Envirothon - Air Quality "Point Sources, Regulation and Permitting"

February 7, 2026

Welcome

2026 Air Quality Envirothon Team

- Grace Hammond (Environmental Engineer)
- James Gil (Engineer Program Manager)
- Joseph Warrington (Environmental Engineer)
- Kelsey Schiliro (Environmental Scientist)
- Kimberly Gould (Environmental Program Manager)
- Michelle Jacobs (Small Business Ombudsman)
- Taylor Englert (Environmental Engineer)
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Overview

Training PowerPoint & Activities

- Section 1 - Introduction to Air Pollution
- Section 2 - Introduction to Point Sources
- Section 3 – Policy – the Overall Strategy and Regulation – the Detailed Steps to Achieve it
- Section 4 - Permitting and Point Sources
- Section 5 - History and Trends
- Section 6 - Point Sources and Air Toxics
- Section 7 – Summary

Section 1
Introduction to Air Pollution

Air Quality Fundamentals

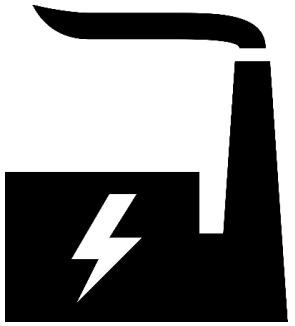
- Air Pollution
- Criteria Pollutants
- Health Impacts
- Air Pollution Sources

Why is Air Quality important?

- Air is a vital resource.
- On average, humans breathe in about 3,000 gallons of air each day!
- Air pollution can negatively affect air quality and cause problems.

What is air pollution?

- Introduced component of the air
- Deteriorates public health or causes adverse change to the environment
- The EPA established a group of six common air pollutants as the “Criteria Air Pollutants”



Criteria Pollutants

EPA uses these criteria air pollutants as indicators of air quality. Criteria pollutants include:

- Carbon Monoxide (CO)
- Lead (Pb)
- Sulfur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Ozone (O_3)
- Volatile Organic Compounds (VOC)
- Particulate Matter ($PM_{2.5}$ & PM_{10})

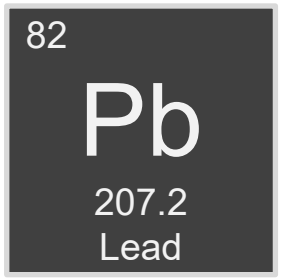
Carbon Monoxide (CO)

- Carbon monoxide is a colorless, odorless, poisonous gas
- Reduces blood's ability to carry oxygen

- The U.S. EPA estimates that approximately 60% of all CO emissions are from motor vehicle exhaust
- Other sources include incinerators, wood stoves, furnaces, and some industrial processes

Lead (Pb)

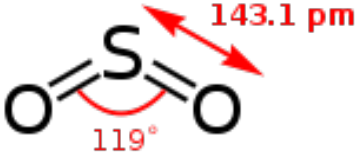
- Unlike most other pollutants, it is an element
- Toxic metal - primarily neurotoxic effects in children and cardiovascular effects in adults



- Major sources of lead in air are ore and metal processing and aircraft
- Also: waste incineration, lead-acid batteries, smelting

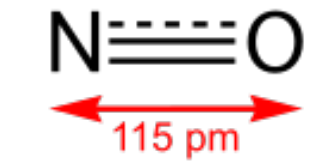
Sulfur Dioxide (SO_2)

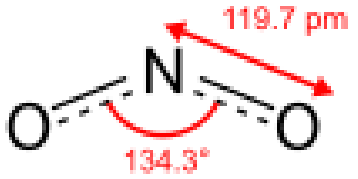
- Pungent, poisonous gas
- Oxidized to SO_3; combines with water vapor to form sulfuric acid and fall as acid rain
- Binds to dust particles and aerosols in the atmosphere
- The main sources are combustion of coal and oil (mostly by power plants), refineries, smelters, and industrial boilers
- Nationally, 2/3 of SO_2 emissions are from power plants
  - Coal fired plants account for 95% of these emissions



Oxides of Nitrogen (NO_x)

- NO_X is a group of reactive, oxidized nitrogen compounds
  - Most abundant form is NO_2
- **Ozone precursor**
- Stunts plant growth and reduces seed production
- Sources of NO_X include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial boilers

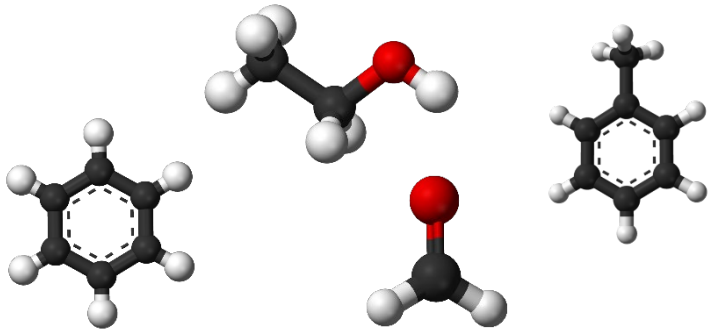




Volatile Organic Compounds (VOC)

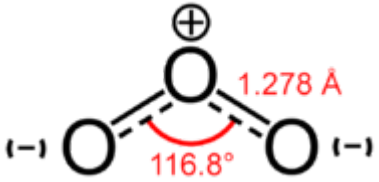
Not a CAP

- VOC are a diverse group of reactive, carbon-based compounds
- **Ozone precursor**
- Wide range of sources, from gasoline to many industrial and commercial products, including:
  - Nail polish
  - Hair spray
  - Paint
  - Refrigerant
  - Air fresheners
  - Car cleaning products
  - Upholstery



Ozone (O_3)

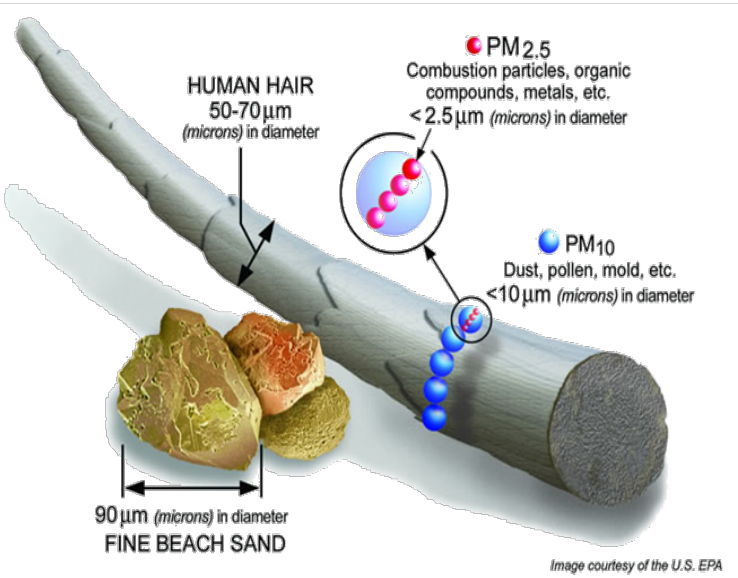
- Highly reactive gas that is the main component of smog
- 30-minute half-life
- Formed (in the lower atmosphere) by a reaction with NOx, VOC, heat and sunlight
- Can cause chest pain, coughing, throat irritation, and other respiratory effects



