLETE OR UNAVAILABLE INFORMATION.

When an RGU is evaluating significant effects on the environment in an EIS and there is scientific uncertainty or gaps in relevant information, the RGU shall make clear that the information is lacking. If the information relevant to the impacts is essential to a reasoned choice among alternatives and is not known and the cost of obtaining it is excessive or the information cannot be obtained within the time periods specified in part 4410.2800, subpart 3, or the information relevant to the impacts is important to the decision and the means to obtain it are beyond the state of the art, the RGU shall weigh the need for the project against the risk and severity of possible adverse impacts were the project to proceed in the face of uncertainty. The EIS shall, in these circumstances, include a worst case analysis and an indication of the probability or improbability of its occurrence.

MS s 116D.04 subd 5a

#### 4410.2600 DRAFT EIS.

**Subpart 1. Preparation.** A draft EIS shall be prepared consistent with parts 4410.0200 to 4410.6500 and in accord with the scoping determination.

**Subp. 2. Review and comment; informational meeting?** When the draft EIS is completed, the RGU shall make the draft EIS available for public review and comment and shall hold an informational meeting in the county where the project is proposed.

Subp. 3. Distribution of draft.) The entire draft EIS with appendixes shall be provided to:

- A. any governmental unit which has authority to permit or approve the proposed project, to the extent known;
- B. the proposer of the project;
- C. the EQB and EQB staff;
- D. the Environmental Conservation Library;
- E. the Legislative Reference Library;
- F. the Regional Development Commission and Regional Development Library;
- G. a public library or public place where the draft will be available for public review in each county where the project will take place, to the extent known; and
- H. to the extent possible, to any person requesting the entire EIS.

Subp. 4. Distribution of summary.) The summary of the draft EIS shall be provided to all members of the EAW distribution list that do not receive the entire draft EIS; any person that submitted substantive comments on the EAW that does not receive the entire draft EIS; and any person requesting the summary.

Subp. 5. Notice to publish in EQB Monitor.) The copy provided to the EQB staff shall serve as notification to publish notice of availability of the draft EIS in the EQB Monitor.

Subp. 6. Press release. The RGU shall supply a press release to at least one newspaper of general circulation within the area where the project is proposed.

Subp. 7. Contents of published notices. The notice of availability in the EQB Monitor and the press release shall contain notice of the date, time, and place of the informational meeting, notice of the location of the copy of the draft EIS available for public review, and notice of the date of termination of the comment period.

Subp. 8. Time of meeting; transcript. The informational meeting must be held not less than 15 days after publication of the notice of availability in the EQB Monitor. A typewritten or audio-recorded transcript of the meeting shall be made.

Subp. 9. Public comment. The record shall remain open for public comment not less than ten days after the last date of the informational meeting. Written comments on the draft EIS may be submitted any time during the comment period.

Subp. 10. RGU's response. The RGU shall respond to the timely substantive comments received on the draft EIS and prepare the final EIS.

MS s 116D.04 subd 5a

Subpart 1: Contents. The final EIS shall respond to the timely substantive comments on the draft EIS consistent with the scoping decision. The RGU shall discuss at appropriate points in the final EIS any responsible opposing views relating to scoped issues which were not adequately discussed in the draft EIS and shall indicate the RGU's response to the views.

Subp. 2. Treatment of major or minor changes to draft EIS. If only minor changes in the draft EIS are suggested in the comments on the draft, the written comments and the responses may be attached to the draft or bound as a separate volume and circulated as the final EIS. If other than minor changes are required, the draft text shall be rewritten so that necessary changes in the text are incorporated in the appropriate places.

Subp. 3. Distribution of copies. The RGU shall provide copies of the final EIS to all persons receiving copies of the entire draft EIS pursuant to part 4410.2600, subpart 3; any person who submitted substantive comments on the draft EIS; and to the extent possible, to any person requesting the final EIS.

Subp. 4. Notice to publish in EQB Monitor. The copy provided to the EQB staff shall serve as notification to publish notice of availability of the final EIS in the EQB Monitor.

Subp. 5. Press release. The RGU shall supply a press release to at least one newspaper of general circulation within the area where the project is proposed.

Subp. 6. Contents of published notices. The notice of availability in the EQB Monitor and the press release shall contain notice of the location of the copy of the final EIS available for public review and notice of the opportunity for public comment on the adequacy of the final EIS.

MS s 116D.04 subd 5a

4410.2800 DETERMINATION OF ADEQUACY..

Subpart 1. Who is to determine. The RGU shall determine the adequacy of the final EIS unless notified by the EQB, on its own initiative or at the request of the RGU, the proposer of the project, or other interested persons, that the EQB will determine the adequacy. The EQB shall notify the RGU no later than 60 days following publication of the preparation notice in the EQB Monitor. The EQB shall intervene only if the EQB determines that:

- A. the RGU is or will be unable to provide an objective appraisal of the potential impacts of the project;
- B. the project involves complex issues which the RGU lacks the technical ability to assess; or
- C. the project has multijurisdictional effects.

Subp. 1a. Decision by EQB; information needs. If the EQB will be determining the adequacy of the EIS, the RGU shall submit to the EQB the following information within five days of the filing of the final EIS:

- A. evidence of compliance with distribution requirements for the scoping EAW, draft EIS, and final EIS;

B. copies of press releases giving notice of EIS scoping, the EIS preparation notice, the draft EIS, and the final EIS, and evidence of submission of each in accordance with the applicable requirements of the rules;

C. copies of all written comments received during the scoping period;

D. a transcript, minutes, or summary of the public scoping meeting;

E. a copy of the scoping decision document;

F. a transcript, minutes, or summary of the public meeting on the draft EIS; and

G. copies of any comments the RGU has received on the final EIS that have not also been supplied to the EQB.

Subp. 2. Written comments. Interested persons may submit written comments on the adequacy of the final EIS to the RGU or the EQB, if applicable, for a period of not less than ten days following publication in the EQB Monitor of the notice of availability of the final EIS. The notice of availability of the final EIS shall indicate when the comment period expires.

Subp. 3. Time limits. The determination of adequacy of the final EIS shall be made at least ten days after publication in the EQB Monitor of the notice of availability of the final EIS. The determination of adequacy of the final EIS shall be made within 280 days after the preparation notice was published in the EQB Monitor unless the time is extended by consent of the proposer and the RGU or by the governor for good cause.

Subp. 4. Conditions. The final EIS shall be determined adequate if it:

A. addresses the issues raised in scoping so that all issues for which information can be reasonably obtained have been analyzed;

B. provides responses to the substantive comments received during the draft EIS review concerning issues raised in scoping; and

C. was prepared in compliance with the procedures of the act and parts 4410.0200 to 4410.6500.

Subp. 5. Inadequacy. If the RGU or the EQB determine that the EIS is inadequate, the RGU shall have 60 days in which to prepare an adequate EIS. The revised EIS shall be circulated in accord with part 4410.2700, subpart 3.

