INDUSTRIAL COMMERCIAL WASTE INCINERATION

REGULATORY OPTIONS

November 1998

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Section 129 of the Clean Air Act directs the Environmental Protection Agency (EPA) to develop regulations for industrial and commercial waste incineration units (ICWI). This paper outlines the regulatory options which have been identified thus far in development of these regulations. Identification of regulatory options, however, is an on-going process. As additional information becomes available, various analyses are undertaken, and new ideas emerge. Regulatory options therefore expand and contract - new options are added and existing options abandoned - throughout the regulatory development process. Thus, options evolve as regulatory development proceeds, and the options identified at one point are usually different from those identified at another point. Accordingly, the regulatory options several months from now may differ in many respects from those identified in this paper.

Much of the work to date on development of regulations for ICWI has been devoted to analyzing data contained in two databases:

- **Inventory database** -- *a detailed listing of industrial and commercial combustion units derived from existing State and federal databases.*

- **Information collection request (ICR)/survey database** -- *responses from an information collection request (ICR) providing updated and detailed information for facilities identified in the inventory database.*

The inventory database was developed from information available from the AIRS (Aerometric Information Retrieval System) and OTAG (Ozone Transport Assessment Group) databases and then supplemented with information available from DOD (Department of Defense) and nineteen States who were not participants in OTAG or maintained additional databases outside AIRS. The resulting inventory database initially contained about 8,000 facilities believed to have one or more incinerator units.

An Information Collection Request (ICR) was developed and forwarded to these facilities to collect additional information. The responses were entered into a separate database--the ICR Survey database.

The ICR survey database indicates that most of the incinerator units identified in the inventory database have been shut down or otherwise do not exist. In addition, a large number of incinerator units were found to be burning solid wastes covered by other regulations (e.g., hospital and infectious medical waste, municipal waste, sewage sludge, and hazardous waste). Taking all of these factors into consideration, the best current estimate of the number of ICWI incinerator units in the inventory and ICR databases that are in operation is about 1,200. This estimate could increase or decrease as more information becomes available.

The inventory and ICR databases represent most of the wood, wood waste, and drum and parts reclaimer units currently operating in the U.S., and over 50% of the remaining incineration subcategories, with the exception of poultry farm incinerators. Poultry farm units, typically rated at <100 lb/hr, have probably never been regulated or permitted due to their small size. Although not all incineration units are captured within the databases, the databases are considered at this point as representative of the cross-section of incinerators and provide a sufficient basis to proceed with regulatory development.

Another database, an emissions database, is currently under development. This database will contain hazardous air pollutant (HAP) emission data compiled from emission source tests at ICWI units. Collection of HAP emission data will continue throughout the regulatory development process, but, by the end of this year, the emission database will contain all of the HAP emission data from ICWI units which have been identified. This includes both emission tests contained in state files as well as emission tests in the possession of owners and operators of ICWI units. As a result, the information in this database will begin to factor into the identification and consideration of regulatory options.

Based on the information in the inventory and the ICR survey databases, four potential ICWI subcategories have been identified at this point:

- **Wood and Other Biomass Waste Incinerators**
- **Pathological Waste Incinerators**
- **Drum and Parts Reclaimer Incinerators**
- **Miscellaneous Industrial and Commercial Waste Incinerators**

Possible descriptions of each potential subcategory are summarized in Table 1 and presented in Attachment A. Whether ICWI should be divided into subcategories for regulation or the number of subcategories that may be appropriate remains uncertain. As regulatory development proceeds, additional subcategories may be added or these four subcategories may be recombined into a single category with no regulatory subcategorization. Also, although several subcategories are under consideration at this point in time, the ICWI regulation is currently envisioned as a single rulemaking (i.e., a single regulation).

Based on the information currently available, it appears that most existing ICWI units have minimal or no control devices in place. The exception may be drum and parts reclaimer incinerators (i.e., furnaces and burnoff ovens) which appear to operate thermal oxidizers. A number of ICWI units may utilize good combustion practices, however. Good combustion practices generally consist of:

- Firebox residence time, temperature, and turbulence
- Stoichiometric ratio (air/waste)
- Combustion air and waste distribution

- Operator training
- Waste composition and handling
- Maintenance practices

If appropriate, good combustion might serve as a basis for regulation through requirements for burner and air control adjustments, operator training, waste quality and handling practices, documented operating and maintenance procedures, and routinely scheduled inspections and maintenance. Because of the variety of unit designs and waste types among ICWI units, it may be appropriate to consider good combustion practices for each potential subcategory. On the other hand, if there are practical and general good combustion practices applicable to all ICWI units, no subcategorization of ICWI may be appropriate and a single set of regulatory requirements based on good combustion practices may be considered.

One issue associated with operator training is the definition of an "operator". At this point, the following definition is under consideration: an operator means an individual(s) whose work duties include the operation, evaluation, and/or adjustment of the combustion system. Additional specificity could be necessary, however, to distinguish "operators" from mechanics, engineers, and others who may occasionally evaluate or adjust the combustion system.

Another issue associated with operator training is how prescriptive possible regulatory requirements might be. This includes details such as:

- Training and qualification criteria
- Training programs and qualification exams
- Training program materials and documentation of qualification

Again, because of the variety of unit designs and waste types among ICWI units, it may be appropriate to consider operator training requirements for each potential subcategory. On the other hand, it may be appropriate to consider a general requirement for all ICWI units that owners and operators of ICWI units develop and implement an operator training program tailored to their equipment and site.