NO_x + VOC +  = O_3

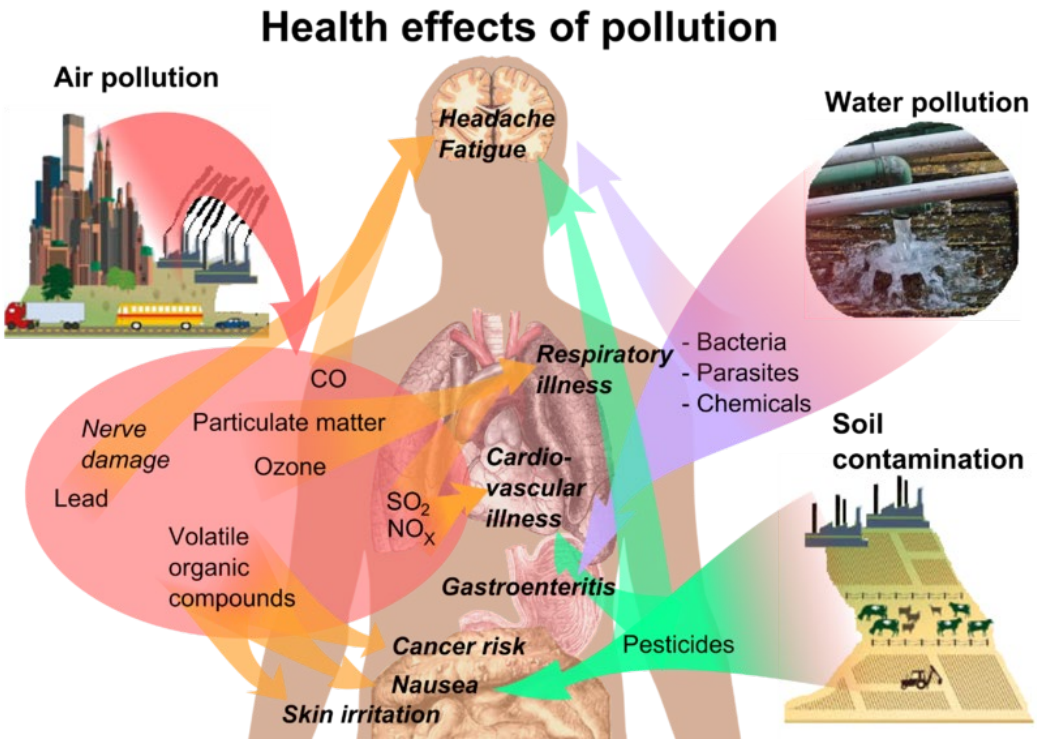
Particulate Matter (PM)

- PM_{10} is particle pollution less than 10 microns (PM_{10})
  - About 1/7 the diameter of a human hair
  - Particles of this size are small enough to be inhaled into the lungs
- Fine PM is smaller than 2.5 microns ($PM_{2.5}$)
  - Penetrate more deeply into the lungs
  - More likely to contribute to health effects
- Some sources emit it directly (construction, vehicles, unpaved roads, smokestacks and fires)
- Some form in the atmosphere (liquid aerosols)



Health Impacts

- Air pollution can affect our health in many ways
- In general, many health impacts are associated with the respiratory system
  - e.g. decreased lung function, difficulty breathing, coughing
- Other impacts include cardiovascular disease, effects on the nervous system, and more

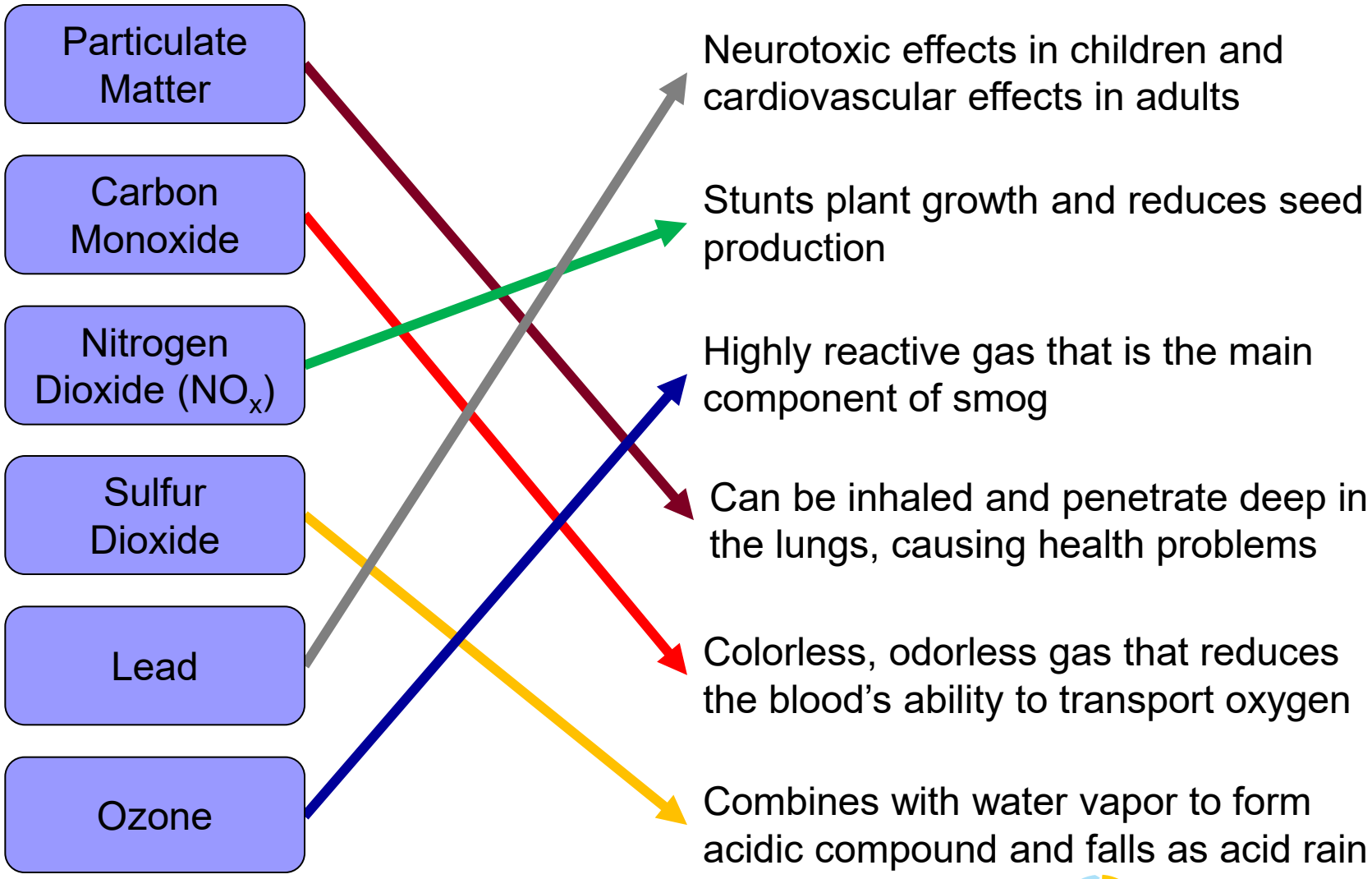


Why is Air Pollution a Problem?