Subp. 6. Notice of determination. The RGU shall notify all persons receiving copies of the final EIS pursuant to part 4410.2700, subpart 3, of its adequacy decision within five days of the adequacy decision. Public notice of the decision shall be published in the EQB Monitor.

MS s 116D.04; 116D.045

13 SR 1437

**STATUS OF EPA REGULATORY DEVELOPMENT PROGRAM FOR MEDICAL WASTE  
INCINERATORS -- RESULTS OF EMISSION TEST PROGRAM**

Kenneth R. Durkee and James A. Eddinger  
Emission Standards Division  
U. S. Environmental Protection Agency  
Research Triangle Park, North Carolina 27711



**ABSTRACT**

The Office of Air Quality Planning and Standards (OAQPS) of the U.S. Environmental Protection Agency (EPA) is conducting a regulatory development program for air emissions from medical waste incinerators (MWI's) under Section 129 of the Clean Air Act Amendments (CAAA) of 1990. The regulatory program includes the development of new source performance standards (NSPS) based on maximum achievable control technology (MACT), and the development of emission guidelines for existing sources. The development program involves three principal phases of activity: (1) information gathering, (2) analysis of the information, and (3) development of the standards for new sources and emission guidelines for existing sources. In developing the standards, the EPA has conducted studies to develop emissions data, information on control equipment performance for removal of various pollutants; and to determine costs, economic, environmental, and energy impacts of various regulatory alternatives.

The incinerator design types investigated are controlled-air, rotary kiln, and pathological. The control techniques investigated include both combustion controls (i.e., achieving appropriate residence time and combustion temperatures) and add-on controls, such as wet scrubbers, dry injection/fabric filter systems, and dry scrubbers. Pollutants for which the EPA has gathered data are particulate matter, carbon monoxide, hydrogen chloride, sulfur dioxide, nitrogen oxides, trace metals, dioxins/furans and pathogens present in the air emissions and ash. As part of this data gathering effort, the EPA has tested seven incinerators with varied emission control techniques and at varied combustion and feed conditions. Preliminary test results for tests at 5 of the incinerators were presented at the 1991 Incineration Conference in a paper by the authors.

This paper will discuss further conclusions from the original 5 tests, additional testing performed with carbon injection at one of the 5 original sites and test data from two additional incinerators and associated control equipment. Also, a summary of the status of this regulatory development program will be presented.

**INTRODUCTION**

The Office of Air Quality Planning and Standards (OAQPS) of the U.S. Environmental Protection Agency (EPA) is developing new source performance standards (NSPS) and emission guidelines for existing units for air emissions from medical waste incinerators (MWI's) as required under Section 129 of the Clean Air Act Amendments (CAAA) of 1990. The NSPS is to reflect the maximum achievable control technology (MACT). Section 129 states that the standards for new MWI's must not be less stringent than the emissions control achieved in practice by the best controlled similar unit. The emission guidelines for existing MWI's may be equal to or less stringent than the NSPS, but must not be less stringent than the average emissions control achieved by the best controlled 12 percent of units in the category. Under Section 129, the EPA may distinguish among classes, types, and sizes of medical waste incinerators in developing the NSPS and emission guidelines. Section 129 also requires EPA to develop numerical emission limits for the following

pollutants: particulate matter (PM), opacity, sulfur dioxide (SO<sub>2</sub>), hydrogen chloride (HCl), oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), lead, cadmium, mercury, and dioxins and furans.

This paper addresses the regulatory development program for MWI's, the schedule and status of the development program, and the MWI emissions testing efforts. Results from the emission tests of MWI's are presented and discussed.

### THE REGULATORY DEVELOPMENT PROGRAM

The development of an NSPS and emission guidelines involves extensive engineering, cost and economic investigations, followed by comprehensive EPA and public reviews. The regulatory development program consists of three phases; data gathering, analysis of data and regulatory alternatives, and proposal development. Currently, the second phase pertaining to the analysis of the data obtained is being completed. As part of the data gathering phase, an emission test program to quantify emissions and measure the performance of various control technologies was conducted. Stack and ash test procedures using Bacillus stearothermophilus spores and sample analysis methodologies were also developed to provide an indication of the incinerator's ability to destroy pathogens.

The various control techniques and regulatory alternatives have been analyzed in terms of emissions, performance of control techniques, costs, economic impacts, and environmental impacts. These analyses were conducted using the model plant approach. The EPA has developed a range of model plants (incinerators with varied control techniques and operating hours) based on the type and size of incinerators used throughout the industry. Information has been developed on the costs, emissions and environmental impacts for each model. The Clean Air Act allows the EPA to distinguish among classes, types, and sizes in developing regulatory alternatives for the regulation and guidelines. Several regulatory alternatives have been developed and are being analyzed as the basis for the proposal of the NSPS and guidelines.

Proposal of the NSPS and emission guidelines initiates a final cycle of public and EPA review. The proposed NSPS and emission guidelines and their supporting background information are distributed to the affected industries and other interested groups. A public hearing on the proposal is held, if requested. Written and oral comments are then analyzed, and appropriate changes are made to either the NSPS or the emission guidelines. The NSPS and emission guidelines are then promulgated. Both the NSPS and the guidelines are scheduled for proposal in June 1993, and promulgation in October 1994.

The EPA is also required under Section 129 of the CAA to develop and promote a model State program for the training and certification of incinerator operators. Therefore, the EPA is currently working with the American Society of Mechanical Engineers (ASME) to develop a certification program for operators of MWI's. In 1989, the EPA developed a basic training course and materials for MWI operators. These training materials are currently being updated and revised to incorporate both new information and the information that will be required to match this training program to the ASME certification program. Certification and training of MWI operators will be required under both the NSPS and guidelines.

The Resource Conservation and Recovery Act/Medical Waste Tracking Act (RCRA/MWTA) defines medical waste as any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals. For this development program for air emission standards for MWI's, the source category is not limited to hospitals or regional/commercial type facilities, but includes MWI's at

pharmaceutical companies, research facilities, nursing homes, etc. Based on this definition, we estimate that over 3 million tons of medical waste are generated annually in the United States and that there are about 5000 existing MWI's. We estimate that there are about 150 commercial MWI's in operation and that about 125 new onsite hospital MWI's and 15 new commercial facilities will be built each year.

The pollution control techniques investigated include combustion controls, add-on control devices, and combinations of the two. Combustion controls refers to the retention time, temperature, and mixing achieved in the secondary chamber and involves the design, operation, and control of the incinerator to promote the destruction of certain pollutants. The add-on air pollution control devices investigated are wet scrubbers (venturi/packed bed), fabric filter followed by packed bed absorber, dry sorbent injection followed by a fabric filter, and dry scrubbers (spray dryer followed by a fabric filter). In addition, carbon injection was investigated to determine its effect on controlling mercury and dioxin/furan emissions.