Waste composition and handling practices may also be appropriate for consideration. Such practices might consist of handling or separation procedures for some types of waste materials. Alternatively, given the diversity of wastes and the differences in design of ICWI units, it may be appropriate to consider a general requirement that owners and operators develop a waste handling/separation program, tailored to their site, focused on certain wastes or waste contaminants. These practices could be supplemented by waste accounting and record keeping.

Finally, maintenance practices may also be appropriate for consideration. As with operator training, however, because of the variety of unit designs and waste types among ICWI units, it may be appropriate to consider maintenance practice requirements for each potential subcategory. Conversely, it may be appropriate to consider a general requirement for ICWI units that owners and operators develop an equipment maintenance program tailored to their equipment and their site.

TABLE 1. POTENTIAL SUBCATEGORIES

POTENTIAL SUB-CATEGORY	POTENTIAL GROUPING	MATERIAL COMBUSTED	UNITS IN DATA BASE	FLOOR LEVEL OF CONTROL	REGULATORY ALTERNATIVES ABOVE FLOOR
Wood and Other Biomass Wastes	Milled and Engineered Wood Wastes	Wastes and residues resulting from wood-working	About 20 units for all groupings of wood and other biomass waste	Undetermined at this time; however, few of the units surveyed report controls and it may not be possible to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, ESPs, afterburners, and secondary combustors
Wood and Other Biomass Wastes	Harvested Wood and Biomass Wastes	Wastes and residues resulting from land clearing, orchard, silviculture, nursery, green-house, agricultural, and forest management activities and sawmill operations	(See above)	Undetermined at this time; however, few of the units surveyed report controls and it may not be possible to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, ESPs, afterburners, and secondary combustors
Wood and Other Biomass Wastes	Construction, Demolition, and Treated Wood Wastes	Wastes and residues resulting from: (1) the construction, remodeling, repairing, and demolition of individual residences, commercial buildings, and other structures, and (2) the treatment of wood products that are impregnated or otherwise treated with various preservatives for the purpose of protecting or other-wise extending the structural properties of the wood	(See above)	Undetermined at this time; however, few of the units surveyed report controls and it may not be possible to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, ESPs, afterburners, and secondary combustors

TABLE 1. POTENTIAL SUBCATEGORIES (Continued)

POTENTIAL SUB-CATEGORY	POTENTIAL GROUPING	MATERIAL COMBUSTED	UNITS IN DATA BASE	FLOOR LEVEL OF CONTROL	REGULATORY ALTERNATIVES ABOVE FLOOR
Pathological Waste Incinerators	<100 lb/hr	Animal remains primarily at poultry farms; small animal crematories, veterinary centers, humane societies, and pharma-ceutical companies	About 600 units for all groupings of pathological waste	Undetermined at this time; however, it appears no units operate controls and it may not be possible to identify a floor for existing units or new units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, and ESPs
Pathological Waste Incinerators	100 to 500 lb/hr	Animal and human remains primarily at human crematories; also animal crematories, veterinary clinics, humane societies, and pharmaceutical companies	(See above)	Undetermined at this time; however, it appears very few units operate controls and it may not be possible to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, and ESPs
Pathological Waste Incinerators	>500 lb/hr	Animal remains primarily at university research hospitals, large animal control facilities, and large pharmaceutical research facilities	(See above)	Undetermined at this time; however, it appears very few units operate controls and it may not be possible to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers, and ESPs

TABLE 1. POTENTIAL SUBCATEGORIES (Continued)

POTENTIAL SUB-CATEGORY	POTENTIAL GROUPING	MATERIAL COMBUSTED	UNITS IN DATA BASE	FLOOR LEVEL OF CONTROL	REGULATORY ALTERNATIVES ABOVE FLOOR
Drum Reclaimer Incinerators	Undetermined	Incinerators used to reclaim steel containers (e.g., 55 gallon drums) for re-use or to prepare them for recycling by burning or pyrolyzing interior and exterior container coatings and residues (containers must be empty as defined by RCRA prior to processing)	44	Undetermined at this time; however, a number of units operate thermal oxidizers and this may serve to identify a floor for existing and new units	Possibilities include good combustion practices, spray dryers, wet scrubbers, ESPs, and fabric filters
Parts Reclaimer Incinerators	Undetermined	Incinerators used to reclaim metal parts such as paint hooks and racks, electric motor armatures, transformer winding cores, and electroplating racks for use in their current form by burning off cured paint, plastisol (i.e., polyvinyl chloride and phthalate plasticizer), varnish, or unwanted parts such as plastic spacers or rubber grommets	332	Undetermined at this time; however, a number of units operate thermal oxidizers and this may serve to identify a floor for existing and new units	Possibilities include good combustion practices, spray dryers, wet scrubbers, and fabric filters
Miscellaneous Industrial and Commercial Waste Incinerators	Undetermined	By-products of industrial operations (including combinations with less that 30% municipal-type solid waste or less than 10% medical waste), environmental control device sludges, waste by-products, maintenance residues, off-test and out-dated materials, and packaging materials	203	Undetermined at this time; however, 12% of the units surveyed report controls for one or more of the following pollutants: PM, NOx, SOx, HCl, and CO and this may serve to identify a floor for existing units	Possibilities include good combustion practices, source separation, particulate controls, scrubbers and ESPs

ATTACHMENT A

POTENTIAL SUBCATEGORY DEFINITION SHEETS

POTENTIAL SUBCATEGORY: Wood and Other Biomass Waste Incinerators

POPULATION STATISTICS:

Twenty two units were identified within the database as combusting various types of wood materials. The identified incineration units are believed to reasonably represent the domestic population of wood incinerators and to include the bulk of existing units. The geographic coverage of the database includes all States where such units would be expected to be concentrated. Due to the economic incentive to burn wood materials as a fuel to provide energy, the population of wood incinerators may be static or in decline.