CAP Activity

Particulate Matter	Neurotoxic effects in children and cardiovascular effects in adults
Carbon Monoxide	Stunts plant growth and reduces seed production
Nitrogen Dioxide (NO_x)	Highly reactive gas that is the main component of smog
Sulfur Dioxide	Can be inhaled and penetrate deep in the lungs, causing health problems
Lead	Colorless, odorless gas that reduces the blood's ability to transport oxygen
Ozone	Combines with water vapor to form acidic compound and falls as acid rain

CAP Activity (Answers)

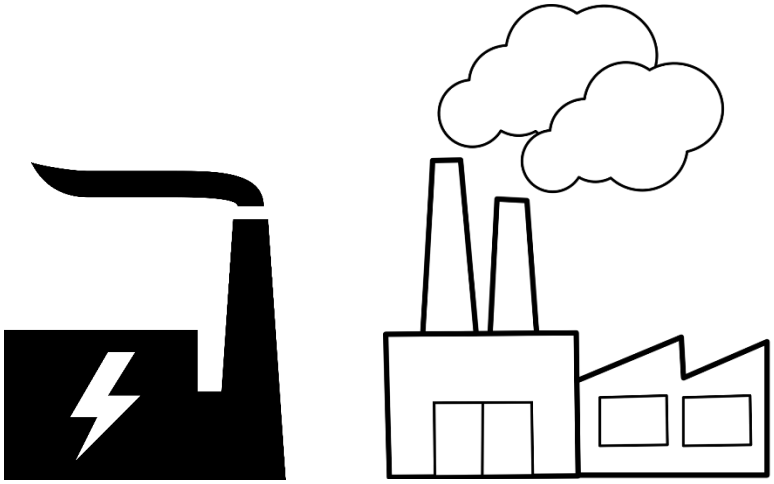


Sources of Air Pollution

- Air pollution comes from a variety of sources
- Source types
  - Point
  - Nonpoint
  - Mobile
    - On-road and Non-road
  - Event

Point Sources

- Larger sources that are at a stationary, fixed location
- Examples include power plants, large industrial facilities, refineries, and more



Nonpoint Sources

- Sources that are too small in magnitude individually to report as point sources

- Examples include asphalt paving, residential heating, commercial solvent use, and others

Mobile Sources

- On-road
  - Sources include light and heavy-duty vehicles operating or idling on roadways
  - Examples: cars, buses, trucks, etc.
- Non-road
  - Sources that are mobile, but operate in off-road environments
  - Examples: construction vehicles, farm equipment, and more

Event Sources

- Sources that include fires, such as wildfires and prescribed burns

- Also includes other natural disasters like dust storms, volcanic eruptions, and more

This concludes Section 1

Section 2
Introduction to Point Sources

Introduction to Point Sources

- Point sources are single, stationary identifiable sources from which air pollutants are released
- Released to the atmosphere through chimneys or similar smokestack devices
- In DE, point sources are further classified by potential to emit (PTE)
  - Title V Source
  - Synthetic Minor Source
  - Natural Minor Source
  - Registered Source

Smokestacks

Major Sources (Title V)

- EPA defines a major source as a facility that emits, or has the PTE, any CAP or HAP at levels greater than or equal to the set threshold

Coal-Fired Power Plant – Indian River
Photo credit- Cape Gazette

- The major source threshold for any air pollutant is typically 100 tons/year

Warren F Beasley Combustion Turbine - Seaford

- Major source thresholds for HAP are 10 tons/year for a single HAP or 25 tons/year for any combination of HAP.

Synthetic Minor Sources (SM)

- Facilities classified as SM have the PTE at or above the major source threshold, but have accepted restrictions on their emission rates
- Less complex permitting process
- Simpler monitoring requirements than a Title V major source
- Restrictions often occur by process controls, such as reducing facility throughput, or burn rates

Environmentally-focused Gas Factory

Orient Corporation – Dye Manufacturing Facility -Seaford

Natural Minor Sources (NM)

- EPA Defines a natural minor source as a facility with PTE regulated pollutants less than major source threshold

- No need to take action to reduce the current PTE of these facilities

Atlantic Concrete

Registered Sources (R)

- Registered sources are facilities/processes whose emissions are too low to require a permit
- Facilities with emissions falling between 0.2 pounds per day and 10 pounds per day may require a registration

Prox Malt Facility - Laurel

Torbet Funeral Chapel Crematory - Dover

Classifying Point Sources

- Point sources can be classified by a facility's PTE
  - Title V
  - SM
  - NM
  - R
- Point sources can also be classified by a facility's production
  - What goods does a facility produce?
  - What services does a facility provide?
- Facilities are classified into sectors and industries using the **N**orth **A**merican **I**ndustry **C**lassification **S**ystem (**NAICS**)

Classifying Point Sources

- NAICS is an Industry Classification System designed for statistical purposes
- The system groups facilities into industries according to similarity in the processes used to produce goods or services
- This grouping was designed to help countries that use NAICS to better understand economic data by industry (for example, industrial performance, productivity, labor costs, and employment)
- This grouping helps DAQ to understand air emissions data by industry

"NAICS United States is used by U.S. statistical agencies to facilitate the collection, tabulation, presentation, and analysis of data relating to establishments; and to provide uniformity and comparability in the presentation of statistical data describing the U.S. economy."

Structure of NAICS

- The 2022 NAICS Manual defines the hierarchical structure of NAICS
- NAICS uses a 6-digit coding system to identify particular industries and their placement in the classification system

NAICS Code Digit	Designation
1st & 2nd	Sector
3rd	Subsector
4th	Industry Group
5th	NAICS Industry
6th	National Industry

20 Sectors and 1,057 Industries in the U.S.

- NAICS code example: 323113

323113 – Sector

32**3**113 – Subsector

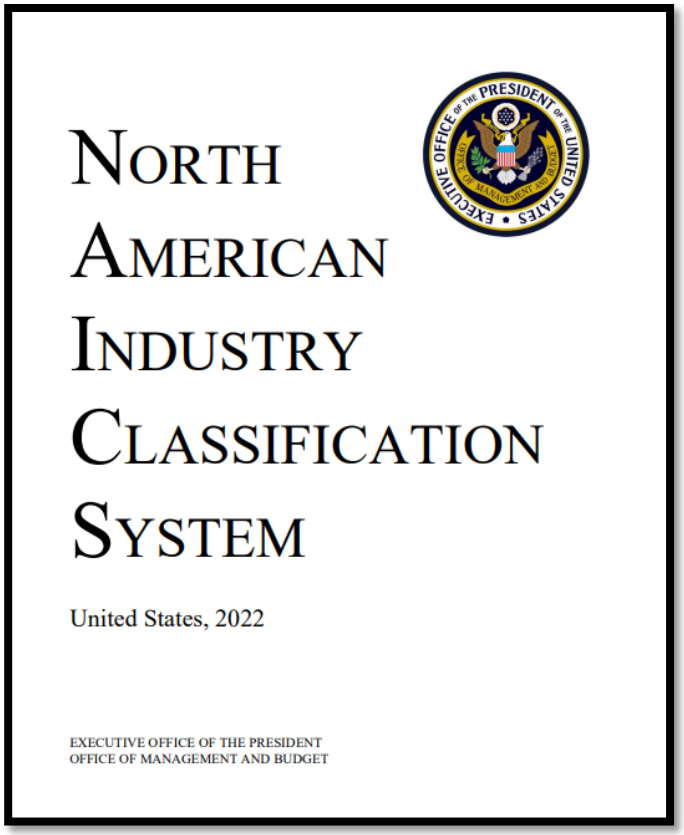
323**1**13 – Industry Group

3231**1**3 – NAICS Industry

32311**3** – National Industry

Assigning a NAICS Code

- Each TV and SM facility that is included in the Point Source Emissions Inventory reports emissions under a NAICS code.



