

National Air Compliance Training Program

NACT 290

Maximum Achievable Control Technology



(MACT)

COURSE OVERVIEW

- ***HISTORY***
- ***CAA section 112***
- ***MACT TIMELINE***
- ***GENERAL / SPECIFIC***
- ***INFORMATION RESOURCES***

Big MACT



NUMBERS GAME

- 188 Hazardous Air Pollutants (HAPs)
- 174 Source Categories
- 68 Area Sources Regulated
- 125 Total promulgated MACTs
- All requiring periodic updates
- Each MACT = 75 - 587 pages

WOW !



A LITTLE HISTORY

Four Sources Hazardous Air Pollutants (HAPs)

- **Natural Sources**
 - Forest fires, Volcanoes
- **Mobile Sources**
 - Planes, Trains, Automobiles
- **Accidental Releases**
 - Factory or Tanker mishaps
- **Stationary Sources**
 - Factories, Businesses









A plant in Donora, Pa., belches clouds of smoke in 1948. The photo is part of the exhibition at the town's smog museum.

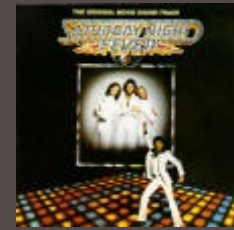
A LITTLE HISTORY

Regulating Four Sources Hazardous Air Pollutants (HAPs)

- Natural Sources
- Mobile Sources
 - Regulated Tailpipe Emissions
 - Reformulated Gasoline
 - Vapor Recovery
- Accidental Releases
 - Risk Management Programs
- Stationary Sources
 - **1970 Clean Air Act**

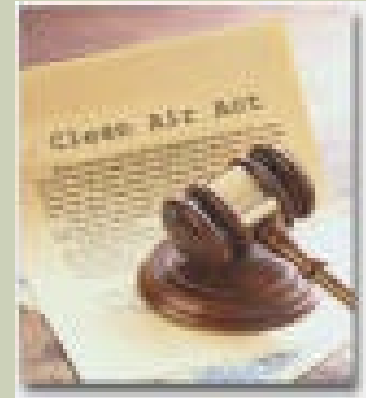


REMEMBER 1970



1970 CLEAN AIR ACT

US EPA

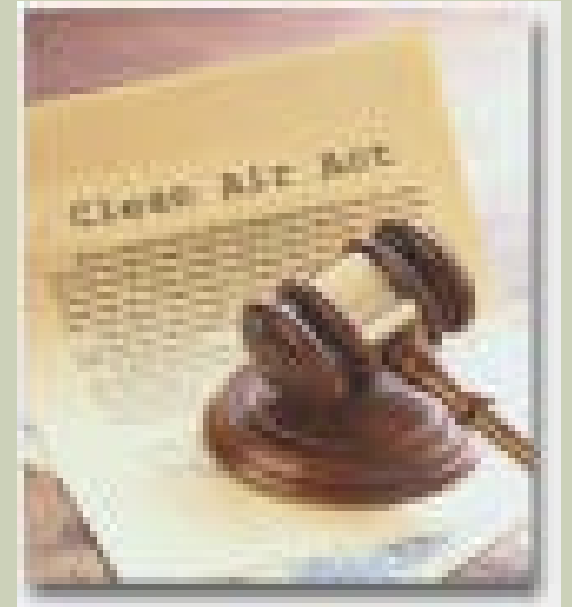


- *Identify HAPs*
- *Reduce emissions*
- *Set emission standards (NESHAPs)*

1970 CLEAN AIR ACT

US EPA

- *Establish NESHAPs*
- *Through NESHAPs reduce routine HAP emissions*
- *NESHAP = National Emission Standards for Hazardous Air Pollutants*



DID IT WORK?

Eight in 20

Eight HAPs promulgated in 20 years !!

REMEMBER 1990 ?



1990 CLEAN AIR ACT AMENDMENTS

Seven Major Titles

Title I – Non attainment

Title II – Mobile Sources

Title III – General

Title IV – Acid Rain

1990 CLEAN AIR ACT AMENDMENTS

Seven Major Titles (cont.)