All seven units identified as incineration units combusting various materials consisting of wood are small to very small in size. These units were also found to have no specific pollution control and were operating infrequently on an as needed or batch basis.

Of the 18 units identified in the database as combusting biomass materials (e.g., materials associated with agricultural activities), no units were found to be incinerators actually combusting non-wood biomass agricultural types of materials. Incineration units burning biomass waste are probably few in number.

MATERIALS COMBUSTED:

Milled Solid and Engineered Wood Wastes. Wastes and residues resulting from woodworking manufacturing activities. The specific characteristics of these materials vary depending on the specie of wood (e.g., pine, oak, and poplar) and the engineered wood (e.g. particle board, plywood, and fiberboard) in question.

Harvested Wood and Biomass Wastes. Wastes and residues resulting from land clearing, orchard, silviculture, nursery, greenhouse, agricultural, and forest management activities and sawmill operations. The combustion characteristics of these materials vary, and the moisture content may range from 20 to 60%. Some wastes may contain residual chemical compounds from pesticide and herbicide treatment of vegetation.

Construction, Demolition, and Treated Wood Wastes. *Construction wastes* are wastes and residues resulting from the construction, remodeling, and repairing of individual residences, commercial buildings, and other structures. The composition is variable and generally includes pallets, forming and framing lumber, treated lumber, shingles, tar-based products, plastics, plaster, wallboard, insulation material, and plumbing, heating, and electrical parts. *Demolition wastes* are generally the same as construction wastes but may include broken glass, painted or contaminated lumber, chemically treated lumber, white goods, and reinforcing steel. *Treated wood wastes* are wastes and residues resulting from the treatment of wood products that are impregnated or otherwise treated with various preservatives (e.g., creosote, copper compounds, arsenic compounds, and pentachlorophenol) for the purpose of protecting or otherwise extending the structural properties of the wood. The composition is variable and contains such contaminants as organic and inorganic chemicals, metals, oils, paint, solvents, and pigments.

COMBUSTION DEVICE:

Includes single and multi-chamber and fluidized bed incinerators of various sizes, and also open burning, air curtain incinerators and teepees. The types of waste typically combusted in each of these combustion devices is illustrated in the following matrix.

COMBUSTION DEVICE	WOOD AND WOOD WASTE TYPE		
	Milled solid and engineered wood	Harvested wood and biomass	Construction, demolition, and treated
Open burning		✔	
Air curtain		✔	
Teepee	✔		
Incinerator	✔		✔

FLOOR LEVEL OF CONTROL:

It may be difficult to identify a MACT floor, based on the absence of any control devices among those units found in the inventory and survey databases. State regulations and permits were not found for these units, except for several opacity limits.

REGULATORY ALTERNATIVES ABOVE FLOOR:

Possible above-the-floor alternaitves are yet to be evaluated, but good combustion practices, source separation, particulate controls, scrubbers, ESPs, afterburners, and secondary combustors may be appropriate for consideration.

A list of wood and wood waste facilities, unit types, and controls is presented below.

ID Number	Facility Name	Unit Type	Type of Controls
450130037	Malphrus Construction #2	Air Curtain	None
220330013	La Skid and Pallet	Air Curtain	None
19059W350	Stylecraft, Inc	Incinerator	None
19059W350	Stylecraft, Inc	Incinerator	None
19059W350	Stylecraft, Inc	Incinerator	None
300670003	Park Lumber Company	Teepee	None
470830063	Imperial Fabricating Company	Incinerator	None
470890001	Burroughs-Ross Colville	Open Burning	None

47163A280	City of Kingsport	Air Curtain	None
47005A246	City of Alcoa	Air Curtain	None
120990233	Marks Landscaping & Paving	Air Curtain	None
530470015	Zosel Lumber	Incinerator	None
511750050	Atlantic Wood	Air Curtain	None
160490002	L.D. McFarland	Air Curtain	None
170312435	Service Products Inc	Incinerator	None
390775014	R.R. Donnelley & Sons	Incinerator	None
482010110	Cagle Constructors	Air Curtain	None
482010110	Cagle Constructors	Air Curtain	None
482010110	Cagle Constructors	Air Curtain	None
550750390	Fruday Canning Corp	Incinerator	None

POTENTIAL SUBCATEGORY: Pathological Waste Incinerators

POPULATION STATISTICS:

Less than 100 lb/hr - possibly several thousand units, however, many of these units are not permitted or registered and therefore are under-represented in the database.

Typical user profile - primarily poultry farmers; secondary small animal crematories, veterinary centers, humane societies, and pharmaceutical companies.

Annual operating hours per unit - Most of these units operate "as needed" and, as a result, operate on an intermittent basis.

Typical waste profile - primarily poultry carcasses; secondarily small animal remains, the bags/containers used to collect and transport the waste material, and animal bedding.

Typical design profile - for poultry units: single chamber systems; fueled with #2 fuel oil, LP gas, or natural gas; no air or temperature controls; manual operating system; batch fed.

100 to 500 lb/hr - possibly 500 units

Typical user profile - primarily human crematories; secondarily animal crematories; veterinary clinics; humane societies; and pharmaceutical companies.