2022 NAICS Manual

Manufacturing Sector Codes

323	**Printing and Related Support Activities**	
3231	**Printing and Related Support Activities**	
	32311	Printing
	323111	Commercial Printing (except Screen and Books)
	323113	Commercial Screen Printing
	323117	Books Printing
	32312	Support Activities for Printing
	323120	Support Activities for Printing
324	**Petroleum and Coal Products Manufacturing**	
3241	**Petroleum and Coal Products Manufacturing**	
	32411	Petroleum Refineries
	324110	Petroleum Refineries
	32412	Asphalt Paving, Roofing, and Saturated Materials Manufacturing
	324121	Asphalt Paving Mixture and Block Manufacturing
	324122	Asphalt Shingle and Coating Materials Manufacturing
	32419	Other Petroleum and Coal Products Manufacturing
	324191	Petroleum Lubricating Oil and Grease Manufacturing
	324199	All Other Petroleum and Coal Products Manufacturing
325	**Chemical Manufacturing**	
3251	**Basic Chemical Manufacturing**	
	32511	Petrochemical Manufacturing
	325110	Petrochemical Manufacturing
	32512	Industrial Gas Manufacturing
	325120	Industrial Gas Manufacturing
	32513	Synthetic Dye and Pigment Manufacturing
	325130	Synthetic Dye and Pigment Manufacturing
	32518	Other Basic Inorganic Chemical Manufacturing
	325180	Other Basic Inorganic Chemical Manufacturing
	32519	Other Basic Organic Chemical Manufacturing
	325193	Ethyl Alcohol Manufacturing
	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
	325199	All Other Basic Organic Chemical Manufacturing
3252	**Resin, Synthetic Rubber, & Artificial and Synthetic Fibers/Filaments Manufacturing**	
	32521	Resin and Synthetic Rubber Manufacturing
	325211	Plastics Material and Resin Manufacturing
	325212	Synthetic Rubber Manufacturing
	32522	Artificial and Synthetic Fibers and Filaments Manufacturing
	325220	Artificial and Synthetic Fibers and Filaments Manufacturing

NAICS Code Activity

Four point source facilities are described below. Using the codes provided, try to assign the most accurate 6-digit NAICS code!

An industrial gas production facility in Claymont produces 1,200 tons per day of liquid oxygen, nitrogen, and argon, as well as 400 tons per day of gaseous products. This facility has become the company's largest liquid merchant plant in the United States. **Code: _ _ _ _ _ _**

A facility in Middletown operates equipment that has the capacity to produce up to 50,000 books per day. The facility prints book pages using 25 black-and white printers and 14 color printers, then binds the pages together during the book finishing process. A complete book can be produced in just 10 minutes. **Code: _ _ _ _ _ _**

A facility in Delaware City manufactures a polyvinyl chloride (PVC) resin which is sold to manufacturers who use the plastic to make a wide range of products. These products include floor tiles, sealants, adhesives, oil filters, and traffic cones. **Code: _ _ _ _ _ _**

A global company that produces roofing and related building materials operates six production facilities in the United States. The company sells products in 94 countries worldwide. The sales and manufacturing plant located in Wilmington focuses on the production of residential roofing products. **Code: _ _ _ _ _ _**

NAICS Code Activity

Answers

An industrial gas production facility in Claymont produces 1,200 tons per day of liquid oxygen, nitrogen, and argon, as well as 400 tons per day of gaseous products. This facility has become the company's largest liquid merchant plant in the United States. **Code:** ***3 2 5 1 2 0***

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A facility in Delaware City manufactures a polyvinyl chloride (PVC) resin which is sold to manufacturers who use the plastic to make a wide range of products. These products include floor tiles, sealants, adhesives, oil filters, and traffic cones. **Code:** ***3 2 5 2 1 1***

A global company that produces roofing and related building materials operates six production facilities in the United States. The company sells products in 94 countries worldwide. The sales and manufacturing plant located in Wilmington focuses on the production of residential roofing products. **Code:** ***3 2 4 1 2 2***

Point Sources in Delaware

- Now you have an idea of a few of the manufacturing facilities that you might not have realized were located in Delaware.

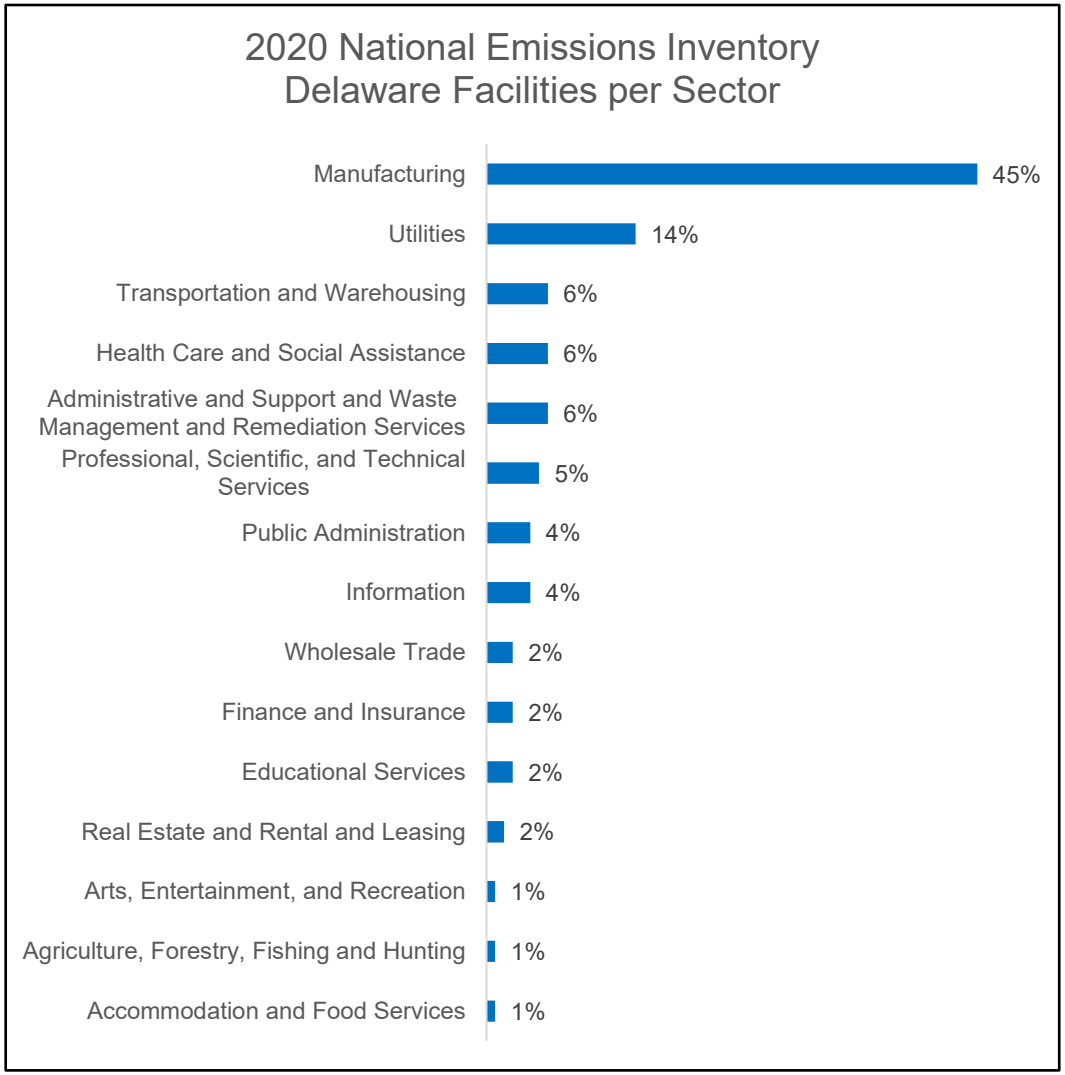
Industrial gas production facility in Claymont