Title V – Permits

Title VI – Ozone Depleting Substances

Title VII – Enforcement

1990 CAAA

40 CFR Part 63

- *Technology and performance based*
- *Reduce HAP emissions*
 - *Major Sources*
 - *Area sources*

TITLE I 1990 CAAA

40 CFR Part 63

- *Identified 181 HAPs*

- *IARC – International Association for Research on Cancer*

- *Rule development Timeline*

THE REGULATIONS

1990 CAAA

- Modified 1970 CAA Title I
- §112

THE REGULATIONS

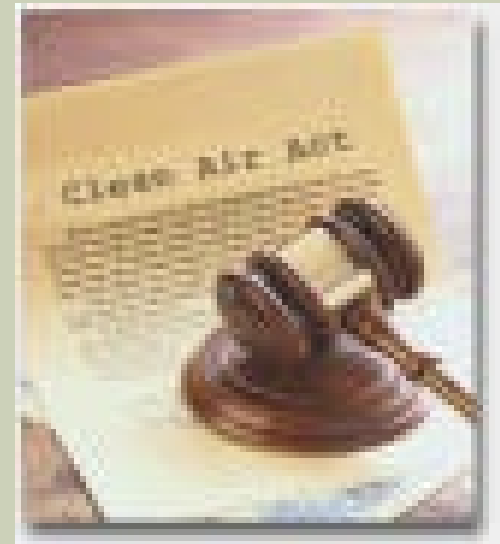
1970 CAA

- **Title I**
 - Modified by **1990 CAAA**
- **Section 112 (a thru r)**
 - Created by **1990 CAAA**

THE REGULATIONS

40 CFR Part 63

- Section 112 Codified
- Citation Numbers



SEC 112

- a Definitions
- b List of HAPs and their control
- c List of Source Categories
- d Emission Standards
- e Schedule for Standards and Review
- f Standard to protect Public Health
- g Modifications
- h Work practices
- I Schedule of compliance

SEC 112 (CONT.)

- j Equivalent Limitation of permit
- k Area source program
- l State programs
- m Deposition
- n Other provisions
- o National Academy of Sciences Study and guidance
- p Air Toxic Research Center
- q Savings provision
- r Accidental Releases

CLEAN AIR ACT SECTION 112

Section 112 Hazardous Air Pollutants

- 112 a) Definitions
- 112 b) Pollutants
- 112 c) Source Categories



CLEAN AIR ACT SECTION 112

Section 112 Hazardous Air Pollutants

- ❖ 112 d) Standards (MACT)
 - ❖ MACT Floor
- ❖ 112 e) Schedule
- ❖ 112 f) Standard to protect Public Health
- ❖ 112 h) Work Practice Standards and other requirements

CLEAN AIR ACT SECTION 112

Section 112 Hazardous Air Pollutants

- 112 j) Equivalent Limitation by Permit (MACT Hammer)
- 112 k) Area Source Program
- 112 r) Prevention of accidental releases

112 (a) DEFINITIONS

Major Source

- Potential To Emit (PTE)
 - 10 tons per year any HAP
 - 25 tons per year any combination of HAPs



112 (a) DEFINITIONS

Area Source

- Potential To Emit (PTE)
 - Less than 10 TPY. Single HAP
 - Less than 25 TPY Mixture HAPs
 - Collective emissions



POTENTIAL TO EMIT (PTE)

Potential to Emit – The maximum capacity of a stationary source to emit pollutant(s) under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit pollutant(s) including air pollution control equipment and hours of operation or on the type, or amount of material combusted, or stored, or processed shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.

Section 112 Glossary of terms – Aug 1998

POTENTIAL TO EMIT (PTE)

- **1994 – Maximum capacity to emit federally enforceable**
- **1996 Enforceable by state and local agencies**

POTENTIAL TO EMIT (PTE)

- Emitting 24 hrs, 365 days
- Permitting Agency may consider limitations
- Policy documents

112 (b) HAPS

188 Hazardous Air Pollutants

■ Examples:

- Benzene (gasoline)
- Perc (Dry Cleaning)
- Dioxin



112 (b) HAPS

188 Hazardous Air Pollutants

■ Examples:

- Benzene (gasoline)
- Perc (Dry Cleaning)
- Dioxin
- Toluene



112(c) SOURCE CATEGORIES

174 Categories

■ Major

- Petroleum and Natural Gas Prod & Refining
- Waste Treatment Disposal

■ Area

- Electroplating
- Glassware Manufacturing

112 (d) MACT STANDARD

- Based on emission levels of better controlled, lower-emitting sources
- Standards to control routine HAP emissions from major facilities in a “source category” (industry group)