Annual operating hours per unit - 700

Typical waste profile - primarily human remains and associated containers; secondarily animal remains, the bags/containers used to collect and transport the waste material, and animal bedding.

Typical design profile - retort and in-line systems; fueled with natural gas, LP gas, or #2 fuel oil; limited air controls and temperature controls; manual control system; batch fed.

Over 500 lb/hr - possibly 100 units

Typical user profile - primarily animal disposal systems for hospitals, animal control facilities, and research facilities.

Annual operating hours per unit - 1000

Typical waste profile - primarily animal remains, the bags/containers used to contain them, and animal bedding.

Typical design profile - multi-chamber design; fueled with natural gas, LP gas, or #2 fuel oil; air and temperature controls; automatic control systems; mechanical feed with intermittent charging.

MATERIALS COMBUSTED:

Pathological waste consists of human or animal remains, anatomical parts and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding.

COMBUSTION DEVICE:

These combustors are generally single or multiple chamber designs. They are fueled with fossil fuel and operate with excess air. The wastes are fed as single batches or intermittently fed.

A crematory incinerator is a pathological waste incinerator which is primarily used to reduce single batches of human or animal remains and their containers (pathological waste) to their basic elements with the intent of recovering the cremated remains for memorialization purposes.

Pathological waste combustors can be classified into the following design categories:

Retort incinerators - multiple chamber incinerator designs in which the secondary chamber is located directly beneath the primary chamber. The purpose of this configuration is that the hearth of the primary chamber is heated by the products of combustion flowing through the secondary chamber.

In-line incinerators - similar to the retort design in that the chambers share a common wall. In the in-line design the secondary chamber is not underneath the hearth, but is behind the primary chamber.

Multi-chamber incinerators - multiple chamber incinerator designs consisting of separated primary and secondary chambers. The secondary chamber is generally located above the primary chamber with the two chambers having no common ceilings, hearth, or walls between them. The temperature in the secondary chamber has little or no influence on the primary chamber temperature.

FLOOR LEVEL OF CONTROL (EXISTING):

Typically these combustors have no add-on emission control devices, thus it may be very difficult to identify a MACT floor for existing units. Good combustion practice may or may not serve to identify a MACT floor.

REGULATORY ALTERNATIVES ABOVE FLOOR:

CONTROL OPTION	PM[a]		Op[b]	SO_2	HCl	NOx	CO	Pb	Cd	Hg	D/F	COMMENTS
	f	t										
No control												Many incinerators are uncontrolled due to their small size, absence of regulations, and/or absence of demonstrated cost effective control technology.
Good combustion design and practice	**X**	**X**	**X**				**X**				**X**	Control of temperature and feed rate and use of supplemental combustion/secondary chamber.
Baghouse/ESP	**X**	**X**	**X**					**X**	**X**	**X**		There are no baghouse systems being manufactured for units this small. ESPs tend to be extremely expensive for small incinerator applications.
Thermal oxidizer/afterburner			**X**									Only applicable to single chamber units.
Cyclone/multiclone		**X**	**X**									Probably not very effective on these units because particle sizes are small.
Wet scrubber (low pressure or venturi)		**X**	**X**	**X**	**X**							Some control of metals may occur, such as mercury.
Dry acid gas/PM scrubbing system, including baghouse (DSI, dry sorbent injection system)	**X**	**X**	**X**	**X**	**X**			**X**	**X**	**X**	**X**	Can be a highly effective control system, although cost may be prohibitive, especially for small units like these. Carbon injection for Hg control can be added at little <u>incremental</u> cost.
Semi-dry acid gas/PM scrubbing system (spray dryer and baghouse)	**X**	**X**	**X**	**X**	**X**			**X**	**X**	**X**	**X**	Performs even better than DSI system, but costs are significantly higher. Carbon injection for Hg control can be added at little <u>incremental</u> cost.
Low-NOx burners, combustion chamber design, SNCR (ammonia injection)						**X**						Applicability of low-NOx burners to these types of small incinerators is questionable due to high excess air requirements.

[a]f = fine particulate matter; t = total particulate matter. [b]Op = opacity

POTENTIAL SUBCATEGORY: Drum Reclaimer Incinerators

POPULATION STATISTICS:

There are 38 facilities with 44 units in the database. In recent years steel drum production rates have remained unchanged and the number of drum reclamation furnaces is not expected to increase.

MATERIALS COMBUSTED:

The drum reclaimer furnace is used to reclaim steel containers, most often 55-gallon drums, for reuse. Drums are prepared for cleaning by abrasive shot blasting by being processed through the furnace, where interior and exterior coatings and residues are burned or pyrolyzed. Drums must be empty as defined by RCRA prior to furnace processing, and thus, not subject to Section 3005 permitting requirements. Natural gas is most often fired as the primary fuel in drum furnaces.

COMBUSTION DEVICE:

The typical drum reclaimer furnace is a semi-continuous tunnel furnace with heat inputs from 1.2 MMBtu/hr to 15.6 MMBtu/hr.

FLOOR LEVEL OF CONTROL:

Based on the inventory database, it is possible that the use of thermal oxidation could serve to identify a MACT floor.

REGULATORY ALTERNATIVES ABOVE FLOOR:

Since the floor control does not control acid gases, a spray dryer or wet scrubber may be considered. Similarly, Cd and Pb are not controlled in a thermal oxidizer and an ESP or fabric filter may be considered.

POTENTIAL SUBCATEGORY: Parts Reclaimer Incinerators

POPULATION STATISTICS:

There are 332 units in the database.