Book printing and binding facility in Middletown

Shingle manufacturing facility in Hillsboro, TX similar to the Wilmington facility

Point Sources in Delaware

- Based on the 2020 Point Source Emissions Inventory, facilities in Delaware represent 14 of the 20 NAICS sectors
- The majority of point sources in Delaware are manufacturing facilities (45%), followed most closely by utilities (14%)



This concludes Section 2

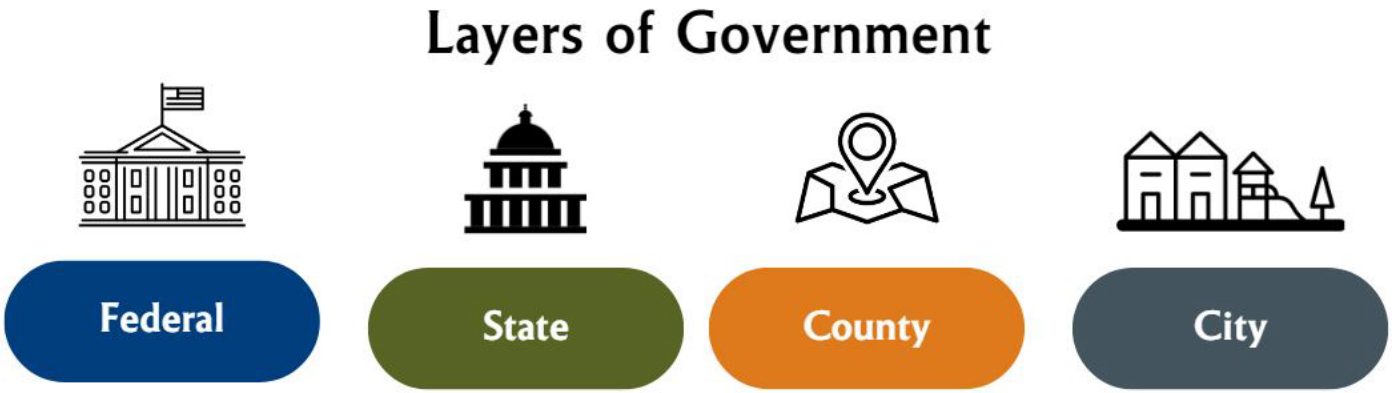
Section 3
Policy – the Overall Strategy
and
Regulation – the Detailed Steps to Achieve it

Section 3 – Policy - the Overall Strategy and Regulation – the Detailed Steps to Achieve it

- What is policy and regulation?
- Law vs. Regulation
- Who sets policy, and how?
- Regulatory Development Process
- Clean Air Act Overview

What is Policy?

- Broadly defined: any action a public entity takes, be it:
  - Federal
  - State
  - Local



https://www.slocity.org/government/roles-of-city-county-state-and-federal-governments

Who Sets Policy?

- Any governmental body given authority to make rules may set policy

How is Policy Set?

- Well, it depends on the type of policy!
- Regulations are relatively broad ranging policies, and require specific steps to be created

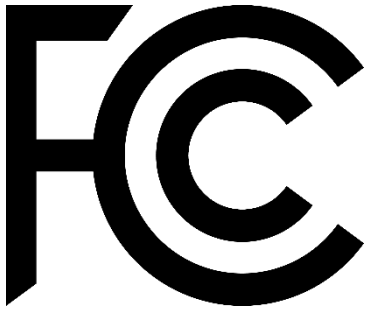
Law vs. Regulation

- Law: generally, laws are created by the legislature (not including concepts like common law)
- Regulation: a rule with the force of law, but developed/set by an “administrative agency”

https://www.istockphoto.com/illustrations/government-regulation

What is an Administrative Agency?

- Federal Examples:
  - EPA
  - FCC (Federal Communications Commission)
  - Federal Reserve
- State Examples
  - DNREC



Creating Regulations

Regulation Development

For EPA, creating a regulation is generally 3 steps

1. EPA proposes a regulation
2. EPA accepts, considers, and responds to comments, then issues a final rule
3. The regulation is codified in the Code of Federal Regulations (CFR)

Clean Air Act (CAA)

- The federal law that defines and controls air pollution
- The law was passed in 1970, and has been amended in 1977 and 1990
- Full implementation requires participation from states and local governments

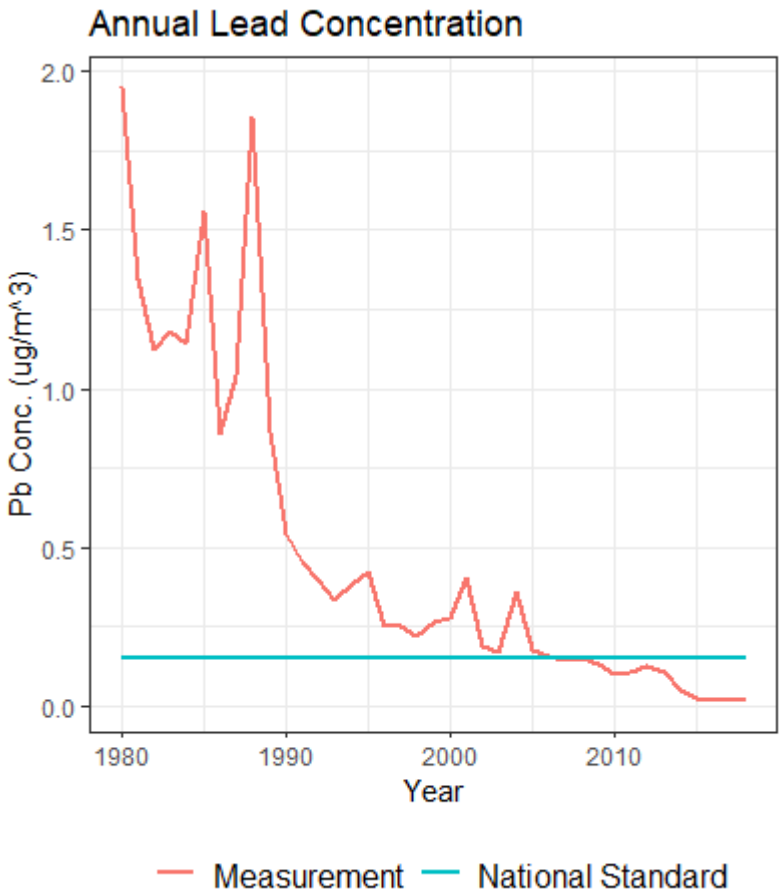
Titles of the Clean Air Act	
Title I	Air Pollution Prevention and Control
Title II	Emission Standards for Mobile Sources
Title III	General
Title IV	Noise Pollution and Acid Deposition
Title V	Permits
Title VI	Stratospheric Ozone Protection