112 (d) MACT STANDARD

- Based on emission levels of better controlled, lower-emitting sources
- Standards to control routine HAP emissions from major facilities in a “source category” (industry group)

HOW MACT STANDARDS ARE DEVELOPED

- Based on emission levels achieved by best facilities through Control Techniques
 - (A) process changes
 - substitution of materials
 - (B) enclosure
 - (C) collect, capture, treat
 - (D) design
 - equipment
 - work practice
 - operational standards
 - (E) combination of above



CONTROL TECHNIQUES:

Control Devices

- Enclosed Systems
- Collection, Capture and Treatment of Emissions
- Equipment Design



CONTROL TECHNIQUES:

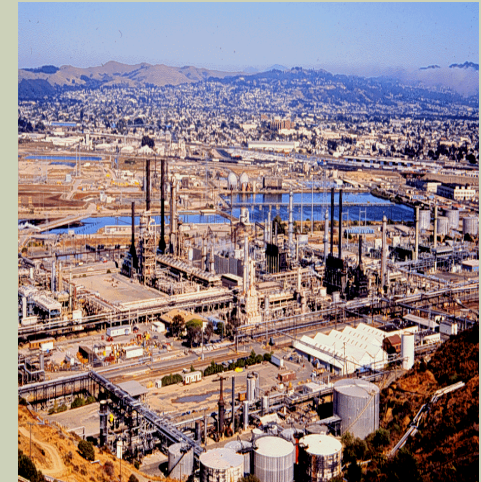
Work Practices

- Material Substitutions
- Materials Handling
- Operational Standards



HOW MACT STANDARDS ARE DEVELOPED

- Set a baseline called “MACT Floor”
- States and Districts can set standard more stringent than the MACT Floor



MACT FLOOR

Existing Sources

- 30 or more - average of best 12%
- Less than 30 - average of 5 best



MACT FLOOR

New Sources

- Standard is percent reduction of emissions or concentration limit



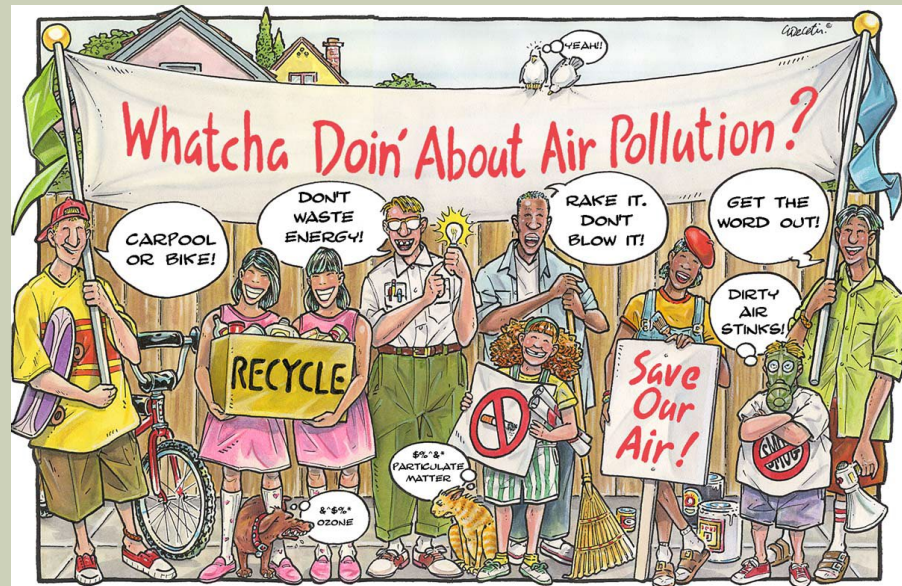
CAA §112(d)

- **Area sources—in lieu**
 - **Generally Available Control Technologies**

CAA 112 (H) WORK PRACTICE STANDARDS

If no other HAP control standard is feasible?