Four control options were selected for analysis in determining MACT for the NSPS and emission guidelines. The first is good combustion control which includes proper design, operation, and maintenance of the incinerator to minimize emissions. Good combustion control is defined as including a minimum secondary chamber temperature of 1800F and a secondary chamber residence time of 2 seconds. The second control option is wet scrubbing in combination with good combustion control. The venturi/packed bed (VS/PB) system was selected to represent this control option since it is the typical wet scrubbing system used in the industry. The third control option is a fabric filter systems combined with good combustion control. These fabric filter systems include a fabric filter followed by a packed bed absorber (FF/PB), dry sorbent injection followed by a fabric filter (DI/FF), or a spray dryer followed by a fabric filter (SD/FF). The fourth control option is the addition of carbon injection to the fabric filter systems.

### EPA TEST PROGRAM

The purpose of the test program was to determine: (a) uncontrolled emissions, (b) the performance of combustion controls, (c) the performance of the various add-on air pollution control devices (APCD), and (d) the performance of the combinations of combustion controls and APCD's.

Seven MWI's were selected for testing. The seven units were selected to generally cover the range of incinerator types, combustion controls, and add-on control devices existing in the industry. Additional details for the units selected are listed in Table I.

For all tests, some degree of parametric testing was conducted to determine the effects of various process conditions on the range of pollutants. The parameters varied included the waste type, secondary chamber temperature, waste charge rate, waste charge frequency, and the carbon injection rate. Both inlet and outlet samples were obtained to evaluate the effects of combustion and charge variables and to establish control device efficiency. The pollutants sampled covered the full range of emissions listed under Section 129. For many of the pollutants [CO, HCl, SO<sub>2</sub>, total hydrocarbons (THC) and NO<sub>x</sub>], continuous emission monitors (CEM's) were used to determine the variation in emissions over the operating cycle. Bacillus stearothermophilus heat resistant spores were added to the incinerator charges, and incinerator ash and air samples were obtained and analyzed to indicate the "kill" efficiency of the incinerator for pathogens. Incinerator ash samples and fabric filter catch samples were also analyzed for each test, as appropriate, for metals, dioxins, and carbon content. Scrubber water samples were also analyzed. [Note: Dioxin is defined in this paper as the total tetra-through octachlorinated dibenzo-p-dioxins (CDD) and dibenzofurans (CDF).]

**TABLE I. UNITS TESTED IN EPA TEST PROGRAM**

<b>Facility</b>	<b>Duty Cycle</b>	<b>Waste Type</b>	<b>Design Capacity (lb/hr)</b>	<b>Secondary Chamber Gas Residence Time (sec.)</b>	<b>APCD</b>
A	Intermittent	General/ Red Bag	680	1.75	Lime Injection /Fabric Filter
B	Continuous	General	1200	2	Venturi/ Packed Bed
J	Batch	Red Bag	750 (lb/batch)	2	Fabric Filter/ Packed Bed
K	Intermittent	General	320	0.35	None
S	Intermittent	Red Bag/ Pathological	250(Red Bag) 175 (Path.)	0.15	None
W	Intermittent	General	320	1	None
M	Continuous (Rotary Incineration)	General	1000	2	Spray Dryer/ Fabric Filter
A*	Intermittent	General	680	1.75	Lime/ Carbon Injection / Fabric Filter

\* = Retested with carbon injection

The key process operating parameters including flue gas oxygen, primary and secondary chamber temperatures, and the amount and frequency of waste charging were monitored and recorded to document the operating conditions during each test. The key control equipment parameters such as scrubber pressure drops, water flow rates, carbon injection rate and lime stoichiometric ratios were also monitored. The test program included a comprehensive quality control program to ensure proper test methodology, sample integrity and proper analysis procedures.

**PREVIOUSLY REPORTED (1990) TEST RESULTS**

Results of emission tests conducted in 1990 on 5 MWI's (Facilities A, B, K, S, and W) were previously reported at the 1991 Incineration Conference in a paper by the authors entitled "Status of EPA Regulatory Program For Medical Waste Incinerators -- Test Program and Characterization of Emissions". Tests were conducted for a total of 17 test conditions at these five test facilities. Table II summarizes the results of the testing conducted under normal design conditions at the three uncontrolled MWI's and the results of the testing at the outlets of the air pollution control device (APCD) for two controlled MWI's. The 1991 paper also presented preliminary results on all the test conditions, the inlet emissions on the MWI's with APCD, ash analyses, indicator spore testing, and opacity measurements.

**TABLE II. SUMMARY OF RESULTS FROM EPA TEST PROGRAM  
(Previously Reported)**

Facility	Units	K	W	S	S	A	A	B
<b>Actual Test Conditions</b>								
Waste Type		General	General	Red Bag	Path.	General	Red Bag	General
Secondary Chamber Temp.	F	1794	2028	1668	1489	1829	1812	1778
Primary Chamber Temp.	F	1823	1810	1470	1437	1285	1300	1760
Waste Charge Rate	lb/hr	255	215	159	160	522	449	843
Residence Time	second	0.31	0.94	0.11	0.12	1.35	1.47	1.65
Flue Gas Flow	dscfm	1209	982	925	972	1526	1382	5615
Moisture Content	%	12.7	15	7.4	8.4	12.5	13	18
APCD		None	None	None	None	DI/FF*	DI/FF*	VS/PB*
<b>Stack Emissions</b>								
O <sub>2</sub>	%	11.8	8.1	15.5	15.5	15	14.8	14
CO <sub>2</sub>	%	6.2	8.2	3.9	3.5	4.7	4.9	4.9
CO	ppm@7%O <sub>2</sub>	127	433	1213	136	15	11	48
NO <sub>x</sub>	ppm@7%O <sub>2</sub>	82	84	182	394	225	200	79
SO <sub>2</sub>	ppm@7%O <sub>2</sub>	12	28	43	126	10	8	0.5
THC	ppm@7%O <sub>2</sub>	20	32	119	14	5	4	17
HCl	ppm@7%O <sub>2</sub>	1430	1318	1537	111	48	73	1
PM	gr/dscf@7%O <sub>2</sub>	0.15	0.19	0.451	0.049	0.024	0.002	0.046
Dioxin	ng/dscm@7%O <sub>2</sub>	1440	954	5050	187	168	47	62
Furan	ng/dscm@7%O <sub>2</sub>	5830	4990	19700	389	476	223	336
Total CDD/CDF	ng/dscm@7%O <sub>2</sub>	7260	5950	24700	576	644	270	398
<b>Metals</b>								
Arsenic	ug/dscm@7%O <sub>2</sub>	10	25	11	83	12	15	9
Lead	ug/dscm@7%O <sub>2</sub>	1870	6250	1878	307	23	20	1745
Mercury	ug/dscm@7%O <sub>2</sub>	139	510	8	61	6609	2162	299
Cadmium	ug/dscm@7%O <sub>2</sub>	214	385	55	21	2	2	217
Chromium	ug/dscm@7%O <sub>2</sub>	25	34	36	190	4	4	25