Title I – Air Pollution Prevention/Control

- Part A – “Air Quality and Emission Limitations”
  - Sets National Ambient Air Quality Standards (NAAQS), and defines how they will be updated
  - Provides funding
  - Defines HAPs
- Part B – Was Stratospheric Ozone, repealed
- Part C – “Prevention of significant deterioration of air quality”
  - Sets limits for maintaining good air quality, despite meeting the NAAQS
- Part D – “Plan requirements for nonattainment areas”
  - What must be done if you don’t meet the NAAQS

Title II – Mobile Sources

- Establishes requirements for all mobile sources
- CAA Amendments of 1990 set many standards that are in place today for mobile sources
  - Tighter control on tailpipe emissions
  - Fuel quality standards and phase out of lead from motor gasoline



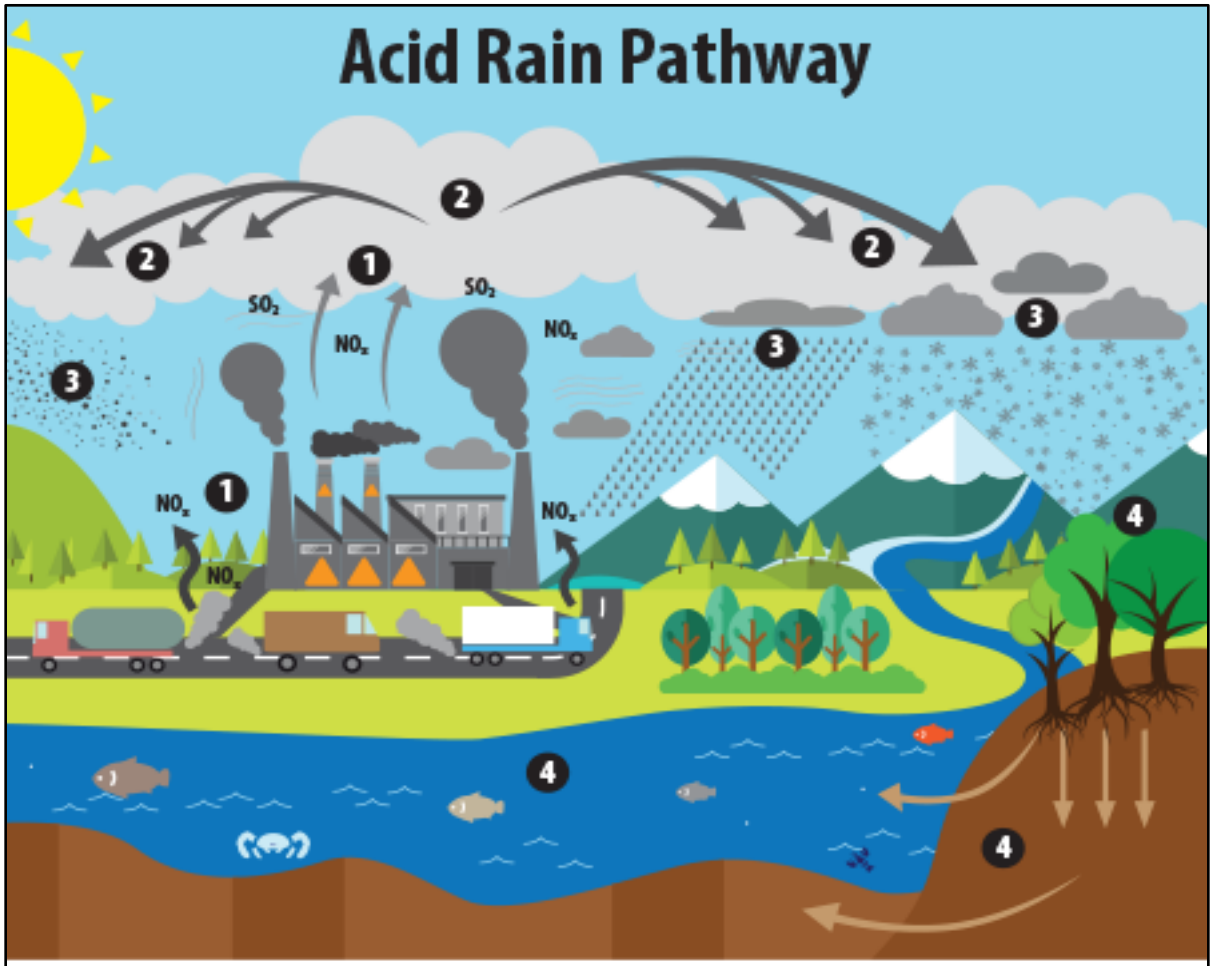
*Lead emissions decreased by 99% from 1980 to 2018

Title III - General

- Diverse topics covered
- Citizen lawsuits regarding CAA
- Monitoring and reporting requirements for states

Title IV - Noise Pollution and Acid Deposition

- Noise pollution – “unwanted or disturbing sound” – delegated to states
- Acid deposition, also known as acid rain



This image illustrates the pathway for acid rain in our environment:
(1) Emissions of SO_2 and NO_x are released into the air, where (2) the pollutants are transformed into acid particles that may be transported long distances. (3) These acid particles then fall to the earth as wet and dry deposition (dust, rain, snow, etc.) and (4) may cause harmful effects on soil, forests, streams and lakes.