- Design, equipment, work practice or Operational standard may be adopted
- **A NUMERICAL STANDARD IS REQUIRED!**
(when feasible)



CAA 112 (J) MACT HAMMER



Equivalent Emission Limitation by Permit

- Case-by-case MACT determination if EPA misses rule promulgation schedule
- Incorporate MACT standard into Title V permit
- Title V permit due 18 months from scheduled promulgation date



CAA 112 (J) MACT HAMMER



- November 15, 2000 Promulgation Deadline
 - Over 60 MACTs not promulgated
 - Hammer date: May 15, 2002
- EPA Changes final Rule
 - 2 part process
 - Part 1: Notification
 - Part 2: Permit
 - 2 yrs between parts 1 & 2

CAA 112 (J) MACT HAMMER



- Sierra Club Sues US EPA
 - Want 12 months between Parts 1 & 2
- **Settled out of Court**
- **12 months between Parts 1 & 2**
- **Extended Promulgation Dates for MACTs**
- **EPA met all Promulgation Dates**



CAA 112 (K) AREA SOURCE PROGRAM

- Affects all non-Major Sources
- 75% Reduction in cancer risk
- Substantially reduce non-cancer health effects like birth defects
- Address hotspots



112 (K) AREA SOURCE PROGRAM

- Identify 30 Haps which present largest threat to public health in largest number of urban areas
- Benzene (gas stations)
- PERC (dry cleaning)
- Cr⁶ (Chrome plating)



112 (K) AREA SOURCE PROGRAM

- **68 Area Sources subject to standards**
 - **Municipal Landfills**
 - **Medical Waste Incinerators**
 - **Stationary internal Combustion Engines**
 - **Hospital Sterilizers**

112 (K) AREA SOURCE PROGRAM

- **Integrated Urban Air Toxics Strategy**
- **Generally available Control Technologies (GACT) or Management practices**

Source Category Name	Group Responsible	1,1,2,2-Tetrachloroethane	1,2-Dichloropropane	1,3 Butadiene	1,3-Dichloropropene	7-PAH	Acetaldehyde	Acrolein	Acrylonitrile	Arsenic Compounds	Benzene	Beryllium Compounds	Cadmium Compounds	Chloroform	Chromium Compounds	Dioxins (2,3,7,8-TCDD)	Ethylene Dichloride	Ethylene Oxide	Formaldehyde	Hexachlorobenzene	Hydrazine	Lead Compounds	Manganese Compounds	Mercury Compounds	Methylene Chloride	Nickel Compounds	Polychlorinated biphenyls	Quinoline	Tetrachloroethylene	Trichloroethylene	Vinyl Chloride	
1. Chromic Acid Anodizing	OCG														1																	
2. Commercial Sterilization Facilities	PPSG																	4														
3. Cremation (Human and Animal) OSWI	CG								0.1		0												3		0							
4. Cyclic Crude & Intermediate prod.	OCG						0	0.4		0			0	0	0		2	0	0			3	0		0	0		93				
5. Decorative Chromium Electroplating	OCG														3																	
6. Dry Cleaning Facilities	CG																											94				
7. Flexible Polyurethane Foam Fabrication Operations	OCG																								23							
8. Gas Distribution Stage I	WCPG									36							2															
9. Halogenated Solvent Cleaners	CCPG																							12				4	85			
10. Hard Chromium Electroplating	OCG														42																	
11. Hospital Sterilizers	PPSG																	87														
12. Industrial Boilers	CG				15	0	2		10	0	8	1	1	1	2.9	0			1			1	26	1		10	5					
13. Industrial Inorganic Chemical Manufacturing	MICG				82		0		7	0			1	0	3						25	1	4	1	0	4						
14. Industrial Organic Chemical Manufacturing	OCG			7.8			1	0.8	0	0			1	0			7	1	0		51	0	0	0	0	0				0		
15. Institutional Commercial Heating	CG					6	2	3		21	0	68	4	1	0.7	0			2			1	8	2		41						
16. Medical Waste Incinerators	CG								1				9	0	73				0			8	0	57		0						
17. Mercury Cell Chlor-Alkali Plants	MG																							15								
18. Municipal Landfills	WCPG	94	92		0			78		2			1			53									6	1		1	3	83		
19. Municipal Waste Combustors	CG								0.4				1	0	10				0			1	0	3		0						
20. Oil & Natural Gas Production	WCPG									48																						
21. Paint Strippers	PPSG	0.1																							40							
22. Plastic Materials and Resins Manufacturing	OCG			17			0	1.6		0							15		0		1	0		0								2
23. Public Owned Treatment Works	WCPG	0.1	3	1.6			2	91	5.5		4		88					1	0						2			0	0	0		
24. Secondary Lead Smelting	MG	0		41	2.5	0	0	3		2	0		17	0		0.1			0			2	0									
25. Stationary ICE	CG					34	86			0.4	4	5	0							92		0	0	0								
26. Synthetic Rubber Manufacturing	OCG			18																												
27. Portland Cement	MICG								1		1	1				1						1					2					
28. Hazardous Waste Incineration	OSWER								19		6	15		1	2							7		5		65						
29. Aluminum Foundries (Castings)	MICG											12	3									1	1			1						
Total percentage from categories above		94	95	86	85	56	91	99	86	62	94	100	54	89	51	90	78	93	96	0	80	24	38	87	84	56	73	93	99	88	85	