\* DI/FF = Dry Injection/Fabric Filter  
VS/PB = Venturi Scrubber/Packed Bed Absorber

The preliminary findings, as reported at the 1991 Incineration Conference, which were drawn from these test data are:

1. CO emissions from well designed and operated MWI's are generally less than 25 parts per million (ppm) at 7 percent(%) oxygen (O<sub>2</sub>).
2. There appears to be little difference in uncontrolled emissions between general hospital waste and segregated red bag waste, but uncontrolled emissions from pathological waste were about 10 times lower as compared to those from red bag waste.
3. Medical waste incinerators cannot generally be operated properly at the manufacturer's design rate when fired with the types of waste typically generated by today's hospitals without experiencing over- temperature conditions in the incinerator, poor ash burnout, and greatly increased air emissions.
4. Secondary chamber gas residence times between 1 second and 2 seconds reduce the variability in uncontrolled emissions caused by other operating factors. For example, increased secondary chamber temperature decreases emissions, but the effectiveness of increased secondary temperatures decreases as the residence time increases.
5. At secondary chamber gas residence times of less than 1 to 2 seconds, incinerator operation significantly affects uncontrolled emissions.
6. The overall pathogen "kill" of the incinerators tested was generally greater than 99.99%.

#### NEW PRELIMINARY TEST RESULTS (1991)

Tests were conducted in 1991 for a total of 7 test conditions at three test facilities as detailed in Table III. Three series of emission measurements were completed under each of the test conditions. Facility J is a batch type MWI. Testing at this MWI was conducted over two stages of its operating cycle. The "burn" and the "burndown" phases. The main difference between these phases is the amount of combustion air feed to the primary chamber. The "burn" phase is operated under low air conditions to gradually raise temperatures in the primary chamber. In the "burndown" phase the combustion air to the primary chamber is increased to burn out the remaining waste bed.

For both Facilities A and M, in addition to determining the performance of the installed APCD, testing was also performed with the addition of carbon injection to the existing APCD to determine the effect of carbon injection on controlling mercury and dioxin emissions. The carbon content of the fly ash is felt to be important in controlling both mercury and dioxin emissions. Facility A was previously tested by EPA. Those results indicated that the DI/FF system achieved no control of either mercury or dioxin emissions. Therefore, the EPA decided to retest Facility A while injecting carbon in addition to its normal lime injection. Facility A was retested without carbon injection, with carbon injection at a rate of 1.0 lb/hr, and with carbon injection at a rate of 2.5 lb/hr. A coal-based activated carbon was used for this test program. The carbon was injected into the duct to the FF (after the waste heat boiler) just prior to the venturi section where the lime is injected. Also, at Facility A, we added tests for dioxins at the heat recovery boiler inlet and outlet so we could ascertain the effects of the heat recovery boiler on dioxin emissions/generation.

Facility M was tested to obtain information on emissions from rotary type MWI's and to determine the performance of a SD/FF control system both with and without carbon injection. At

TABLE III. SUMMARY OF RESULTS FROM EPA TEST PROGRAM

Facility	Units	J	J	A	A	A	M	M
<b>Facility</b>								
<b>Actual Test Conditions</b>		<b>Burn</b>	<b>Burndown</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>
Waste Type		General	General	General	General	General	General	General
Secondary Chamber Temp.	F	1792	1878	1839	1851	1823	1791	1787
Primary Chamber Temp.	F	631	1199	1264	1294	1297	1459	1445
Waste Charge Rate	lb/hr	717	---	549	553	548	749	672
		(lb/batch)						
Residence Time	second	1.63	1.86	1.3	1.2	1.3	2.26	2.25
Flue Gas Flow (inlet)	dscfm	692	630	1655	1796	1668	3460	3418
(outlet)	dscfm	1350	1283	2304	2251	2309	4897	4958
Moisture Content	%	15.5	14.3	11.1	8.7	10.5	14.7	13.8
APCD		FF/PB	FF/PB	DI/FF	DI/FF/C	DI/FF/C	SD/FF	SD/FF/C
Carbon Injection Rate	lb/hr	0	0	0	1	2.5	0	3.0
<b>Inlet Emissions</b>								
O <sub>2</sub>	%	9.9	9.3	14.1	14.3	14	10.9	10.6
CO <sub>2</sub>	%	6.2	7.6	4.4	4.1	3.8	7	6.5
CO	ppm@7%O <sub>2</sub>	8	14	13	9	9	15	9
NO <sub>x</sub>	ppm@7%O <sub>2</sub>	86	109	143	141	153	85	83
SO <sub>2</sub>	ppm@7%O <sub>2</sub>	8	33	6	5	8	11	18
THC	ppm@7%O <sub>2</sub>	13	8	9	5	4	4	3
HCl	ppm@7%O <sub>2</sub>	112	284	1669	2230	1944	724	1065
PM	gr/dscf@7%O <sub>2</sub>	0.004	0.027	0.077	0.074	0.078	0.493	0.488
Dioxin	ng/dscm@7%O <sub>2</sub>	9	264	53	89	94	24	25
Furan	ng/dscm@7%O <sub>2</sub>	24	949	184	322	322	168	174
Total CDD/CDF	ng/dscm@7%O <sub>2</sub>	33	1213	237	411	416	192	199
<b>Metals</b>								
Arsenic	ug/dscm@7%O <sub>2</sub>	0.6	4	6	7	4	12	9
Lead	ug/dscm@7%O <sub>2</sub>	805	5542	1503	2110	1500	3587	4413
Mercury	ug/dscm@7%O <sub>2</sub>	1257	3394	6883	7380	9503	2591	2627
Cadmium	ug/dscm@7%O <sub>2</sub>	30	207	402	1933	714	471	492
Chromium	ug/dscm@7%O <sub>2</sub>	15	24	33	50	43	131	151

TABLE III. SUMMARY OF RESULTS FROM EPA TEST PROGRAM (Continued)