MATERIALS COMBUSTED:

This type of incinerator is used to reclaim metal parts for reuse in their current form. Coatings such as cured paint, plastisol, or varnish or unwanted parts such as plastic spacers or rubber grommets are burned off a wide variety of metal parts in these units. Plastisol coatings are comprised of polyvinyl chloride and phthalate plasticizer. Plastisol and paint both may contain heavy metal pigments. Metal parts fed to these primarily batch units include paint hooks/racks, electric motor armatures, transformer winding cores, and electroplating racks.

COMBUSTION DEVICE:

Parts reclaimer burnoff units are typically small, batch, fossil fuel-fired units. The database shows a range of heat inputs from 0.2 MMBtu/hr to 3.7 MMBtu/hr. They are often called burnoff ovens or pyrolysis units rather than termed "incinerators". Operations consist of loading the cold burnoff oven with metal parts, igniting the thermal oxidizer, if present, and main burner (both usually natural gas-fired), and allowing the combustible coating or part to pyrolyze into an fragile ash-like material (often over a period of hours) which may be then mechanically removed or abrasive-blasted off the metal part. Because of the wide variety of parts recycled in these units, facility size varies widely, from small electric motor repair shops to large automobile assembly plants.

FLOOR LEVEL OF CONTROL:

Based on both the inventory and survey databases, it is possible that the use of thermal oxidation might serve to identify a MACT floor for parts reclaimer burnoff units. Practices such as thermal oxidizer preheat and the removal of excess combustible materials (e.g., paper, rope, cloth, and visibly loose coatings/parts) may also serve to identify a MACT floor.

REGULATORY ALTERNATIVES ABOVE FLOOR:

The database lists a number of units controlled by a wet scrubber or a fabric filter in addition to a thermal oxidizer. Control alternatives above the floor might also include spray dryers and good combustion practices.

A summary of control devices for parts reclaimer burnoff units in the databases is presented below.

Air Pollution Control Devices for Parts Reclaimer Units listed in the ICR survey database			
ICR Database Control Device Code(s)	Description of Control Device/ Technique	Number of Units With Device	Percent of Total Units
019	Catalytic Afterburner	1	<1%
021	Direct Flame Afterburner	42	13%
022	Direct Flame Afterburner	6	2%
025	Staged Combustion	1	<1%
076	Multiple Cyclone w/o Flyash Reinjection	2	<1%
086	Water Curtain	3	1%
101	High Efficiency Particulate Air Filter	1	<1%
212	Air to Fuel Ratio Control	2	<1%
021 & 021	Direct Flame Afterburner	1	<1%
021 & 025	Direct Flame Afterburner & Staged Combustion	3	1%
021 & 028	Direct Flame Afterburner & Steam Injection	1	<1%
022 & 022	Direct Flame Afterburner	2	<1%
029 & 212	Low Excess Air & Air to Fuel Ratio Control	1	<1%
206 & 212	Low NOx Burners & Air to Fuel Ratio Control	2	<1%
021 & 028 & 025	Direct Flame Afterburner & Steam Injection & Staged Combustion	1	<1%
024 & 206 & 212	Mod. Furnace & Low NOx Burners & A to F Ratio	2	<1%
---	Approximate units not listed	261	79%

Air Pollution Control Devices for Parts Reclaimer Units listed in the inventory database			
CODE(S)	DESCRIPTION	Number	Percent
000	none	38	11%
002	Wet Scrubber - medium efficiency	1	<1%
003	Wet Scrubber - low efficiency	1	<1%
020	Catalytic Afterburner	2	<1%
021	Direct Flame Afterburner	66	20%
022	Direct Flame Afterburner	4	1%
024	Modified Furnace/Burner Design	1	<1%
078	Baffle	1	<1%
099	Other Devices	1	<1%
101	High Efficiency Particulate Air Filter	1	<1%
256	No code description available (unknown)	1	<1%
021 & 002	Direct Flame Afterburner & Wet Scrubber	1	<1%
021 & 003	Direct Flame Afterburner & Wet Scrubber	1	<1%
021 & 004	Direct Flame Afterburner & Gravity Collector	1	<1%
021 & 006	Direct Flame Afterburner	3	1%
021 & 016	Direct Flame Afterburner & Fabric Filter	1	<1%
021 & 028	Direct Flame Afterburner & Steam Injection	1	<1%
021 & 033	Direct Flame Afterburner	1	<1%
021 & 099	Direct Flame Afterburner	3	1%
021 & 020 & 016	Direct Flame Afterburner & Catalytic Afterburner & Fabric Filter	1	<1%

Air Pollution Control Devices for Parts Reclaimer Units listed in the inventory database			
CODE(S)	DESCRIPTION	Number	Percent
021 & 016 & 053	Direct Flame Afterburner & Fabric Filter & Venturi Scrubber	1	<1%
---	Approximate units not listed	201	61%

POTENTIAL SUBCATEGORY: Miscellaneous Industrial and Commercial Waste Incinerators

POPULATION STATISTICS:

Nationwide, there are 203 units in this potential subcategory. This includes incinerators in the twenty four (24) Standard Industrial Classification (SIC) groupings including the following: 13, 20, 22, 23, 24, 26, 28, 29, 30, 33, 34, 35,36, 37, 42, 46, 49, 51, 55, 73, 75, 87, 92, 97. These SIC groupings include the following industries:

Aircraft
Catalyst manufacturing
Government/municipality
Industrial organic and inorganic chemicals
Metal products
Oil and gas
Petrochemical
Photo processing
Pharmaceutical
Tire and rubber

Incinerators in this potential subcategory are located in 29 states as follows:

Arkansas (4), Alabama (2), California (21), Connecticut (9), Georgia (2), Iowa (6), Idaho (1), Illinois (3), Indiana (11), Kansas (1), Louisiana (13), Massachusetts (6), Maine (3), Michigan (13), North Carolina (9), North Dakota (2), Nebraska (2), New Jersey (7), Ohio (5), Pennsylvania (15), Puerto Rico (12), South Carolina (8), Tennessee (8), Texas (36), Virginia (9), Washington (6), Wisconsin (5), West Virginia (2).