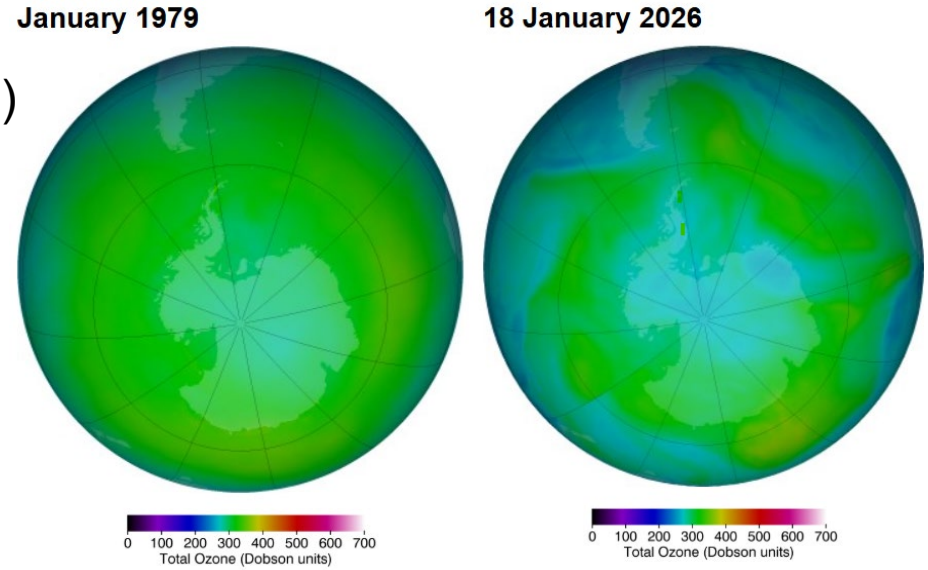
*Acid rain is when sulfur or nitrogen reacts with water and oxygen in the atmosphere and creates acidic solutions

Title V - Permits

- The CAA permit program ensures compliance for affected sources
- Requires involvement at the federal, state, and source levels
- Permits contain important information for source operation requirements to maintain compliance, which will be discussed in Section 4

Title VI – Stratospheric Ozone

- Regulations under Title VI require safe handling and destruction of ozone depleting substances (ODS)
- ODS were common in the 1980s
- Global action took place to phase out these chemicals
- Examples of ODS:
  - Chlorofluorocarbons (CFC)
  - Hydrochlorofluorocarbons (HCFC)
  - Carbon tetrachloride (CCl_4)



Map of stratospheric ozone above Antarctica, NASA

CAA Titles Activity

1. Various technical information
2. Handles nonattainment areas
3. Sulfur standard in diesel fuels
4. Describes the NAAQS
5. Unwanted or disturbing sounds
6. Destruction of ODS
7. Emission controls for cars
8. Citizen lawsuits
9. Phase-out schedule for ODS manufacturing
10. Permit reporting requirements
11. Credits for SO_2 emissions
12. Safe ODS alternative policy
13. State permit programs
14. Prevention of significant deterioration
15. Monitoring requirements

Title I - AP Prevention	Title II – Mobile
Title III - General	Title IV – Acid Rain
Title V - Permits	Title VI – Ozone

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4. Describes the NAAQS
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Title II
3. Sulfur standard in diesel fuels
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Title III
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15. Monitoring Requirements

Title IV
5. Unwanted or disturbing sounds
11. Credits for SO_2 emissions

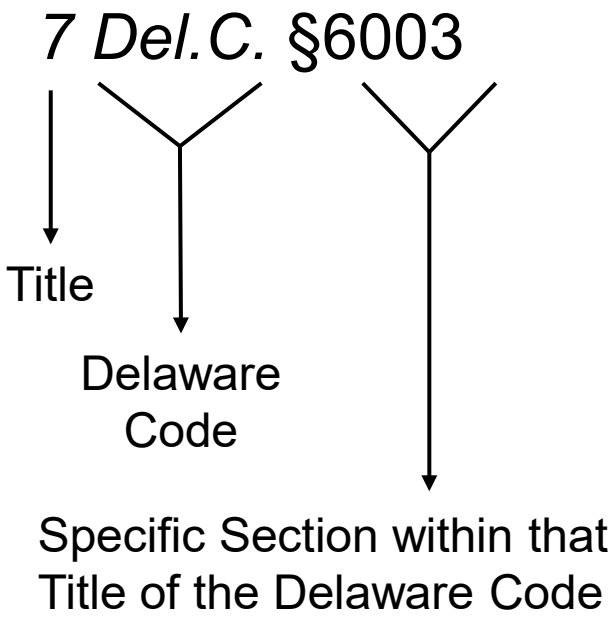
Title V
10. Permit reporting requirements
13. State permit programs

Title VI
6. Destruction of ODS
9. Phase-out schedule for ODS manufacturing
12. Safe ODS alternative policy

Delaware Air Regulations

- Regulations provide requirements and prohibitions to comply with Delaware law
- The Delaware Code is the collection of statutes enacted and codified to the state law
- The Delaware Code is often referenced in regulations and other legal documents
  - An official citation format exists so the language can be accurately and reliably referenced

*Example citation for Section 6003 of Chapter 60 of Title 7 of the Delaware Code**

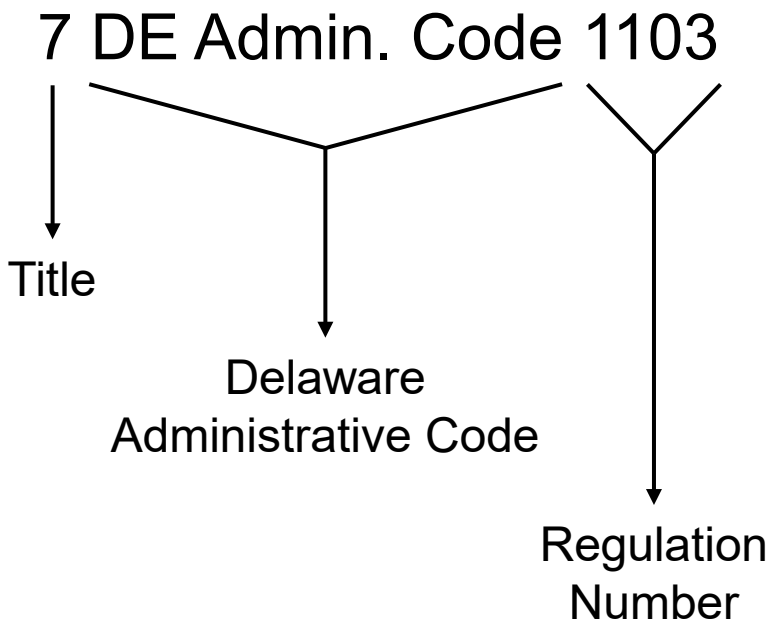


*This section provides the statutory language related to environmental permitting 7 Del.C. §6003