W/D.C. V.I. C V.I. C

Facility	Units	J	J	A	A	A	M	M
<b>Outlet Emissions</b>								
O <sub>2</sub>	%	17.3	17.6	15.5	15.6	15.1	14	14
CO <sub>2</sub>	%	2.1	2.1	4.4	4.3	4.7	5.3	5.2
CO	ppm@7%O <sub>2</sub>	---	---	4	2	2	1	1
NO <sub>x</sub>	ppm@7%O <sub>2</sub>	---	---	170	130	144	94	89
SO <sub>2</sub>	ppm@7%O <sub>2</sub>	2	13	9	19	8	9	4
THC	ppm@7%O <sub>2</sub>	4	4	5	--	--	2	3
HCl	ppm@7%O <sub>2</sub>	18	70	69	35	41	6	26
PM	gr/dscf@7%O <sub>2</sub>	0.001	0.002	0.003	0.002	0.003	0.004	0.001
Dioxin	ng/dscm@7%O <sub>2</sub>	2950	1356	25	6	2	2	0.7
Furan	ng/dscm@7%O <sub>2</sub>	3879	1711	107	10	4	30	2.6
Total CDD/CDF	ng/dscm@7%O <sub>2</sub>	6829	3066	132	16	6	32	3.3
<b>Metals</b>								
Arsenic	ug/dscm@7%O <sub>2</sub>	0.3	0.5	0.7	1	0.8	1	1
Lead	ug/dscm@7%O <sub>2</sub>	12	79	4	5	7	6	3
Mercury	ug/dscm@7%O <sub>2</sub>	464	1184	7407	587	389	1979	284
Cadmium	ug/dscm@7%O <sub>2</sub>	4	5	2	2	10	2	1
Chromium	ug/dscm@7%O <sub>2</sub>	6	6	20	15	10	4	3

Facility M, the carbon was mixed with the lime slurry prior to injection into the spray dryer. Facility M is the only MWI in the U.S. known to have an installed SD/FF system.

## PRELIMINARY (1991) TEST FINDINGS

### Effect of Carbon Injection

The main objective of retesting Facility A was to determine the effect of carbon injection on controlling dioxin and mercury emissions. During the initial testing at Facility A, with lime injection only, no reduction was achieved in mercury or dioxin emissions. During the retest, 3 test conditions were sampled. These were: 1) no carbon injection (lime injection/FF only), 2) 1 lb/hr carbon injection rate, and 3) 2.5 lb/hr carbon injection rate. Figure 1 shows the effect of carbon injection at Facility A. As Figure 1 shows, mercury control efficiency increases from 0% at no carbon injection to 92% at a carbon feed rate of 1 lb/hr, and to 96% at a 2.5 lb/hr carbon feed rate. During all these tests, the lime injection rate was maintained at about 40 lb/hr. As for dioxin emissions, the normal DI/FF achieved a control efficiency of 44%. When carbon was injected at 1 lb/hr, the dioxin control efficiency increased to 96%. At 2.5 lb/hr carbon feed rate, the dioxin control efficiency increased to 98.6%. As Figure 1 shows, there is clearly an increase in control efficiency with the addition of carbon injection for both mercury and dioxin emissions, and the effectiveness increases at higher carbon feed rates.

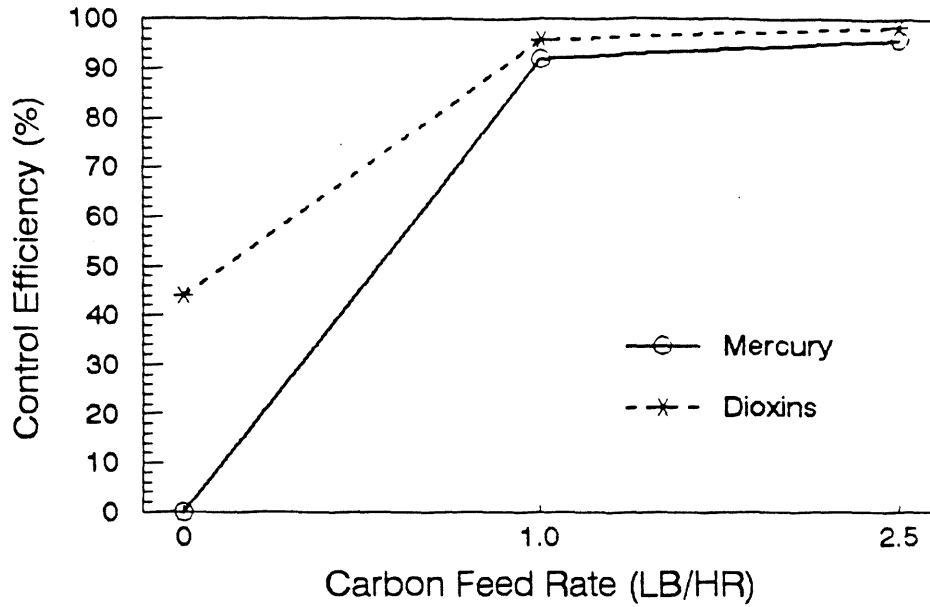
### Emissions from Batch Type Incinerator

The objectives for testing Facility J included determination of uncontrolled and controlled emissions from a typical batch-fed unit and to define the performance of the FF/PB control system. Exhaust gas from the batch MWI passes through an air-to-air heat exchanger where the gases are cooled to below 400F prior to entering the FF/PB system. Under normal operation of the unit, waste is charged and the secondary chamber is preheated, the waste in the primary chamber is ignited and combustion of the waste occurs under starved-air conditions ("burn" phase). After a period of time, about 8 hours, a "burndown" phase begins when the primary combustion air is increased such that excess air is achieved in the primary chamber. After about 4 hours of burndown, the unit shuts off and cooldown begins. To characterize emissions over the entire waste burn cycle, separate emission samples were taken during the "burn" and "burndown" phases. Measurements were made upstream (inlet) from the heat exchanger and at the outlet of the FF/PB system.

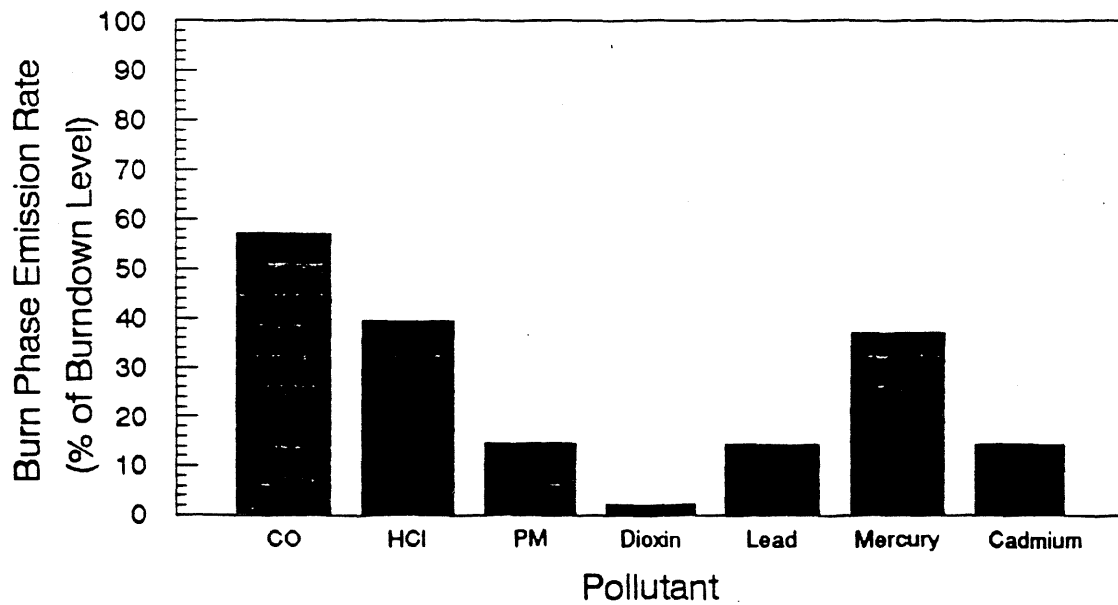
The test results from Facility J presented in Table III indicate that uncontrolled emissions are higher during the "burndown" phase than during the "burn" phase. Figure 2 shows the "burn" emission concentration rates for 7 pollutants in terms of percent of the "burndown" emission rates. In all cases reported, emission rates during the "burn" phase are less than 60 percent of the "burndown" rates. At the lower primary air flow during the "burn" phase, waste combustion is occurring at a slower rate as evident by the low average primary chamber temperature (630F) achieved during this phase. During the "burndown" phase, the air flow to the primary chamber is increased and the waste combustion increased substantially as indicated by the increased average primary chamber temperature of 1200F. Continuous monitoring of both process parameters and emissions was performed over the entire operating cycle (burn, burndown, and cooldown phases). These results are discussed later.