MATERIAL COMBUSTED:

Byproducts of industrial operations, including combinations with less that 30% trash or less than 10% medical waste, environmental control device sludges, industrial process biosolids, waste byproducts, maintenance residues, off-test and out-dated materials, and packaging materials. Some of the waste descriptions mention the following materials:

Aqueous waste, commercial and industrial wastes, decorative laminate/cast polymer scrap, industrial sludge, industrial wastewater sludge, liquid wastes, medical waste (less than 10 percent of total feed), municipal solid waste (below 30 percent of feed), plastics, waste oil, pathological wastes, finishing wastes and paint wastes.

Attached is a list of the wastes burned and, as shown, no particular waste or wastes predominates.

COMBUSTION DEVICE:

All types of incinerators are used in this potential subcategory, including, but not limited to,

single and multiple chamber (including multiple hearth), fluid bed, rotary kilns, and tray types. The breakdown of units is as follows:

Multiple Chamber	45.2%
Single Chamber	25.4%
Rotary	9.7%
Fluidized Bed	2.3%
Otherwise classified	1.4%
Unclassified	16.0%

A more detailed list of combustion devices is attached.

Air pollution control devices are generally add-on units. The database contains information on controls device on 58 of 203 units. Of these 58 units, the database indicates that they were equipped with 124 control devices: 45 units have control devices for particulates (58%), 25 units have controls for CO (32%), 17 units have SOx control devices (22%), 20 units have devices for controlling NOx (26%) and 20 have control devices for HCl (26%). Many of the 58 units with controls appear to have redundant controls; however, this may actually be multiple incinerator units which are not accurately depicted in the database.

PM control equipment listed in the database include wet scrubbers, wet cyclone separators, venturi scrubbers, single cyclones, packed columns, multiple cyclones, mist eliminators, impingement plate scrubbers, ESP, afterburners, chemical neutralization, and fabric filters.

CO control equipment listed in the database include air/fuel ratio control, afterburners, and staged combustion.

SOx control equipment listed in the database include venturi scrubbers, sodium alkali scrubbing systems, packed absorption, mist eliminators, impingement plate scrubbers, sorbent injection, chemical neutralization, and alkalized fly ash scrubbers.

NOx control equipment listed in the database include air/fuel ratio control, ammonia injection, chemical neutralization, impingement plate scrubbers, low NOx burners, low excess air firing, packed absorption column, staged combustion, and venturi scrubbers.

HCl control equipment listed in the database include wet scrubbers, venturi scrubbers, packed columns, mist eliminators, sorbent injection, chemical neutralization, and flyash alkaline scrubbing.

A further breakout of the air pollution control devices is attached.

MACT FLOOR:

Although more than 12 percent of the units have some types of controls, there is also a large percentage with no control. Significant numbers of units (i.e. more than 12 percent) reported

some type of control for particulates, SO_2, HCl, NOx, or CO. The analysis of the data is incomplete, and it is unknown at this point how many units control multiple pollutants. Control for one or more of these pollutants could serve to identify a MACT floor.

REGULATORY ALTERNATIVES ABOVE FLOOR:

Possibilities include good combustion practices, source separation, particulate controls, scrubbers, and ESPs.