Source Category Name	Group Responsible																															
		1,1,2,2-Tetrachloroethane	1,2-Dichloropropane	1,3-Butadiene	1,3-Dichloropropene	7-PAH	Acetaldehyde	Acrolein	Acrylonitrile	Arsenic Compounds	Benzene	Beryllium Compounds	Cadmium Compounds	Chloroform	Chromium Compounds	Dioxins (2,3,7,8-TCDD)	Ethylene Dichloride	Ethylene Oxide	Formaldehyde	Hexachlorobenzene	Hydrazine	Lead Compounds	Manganese Compounds	Mercury Compounds	Methylene Chloride	Nickel Compounds	Polychlorinated biphenyl	Quinoline	Tetrachloroethylene	Trichloroethylene	Vinyl Chloride	
Acrylic Fibers/modacrylic Fibers Production	PPSG							10																								
Agricultural Chemicals and Pesticides Manufacturing	OCG				13				10					0						99	13	0	3									
Autobody Refinishing Paint Shops	CCPG/OCG																					6										
Primary Nonferrous Metals- Zinc, Cadmium and Beryllium - 3 c	MG								1.5			8										2	1			0						
Flexible Poly Foam Production	OCG																								6							
Iron Foundries	MG													1								2	5			1						
Lead Acid Battery Manufacture	MG											1										9			0							
MON	OCG		5	11	2		2	1	0			0				3					4	0	0	0	0	0	0	7.1			1	
Pharmaceutical Production	OCG												3			10							0	1								
Plating and Polishing	CCPG											4	4									0	0	0	3				0	1		
Polyvinyl Chloride and Copolymers Production	OCG																															12
Pressed and Blown Glass and Glassware Manufacturing	MICG								9			1	0									8	0		0							
Secondary Copper Smelting	MG											8			0.6							9										
Secondary Nonferrous Metals	MG								1.7					0								5	0	1	2							
Sewage Sludge Incineration	MG	6			1			3	2		11	0	1	5							7	0	3	1	18						1	
Stainless and Nonstainless Steel Manufacturing EAF	MG								1.5		1		3									3	11	0	2					0		
Steel Foundries	MG												6									0	5		3							
Wood Preserving	MG								10				0	4										0								
<i>Total percentage from all source categories</i>		100	100	97	100	56	93	99	100	98	95	100	89	93	66	100	91	93	96	99	97	75	64	91	91	67	91	100	99	89	98	