### Dioxin Formation in Exhaust Stream

Another objective of the retest at Facility A was to determine dioxin formation across the waste heat recovery boiler. The initial test at Facility A in 1990 indicated dioxin formation across the DI/FF system, based on comparing the inlet emission rate to the total outlet emissions (stack gas dioxin plus



**Figure 1. Effect of Carbon Injection on Mercury and Dioxin Emissions.**



**Figure 2. Batch Type Incinerator Emissions (Facility J - Burn Phase vs. Burndown Phase)**

the dioxin content of the ash in the baghouse catch). During the retest, dioxin sampling was performed at the boiler inlet, the boiler outlet (DI/FF inlet), the stack exhaust (DI/FF outlet) and the baghouse ash catch. The results are presented in Figure 3. As Figure 3 shows, dioxin emissions increase between the boiler inlet and outlet sampling locations during all 3 carbon injection test conditions. Total dioxin emissions also again increased across the DI/FF system. A theoretical mechanism/cause for this dioxin formation is discussed in another paper being presented at this session.

The data in Figure 3 also show that for all 3 test conditions the total dioxins (exhaust from fabric filter and ash) increased across the FF system with less dioxin being emitted to the atmosphere but more being found in the baghouse "ash" catch. This increase in total dioxins across the FF system increased with increasing carbon injection rate. However, as discussed earlier, the dioxin emitted to the atmosphere decreased with increasing carbon rate.

Dioxin formation was also observed across the FF/PB system at Facility J. This unit has an air-to-air heat exchanger, instead of a waste heat recovery boiler, prior to the FF/PB. During the "burn" phase, dioxin emissions increased from 33 nanograms per dry standard cubic meter (ng/dscm), corrected to 7% O<sub>2</sub>, at the incinerator outlet (heat exchanger inlet) to almost 7000 ng/dscm at the stack (FF/PB outlet). This same phenomenon was observed during the "burndown" phase. Whether the dioxin formation occurred in the heat exchanger, the fabric filter, or both was not determined. The inlet temperature to the APCD's at Facilities A and J were in the same range (350 to 375F). Therefore, dioxin formation at Facility J could be occurring across both the heat exchanger and the fabric filter, as occurred at Facility A. The greater formation observed at Facility J, as compared to Facility A, may be due to the lack of lime injection which may react with the dioxin precursors in some way to lessen the dioxin formation.

### Emissions over Entire Operating Cycle

During the test program emissions were measured using CEM's over the 24-hour period of typical operation for each MWI. Figures 4 and 5 present profiles for one 24-hour period of one hour averages for the primary and secondary chambers temperatures and uncontrolled HCl and CO emissions. In Figure 4, Facility A is an intermittent MWI charged at an average rate of 476 lb/hr for 8.1 hours after which the "burndown phase" was entered. The main secondary burner operated through the 13th hour after which it was shutdown and two pilot burners were operated through the 16th hour after which one pilot burner continued to operate. As one can observe from Figure 4, the primary chamber temperature stabilized at about 1300F while the secondary operated at about 2000F during the "burn phase". During the burn phase, CO emissions were less than 25 ppm @ 7% O<sub>2</sub> and HCl emissions were variable but reached a high point of 3300 ppm @ 7% O<sub>2</sub> and then decreased as charging of waste was stopped after 8.1 hours and the residual waste continued to burn out. At the 16th hour there was a spike in CO and HCl emissions. This is theorized to have occurred when the operator opened the incinerator charge door during cooldown, additional air was available and residual waste burned more rapidly.

In contrast to Facility A, Facility J as shown in Figure 5 is a batch type incinerator which was initially charged with a single 750 pound batch. The incinerator was then "closed up" and "burn" initiated. The secondary chamber operated at 1800F to 2000F for the first 12.5 hours after which the secondary burner was shut off. The "burn" cycle lasted for about 6.5 hours after which a "burndown" cycle was initiated by increasing the primary chamber air flow rate. As shown in Figure 5, the primary chamber temperature gradually increased from about 300F in the second hour of "burn" to about 1300F after 12.5 hours when the "cooldown" cycle began. During the "cooldown" cycle, the