LIST OF MISCELLANEOUS INDUSTRIAL AND COMMERCIAL WASTE DESCRIPTIONS, NUMBER OF UNITS, AND PERCENTAGE OF UNITS IN DATABASE

1,4 butanediol heavy ends, 1, 0.42%
5% office paper, 95% paint sweepings and paint booth, 1, 0.42%
50-500 ppm PCB's/other (unidentified), ,1 0.42%
98% water, 2% anti-static liquid mixed with water, 1, 0.42%
Activated sludge from a pharmaceutical manufacturing plant wastewater treatment, 1, 0.42%
Aniline/other (unidentified), 1, 0.42%
Biological secondary sludge from aerobic treatment of industrial wastewater, 1, 0.42%
By-product waste, 1, 0.42%
Carbon black, 2, 0.84%
Coal tar waste/mixed industrial, 1, 0.42%
Confidential papers, 1, 0.42%
Contaminated trash from ammunition production lines, 1, 0.42%
Coproduct of partial acidation process, 1, 0.42%
Decorative laminate/cast polymer scrap, 1, 0.42%
Diesel fuel, 2, 0.84%
Disposal of pyrophoric samples, 1, 0.42%
Distillate from reactors containing approximately 7 NT % TOC, 1, 0.42%
Distillate or water by-product generated by condensation, 1, 0.42%
Ethyl acetate isopropanol, 1, 0.42%
Fabric scraps and lint, 1, 0.42%
Fiber paint booth filters & paper waste ,1, 0.42%
Fiberglass overspray filters loaded with overspray from finish system ,1, 0.42%
Fibers waste, 2, 0.84%
Fumes from reactors, 1, 0.42%
Gauzes, dispensary wastes, oily rags, floor sweepings, plastics, paper, and cardboard, 1, 0.42%
Illegal drugs and combustible contraband, 1, 0.42%
Industrial sludge, 1, 0.42%
Industrial solid waste (non-hazardous) ,1, 0.42%
Industrial waste materials, 1, 0.42%
Industrial waste/waste oil ,1, 0.42%
Industrial wastewater sludge, 6, 2.52%
Industrial wastewater sludge from bulk pharma-chemical manufacturing, 1, 0.42%
Lacquer dust from spray booth clean up as well as scrapings and filters, 1, 0.42%
Lead-free, chrome- free paint sludge (~10% solvent, ~90% solids), 1, 0.42%
Liquid hydrocarbon wastes containing salts and catalyst, 1, 0.42%
Liquid waste from air oxidation process, 1, 0.42%
LPG, 10 ,4.20%
Medical waste, 1, 0.42%
Microfiche (15%), paper (5%), and Mylar/mixed, 1, 0.42%
Mineral spirits fumes burned off without condensation, 2, 0.84%
Mixture containing 2/3 common trash, 1/3 non-hazardous chemicals (plastics, foam etc.), 1, 0.42%
Mixture of combustible waste such as non-recycled paper, cardboard carton, floor sweepings, 1, 0.42%
Molded paper articles containing nitrocellulose, 1, 0.42%
Molded paper articles containing nitrocellulose, 1, 0.42%
Multiple effect evaporator concentrate; concentrated blowdown from cooling tower, 1, 0.42%
Municipal/commercial solid waste: type 0 - trash, 3, 1.26%
N-methyl pyrrolidine residue, 1, 0.42%
Natural gas, 43, 18.07%
NCGS from pulping operations, 1, 0.42%
Nitric acid fumes as No 3 and NO 2, 2, 0.84%
No. 2 distillate, 15, 6.30%

No. 6 residual oil, 1, 0.42%
Non-hazardous industrial solid waste, including off-spec pharmaceutical and other, 1, 0.42%
Non-hazardous liquid distillates generated from pioneer's, 1, 0.42%
Non-hazardous, non-RCRA, non-DOT regulated polyols, 1, 0.42%
Off spec pharmaceutical products & packaging components, 1, 0.42%
Off-gas from air oxidation process, storage tank vents, distillation vents, 1, 0.42%
Off-specification diaper raw materials and trim waste, paper, corrugated cartons, plastic, 1, 0.42%
Oil filters & process filters oil & gas, 1, 0.42%
Oil filters, oil field trash, process filters ,1, 0.42%
Oil soaked pads - oil absorbent bags from floor drains, 1, 0.42%
Oily absorbents used for soaking up spilled motor and hydraulic oils, 1, 0.42%
Organic fumes from condensation reaction of unsaturated polyester resin, 1, 0.42%
Oxidized waxes and petroleum, 1, 0.42%
Paint booth filters & paint dust, 1, 0.42%
Paint both filters containing cured 2-part urethane paint; floor sweepings, 1 ,0.42%
Paint filters and varnish dust, 1, 0.42%
Pallets, 2, 0.84%
Paper mill sludge from waste treatment plant-deink tissue mill, 1, 0.42%
Paper slurry containing nitrocellulose, 2 ,0.84%
Pathological: animal remains, 1, 0.42%
Petrochemical process gas, 1, 0.42%
Phosphate cleaner & paint waste, 1, 0.42%
Phosphate cleaner waste, 1, 0.42%
Plastics ,5, 2.10%
Polypropylene carpet backing, 1, 0.42%
Process off-gas from herbicide production, 1, 0.42%
Process wax composed of fillers and resins, 1, 0.42%
Pulp mill non-condensible gases , 1, 0.42%
PVC/styrene/abs/hdpe/ldpe/ (plastics), 1, 0.42%
Quantity of wax, 1, 0.42%
Rectified methanol from pulpmill condensates, 1, 0.42%
Refined petroleum contaminated debris, 1, 0.42%
Regulated medical waste such as discarded wipes, gauze, gowns, gloves, bandages, 1, 0.42%
Residue from herbicide intermediate production, 1, 0.42%
Returned pharmaceutical products with packaging (non-hazardous), 1, 0.42%
Single chamber incinerator, 1, 0.42%
Solids from manufacturing and product storage, 1, 0.42%
Solids/other (unidentified), 1, 0.42%
Stoddard calibration fluid, 1, 0.42%
Sulfur-free organic by-product/other (unidentified), 1, 0.42%
Tablets, capsules, non-corrugated carton, 1, 0.42%
Tar oil; similar to no 6 fuel oil, 16,000 btu/lb, 1, 0.42%
Turpentine and methanol from foul condensate stripper, 1, 0.42%
Undefined solid waste (explosives), 1, 0.42%
Undefined solid waste (fertilizer)/other (unidentified), 1, 0.42%
Undefined solid waste (laboratory waste)/other (unidentified), 1, 0.42%
Undefined solid waste (metal coating)/finishing waste, 3, 1.26%
Undefined solid waste (photofinishing)/photo processing, 1, 0.42%
Undefined solid waste (toilet preparations; cosmetics, 1, 0.42%
Undefined waste (plastics, synthetic materials, etc), 1, 0.42%
Unknown/finishing wastes, 1, 0.42%
Used air filters from paint booths, dirty rags, drip paper from paint booths, 1, 0.42%
Vapor from stoddard calibration fluid, 1, 0.42%
Vegetable oil, coconut oil, rice oil, silicone oil, 1, 0.42%
Vent gases produced in manufacturing and product storage, 1, 0.42%