Source Category Name	Group Responsible	1,1,2,2-Tetrachloroethane	1,2-Dichloropropane	1,3-Butadiene	1,3-Dichloropropene	7-PAH	Acetaldehyde	Acrolein	Acrylonitrile	Arsenic Compounds	Benzene	Beryllium Compounds	Cadmium Compounds	Chloroform	Chromium Compounds	Dioxins (2,3,7,8-TCDD)	Ethylene Dichloride	Ethylene Oxide	Formaldehyde	Hexachlorobenzene	Hydrazine	Lead Compounds	Manganese Compounds	Mercury Compounds	Methylene Chloride	Nickel Compounds	Polychlorinated biphenyls	Quinoline	Tetrachloroethylene	Trichloroethylene	Vinyl Chloride
1.Chemical Manufacturing: Chromium Compounds	MG														3																
2. Chemical Preparations	MICG														1		2	1				1	0	1					1		
4.Clay Products manufacturing - 2 categories	MICG														0								3	1					0		
5. Industrial Machinery and Equipment - Finishing Operations - 3 categories															2								0	3					3		
8.Copper Foundries	MG																						2	0					0		
7.Electrical and Electronic Equipment - Finishing Op. - 2 categories															2									1				3			0
8: Ferroalloys Production: Ferromanganese and Silicomangan	MG					2									1									4				1			
9.Fabricated Metal Products, nec	MG												1		0								1	1				1			0
10.Fabricated Plate Work	MG														4									2				4			
11.Fabricated Structural Metal Manufacturing	MG														2									3			2				
12.Heating Equipment, Except Electric	MG														1									1			1				
13.Inorganic Pigments Manufacturing	MICG														1								3	2				0			
14.Iron and Steel Forging	MG														1									1			3				
15.Nonferrous Foundries, nec	MG														0								1					0			
16.Paints and Allied Products Manufacturing	MICG									0			1		2								2				1	0			
17.Plastic Parts and Products (Surface Coating)	CCPG													1	2								2	1		1	1			1	
18.Prepared Feeds Man	MICG									0.8					0			0						4							
19.Primary Copper (not subject to MACT)	MG									1.5			2		0								1				0				
20.Primary Metal Products Man	MG												0		2								0	4			2			0	
21.Valves and Pipe Fittings	MG												1		0								0				1			0	
22. Carbon Black Production	OCG					18																									
23. Asphalt Processing and Asphalt Roofing Manufacturing	MICG					17																									
Total all above		100	100	97	100	93	93	99	100	100	95	100	93	94	90	100	93	95	96	99	99	90	90	91	93	90	91	100	99	91	98

CAA 112 (R) PREVENTION OF ACCIDENTAL RELEASES

- At Least 100 substances known to cause death, injury, environmental damage
- Created Chemical Safety and Hazard Investigation Board



CAA 112 (R) PREVENTION OF ACCIDENTAL RELEASES

California Program is equivalent with additional chemicals listed

- Requires a risk management plan for Title V permits



MACT TIMELINE



Compliance Date:

- Existing Sources – 36 months (48 in some cases)
- New Sources – Compliance date or upon Startup
- Demonstrate compliance within 6 months of startup

MACT TIMELINE



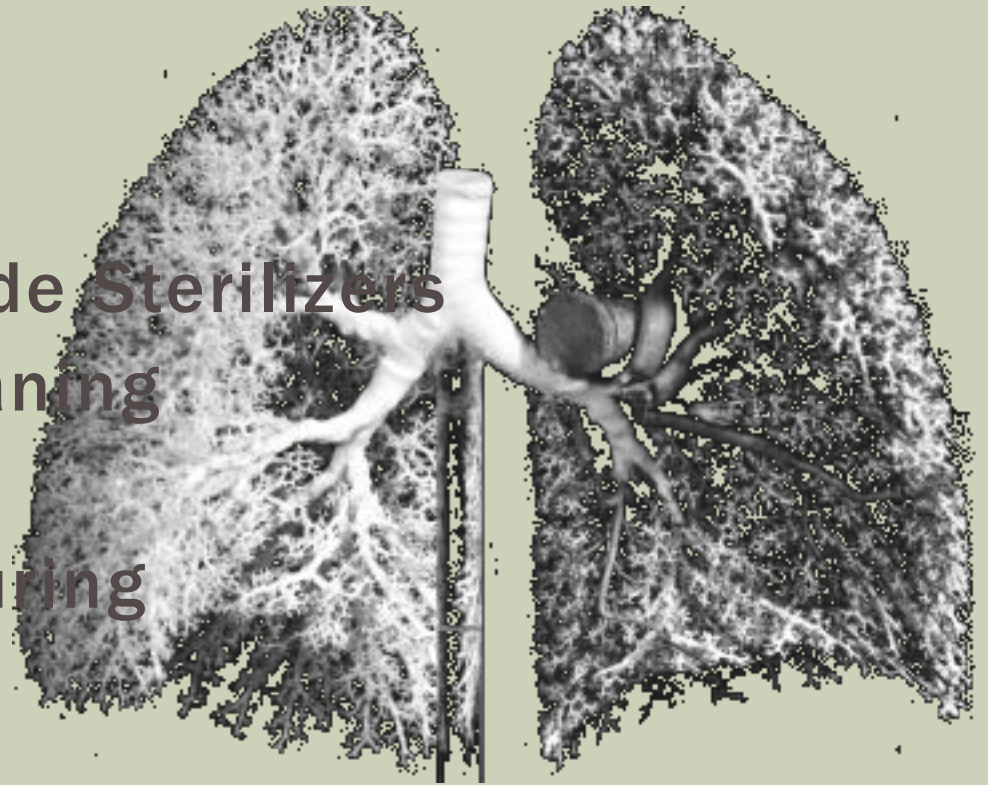
Compliance Date:

■ Boilers

- Effective date: Nov. 12, 2004
- Compliance date (New) Nov.12, 2004 or on Startup
- Compliance date (existing) Nov.13, 2007

RESIDUAL RISK STANDARDS

- 8 Years after setting MACT
- Examples of completed reviews
 - Dry Cleaning
 - Gasoline Distribution
 - Commercial Ethylene Oxide Sterilizers
 - Halogenated Solvent Cleaning
 - Industrial Cooling Towers
 - Magnetic Tape Manufacturing



MACT LAYOUT

Summary

- Effective Date
- Contact info
- Supplemental Info
 - Federal Register
 - Web page

I - INTRODUCTION

- **Authority**
 - Statute
- **Affected Processes**
 - Who is effected

II – FINAL RULE

- **Source Categories Affected**
- **Pollutants Regulated**
- **Requirements**
- **Compliance**
 - **Date of Compliance**
 - **Demonstration of compliance**

III - IMPACT

- **Environmental**
 - Air, Water, Solid and Waste
- **Energy**
 - increase or decrease
- **Economic**

MACT LAYOUT

- IV – Summary of Changes
- V – Response to Major comments
- The Regulation

INTERNET RESOURCES

www.epa.gov/ttn/atw/eparules.html

<https://www3.epa.gov/ttn/atw/area/arearules.html#imp>

<http://www.combustionportal.org/>

<https://www.tceq.texas.gov/permitting/air/rules/federal/fedhp>

<https://www.govinfo.gov/help/cfr>

<https://ecfr.io/Title-40/>

TTNWeb - Technology Transfer Network



Technology Transfer Network Air Toxics Web Site

Contact Us Search: All EPA This Area Go

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National-Scale Air Toxics Assessment

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State, Local, Tribal Resources

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<http://www.epa.gov/ttn/atw/>
[Print As-Is](#)

Last updated on Thursday, December 27, 2012





Technology Transfer Network Air Toxics Web Site

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Rules and Implementation

The Clean Air Act requires EPA to regulate emissions of [toxic air pollutants](#) from a published list of industrial sources referred to as "source categories." As required under the Act, EPA has developed a [list of source categories](#) that must meet control technology requirements for these toxic air pollutants. The EPA is required to develop regulations (also known as rules or standards) for all industries that emit one or more of the pollutants in significant quantities.

NOTICE announcing that EPA has completed the emission standards required by sections 112(c)(3) and (k)(3)(B) and 112(c)(6) of the Clean Air Act (CAA).

See [Federal Register, March 21, 2011 \(page 15308\)](#)

National Emission Standards for Hazardous Air Pollutants Information

[National Emission Standards for Hazardous Air Pollutants Rules](#)

Rule Information

[Residual Risk/Technology Rules](#)

[Area Source General Information and Implementation Tools \(CAA, Section 112\(k\)\)](#)

Solid Waste Rules (Sections 129/111(d) Rules)

- [Solid Waste Combustion](#)
- [Sewage Sludge Incinerator rule \(SSI\)](#)
- [Hospital/Medical/Infectious Waste Incineration \(HMIWI\)](#)
- [Municipal Waste Combustors \(MWC\) - Large Units](#)
- [Municipal Waste Combustors -Small Units](#)
- [Commercial/ Industrial Waste Incinerators \(CIWI\)](#)
- [Other Solid Waste Incinerators](#)

Selected New Source Performance Standards (NSPS) [these are criteria pollutant regulations]

Note that the [General Provisions](#) apply.

- [Archived Clean Air Mercury Rule](#)
- [Boilers \(Steam Generating Units\)](#)
- [Diesel Engines \(Compression Ignition Internal Combustion Engines\)](#)
- [Petroleum Refineries](#)
- [Portland Cement](#)
- [SOCMI Wastewater](#)
- [Municipal Solid Waste Landfills](#)
- [Stationary Combustion Turbines](#)
- [Stationary Spark Ignition Internal Combustion Engines](#)

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QUESTIONS?