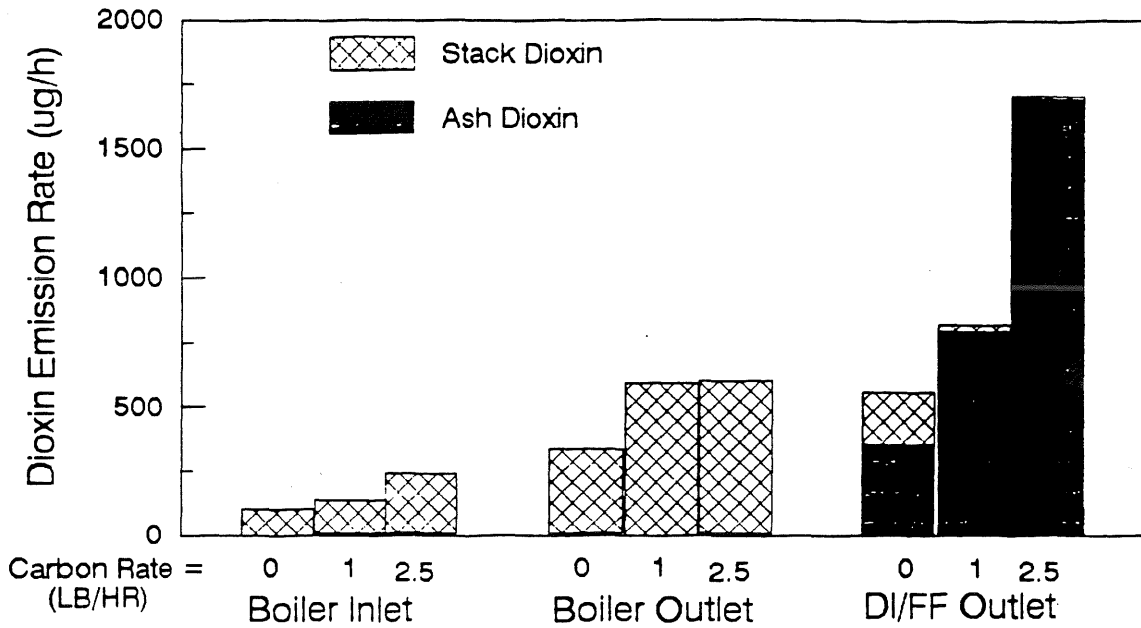


Figure 3: DIOXIN FORMATION

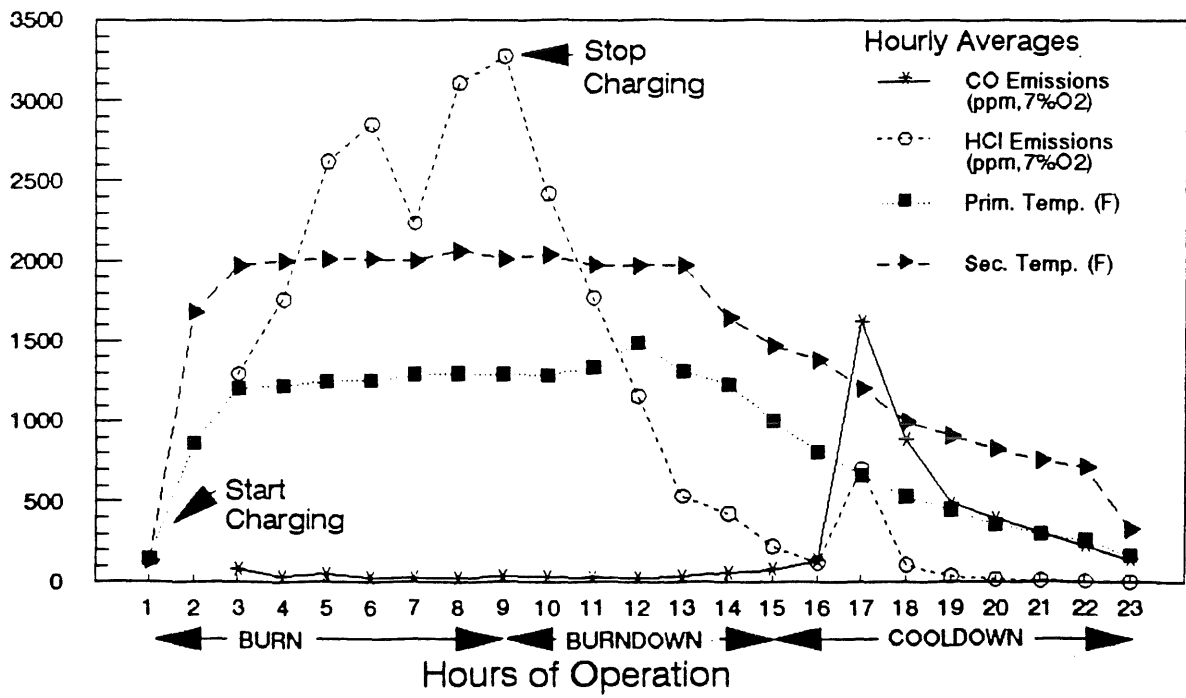


Figure 4. Facility A

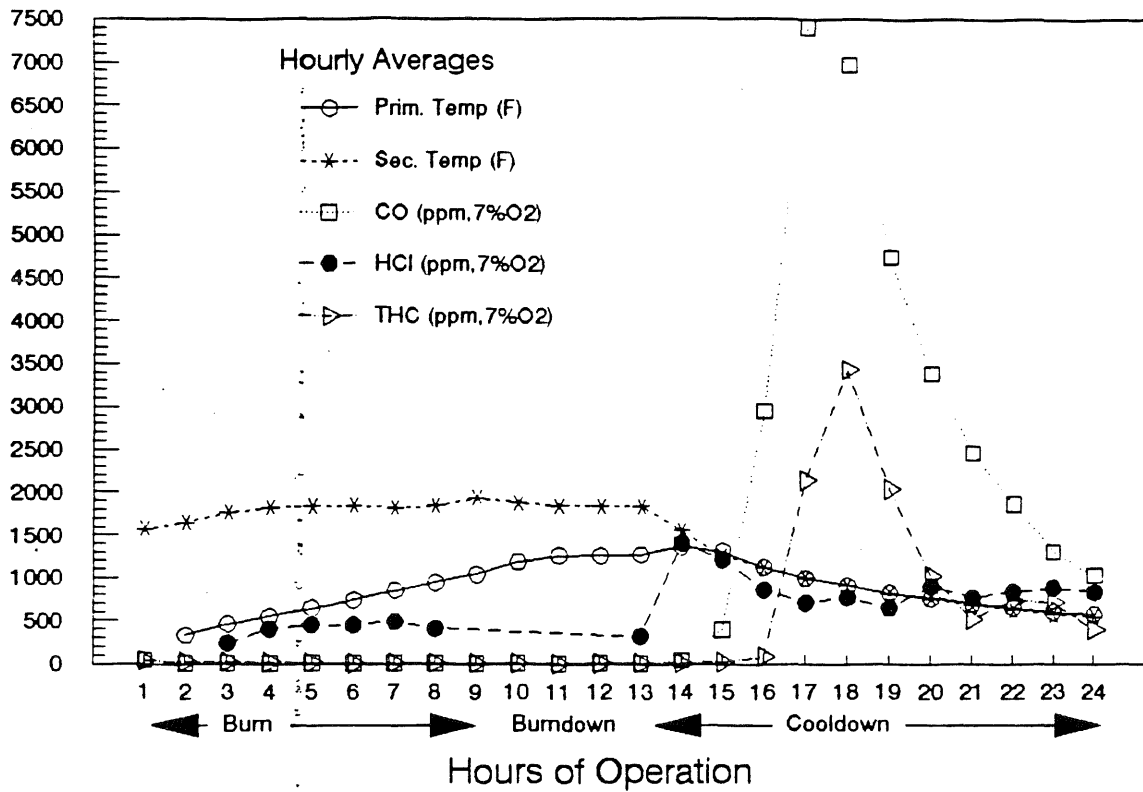
secondary chamber burner was off and the primary chamber air flow rates were maintained at the high flow level. The figure shows CO emissions of less than 25 ppm @ 7% O<sub>2</sub> during the burn and burndown phases when the secondary chamber burner was operating. HCl emissions during this period were less than 300 ppm @ 7% O<sub>2</sub>. In contrast, emissions of CO during the "cooldown" phase peaked as high as 7500 ppm at 7% oxygen (1 hour average, actual instantaneous peak was 9275 ppm @ 7% O<sub>2</sub>) and HCl emissions ranged from 800 to 1400 ppm at 7% oxygen.