Vinyls/other (unidentified), 1, 0.42%
Volatile organic compounds from pioneer's, 1, 0.42%
Waste activated charcoal and waste diatomaceous earth used as filter media, 1, 0.42%
Waste carbon black, 1, 0.42%
Waste ethical drugs, sweeping, etc., waste narcotic controlled drugs, 1, 0.42%
Waste excess activated sludge from permitted wastewater treatment plant, 1, 0.42%
Waste fluids, 3, 1.26%
Waste fluids/other (unidentified), 2, 0.84%
Waste from fibers processing, primarily fishing, 2, 0.84%
Waste lint/other (unidentified), 1, 0.42%
Waste lubrication oils, 1, 0.42%
Waste oil, 7, 2.94%
Waste type 1, 1, 0.42%
Waste water sludge from auto painting, 1, 0.42%
Water used to wet rags for wiping off furniture parts is evaporated in the incinerator, ,1 0.42%
Water vapor with varying amounts of organics, 1, 0.42%
Water with varying amounts of organics, 1, 0.42%
Wax composed of fillers and resins, 1, 0.42%
Wood: dried milled lumber, 1, 0.42%
Unspecified, 18, 7.56%
Total in database, 238

LIST OF MISCELLANEOUS INDUSTRIAL AND COMMERCIAL WASTE COMBUSTION DEVICES AND NUMBER OF DEVICES IN DATABASE

Catalytic, 2
Extrusion incinerator, 1
Excess air, fluid bed, single batch fed, 2
Fluidized-bed, 1
Suspension firing, fluid bed, continuously fed, 2
Burn-off oven, multi-chamber, excess air, intermittent batch fed, 2
Burn-off oven, multi-chamber, starved air, single batch fed, 1
Fixed hearth, multi-chamber, excess air, intermittent batch fed, 10
Fixed hearth, multi-chamber, excess air, single batch fed, 3
Fixed hearth, multi-chamber, intermittent batch fed, 4
Fixed hearth, multi-chamber, single batch fed, 2
Fixed hearth, multi-chamber, starved air, intermittent batch fed, 3
Multi-chamber, continuously fed, 2
Multi-chamber, continuously fed, down fired, 3
Multi-chamber, continuously fed, sudden expansion, 3
Multi-chamber, excess air, automatic feeder, 8
Multi-chamber, excess air, continuously fed, 3
Multi-chamber, excess air, intermittent batch fed, 4
Multi-chamber, excess air, starved air, 4
Multi-chamber, intermittent batch fed, 3
Multi-chamber, intermittent batch fed, continuously fed, 3
Multi-chamber, single batch fed, 12
Multi-chamber, starved air, single batch fed, 4
Multiple chamber (could be starved or excess air), 5
Multiple hearth, 1
Multiple hearth, continuously fed, 4
Multiple hearth, excess air, continuously fed, 2
Pathological, fixed hearth, multi-chamber, excess air, starved air, intermittent batch fed, medical, 2
Pathological, multi-chamber, intermittent batch fed, medical waste, rocking kiln, 6
Spreader stoker, multi-chamber, excess air, single batch fed, 2
Suspension firing, multi-chamber, intermittent batch fed, 2
Rotary hearth, 3
Rotary kiln, 4
Rotary kiln, multi-chamber, continuously fed, 2
Rotary kiln, multi-chamber, excess air, intermittent batch fed, 5
Fire tube, induced draft, rotary kiln, multi-chamber, excess air, continuously fed, 3
Metals recovery, rotary hearth, 4
Single chamber, 13
Single chamber, continuously fed, 12
Single chamber, down-fired thermal oxidizer liquid incinerator, 3
Single chamber, excess air, continuously fed, 11
Single chamber, excess air, fluid bed, continuously fed, 3
Single chamber, excess air, single batch fed, 1
Single chamber, single batch fed, 3
Burn-off oven, single chamber, excess air, intermittent batch fed, 2
Fixed hearth, single chamber, excess air, 2
Single chamber, single batch fed, with after burner, 2
Suspension firing, single chamber, excess air, continuously fed, 3
Burn-off oven, 2
Continuously fed, 5
Excess air, continuously fed, 4

Furnace, 1
Incinerator, 3
Incinerator, metals recovery, pathological, single batch fed, 4
Oxidation plant, 1
Pathological, fixed hearth, starved air, single batch fed, 3
Suspension firing, excess air, continuously fed, 2
Unspecified incinerator, 6
Unspecified incinerator/UR 1500, 2
Used oil heater, 1
Total in database, 316

LIST OF MISCELLANEOUS INDUSTRIAL AND COMMERCIAL WASTE INCINERATION EMISSION CONTROL DEVICES AND NUMBER OF DEVICES IN DATABASE

Direct flame afterburner, 20
Direct flame afterburner - heat exchange, 2
Electrostatic precipitator, high efficiency, 3
Fabric filter, high temperature, 3
Fabric filter, medium temperature, 6
Impingement plate scrubber, 1
Mist eliminator, high velocity, 4
Mist eliminator, low velocity, 1
Multiple cyclone w/o fly, 2
Packed-gas absorption column, 4
Single cyclone devices, 5
Venturi scrubber, 15
Wet cyclonic separator, 5
Wet scrubber, high efficiency, 6
Wet scrubber, medium efficiency, 3