From these plots in Figure 5, one can conclude that major combustion of the waste charge occurred during the "cooldown" phase. Emissions of HCl continued and, since the secondary burner was off during this period, major emissions of CO and THC also occurred. We performed dioxin testing during the "burn" and "burndown" phases as discussed earlier but did not perform dioxin testing during the "cooldown" phase. However, given that our data from the previous testing as presented in our paper at last year's conference shows a strong correlation between high CO and high dioxin levels (see Figure 6), one can conclude that extremely high levels of dioxins were emitted from this incinerator during the cooldown phase when the secondary burner was off.

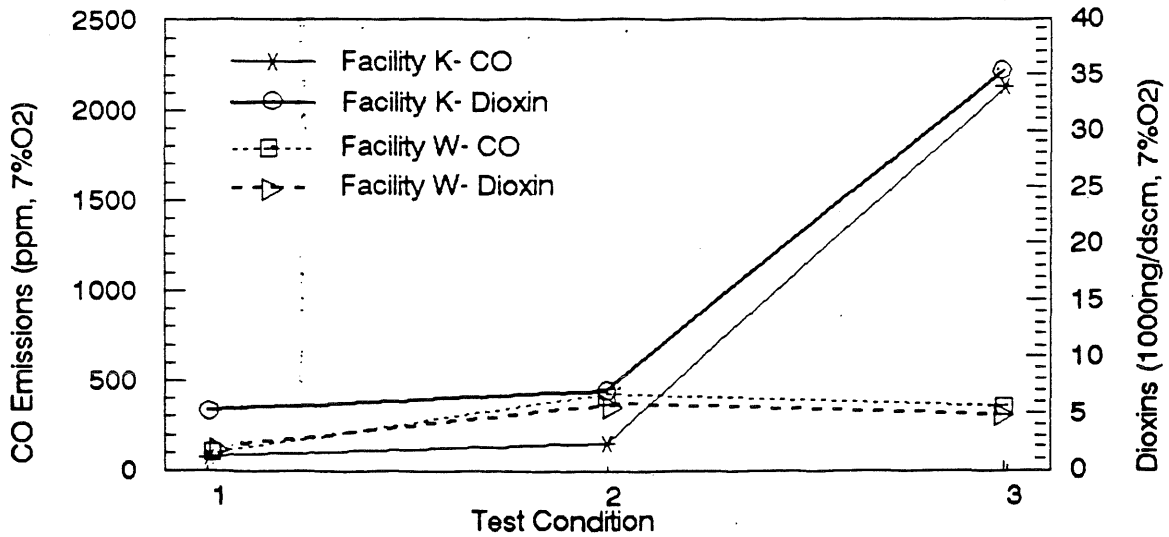
### Control Efficiency of Add-on Controls

Table IV summarizes the performance of the four control systems tested to date. The table shows that:

- \* All systems achieved greater than 95% HCl reduction, except for the FF/PB system which had reported PB spray nozzle plugging problems during the test period.
- \* The fabric filter systems achieved greater control of PM and metals emissions than the wet scrubber system.
- \* the FF/PB system achieved about 60% removal of mercury emissions without the addition of carbon injection compared to about 10% removal of mercury by the VS/PB. It is not clear why this occurred.
- \* Removal efficiencies for mercury emissions across the DI/FF system increased from 0% without carbon injection to over 95% with carbon injection. Similarly, mercury removal for the SD/FF system increased from 23% to about 90%.
- \* SO<sub>2</sub> removal efficiencies are low because uncontrolled levels are low (5 to 30 ppm) and we are introducing levels of uncertainty caused by SO<sub>2</sub>-CEM capabilities at these low levels.
- \* Dioxin removal for the DI/FF system increased from 44% without carbon injection to about 99% with carbon injection. Dioxin removal for the SD/FF system increased from 83% without carbon injection to over 98% with carbon injection. The VS/PB system removed about 70% of the dioxins and the FF/PB/heat exchanger system resulted in dioxin generation across the system.



**Figure 5. Facility J (Batch MWI - Single 750 Lb Charge at Start)**



Test Conditions: 1 - Undercapacity (Low charge rate, high sec. temp.)  
 2 - Design (Design charging procedure, high sec. temp.)  
 3 - Overcharge (High per charge rate, Cond.2 hourly rate, low sec. temp.)

**Figure 6. Effects of Operating Conditions and Residence Time**

TABLE IV. CONTROL EFFICIENCY FOR AIR POLLUTION CONTROL DEVICES

Pollutant	APCD Efficiency (%)					
	VS/PB	DI/FF		SD/FF		FF/PB
		W/O Carbon	With Carbon	W/O Carbon	With Carbon	
PM	54	96	96	99.2	99.8	88
Metals						
Arsenic	67	88	80	91.7	88.9	78.6
Lead	47	99.7	99.5	99.8	99.9	98.6
Mercury	9.4	0	95.9	23.6	89.2	64.2
Cadmium	0	99.5	98.6	99.6	99.8	95.5
Chromium	51	39	76.7	96.9	98	66.7
HCl	99.9	95.9	97.9	99.2	97.6	79.4
SO <sub>2</sub>	80	0	0	18.2	77.8	68.8
CDD/CDF	72.2	44.3	98.6	83.3	98.5	0*

\* Dioxin formation occurred across control system.

VS/PB = Venturi Scrubber/Packed Bed Absorber  
DI/FF = Dry Injection/Fabric Filter

SD/FF = Spray Dryer/Fabric Filter  
PB/FF = Packed Bed/Fabric Filter

## CONCLUSIONS

- \* Dioxin formation has been shown to occur across waste heat recovery boilers and APCD's.
- \* Carbon injection is necessary to achieve high dioxin removal for the DI/FF system and increases dioxin removal efficiency of the SD/FF.
- \* Carbon injection provides high mercury removal for both the DI/FF and SD/FF systems.
- \* Fabric filters are better than wet scrubbers for controlling PM and metal emissions.
- \* Extremely high CO, THC and dioxin emissions can be experienced during the burndown/cooldown phases of incineration unless the secondary chamber temperature continues to be maintained.
- \* There are significant differences in emissions profiles between intermittent and batch incinerators. These differences should be considered when selecting incinerator type and when operating the incinerator and control equipment. Secondary burners should operate until waste combustion has ceased in the primary chamber.