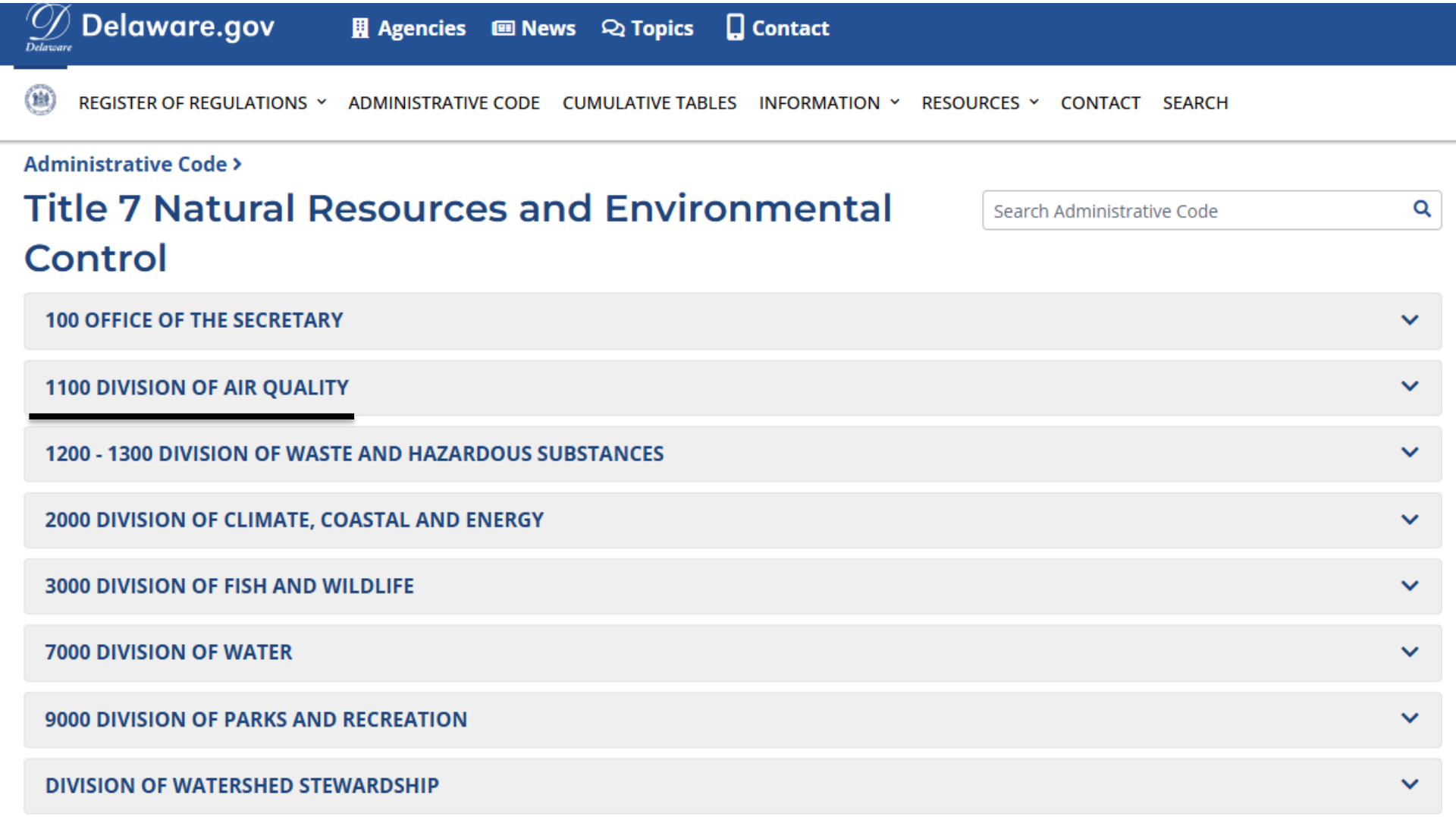
Delaware Air Regulations

- The State's regulations can be found in the Delaware Administrative Code
- Regulations associated with natural resources are found in Title 7 of the Administrative Code
  - Clean air regulations are found in Chapter 1100
- The citation to regulations in the Administrative Code clarifies the reference so it is not confused with the Delaware Code

*Example citation for Regulation 1103 of Title 7 of the Delaware Administrative Code**



*This regulation is "1103 Ambient Air Quality Standards" 7 DE Admin. Code 1103



DNREC Administration Code Website:
https://regulations.delaware.gov/AdminCode/title7

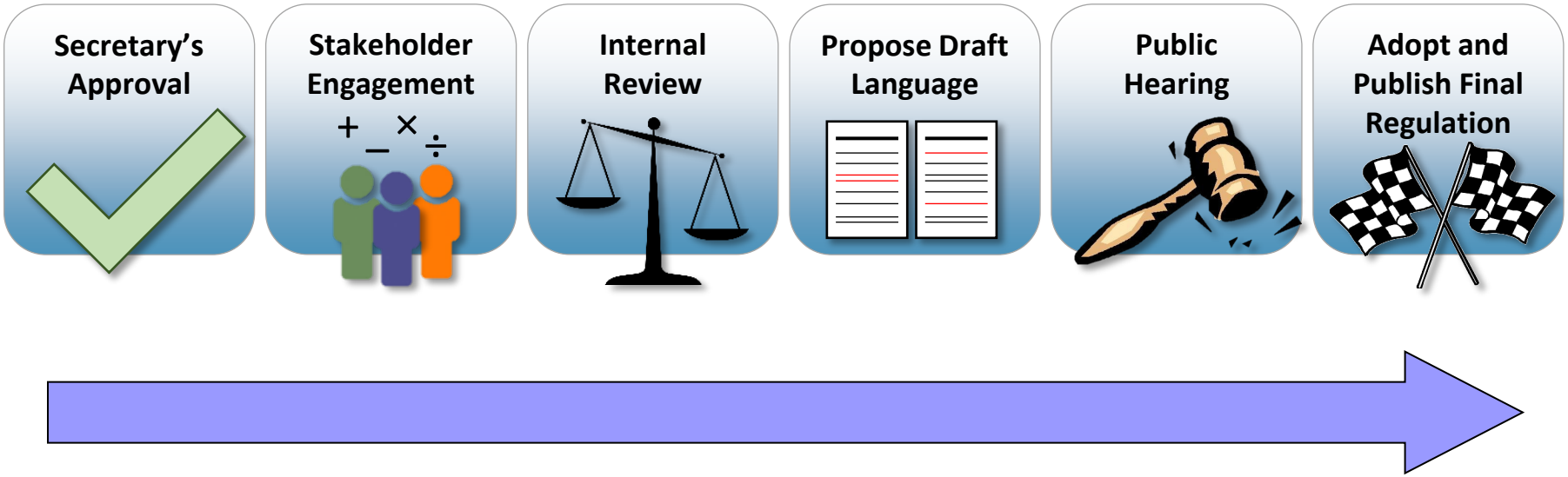
Regulatory Development Process

- All of Delaware's regulations must follow Delaware's Administrative Procedures Act (APA); 29 *Del.C.* Ch. 101

- The Department has a 24 step Regulatory Development Process, that ensures the Department will:
  - Give proper notice to the public
  - Follow a predictable and open process
  - Adhere to all legal and programmatic guidelines

Regulatory Development Process

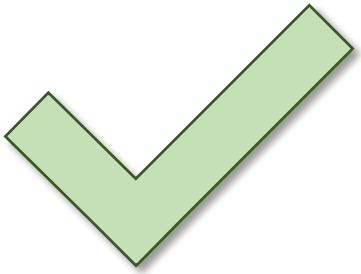
There are several key actions during the Regulatory Development Process. The next slides will go through these actions.

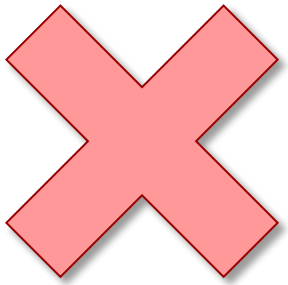


Regulatory Development Process

Secretary's approval

- Every DNREC regulatory action begins with the Secretary's Approval
- Staff prepare a document with key information and necessity of the action
- The Secretary makes an informed decision to approve or disapprove, or requests more information

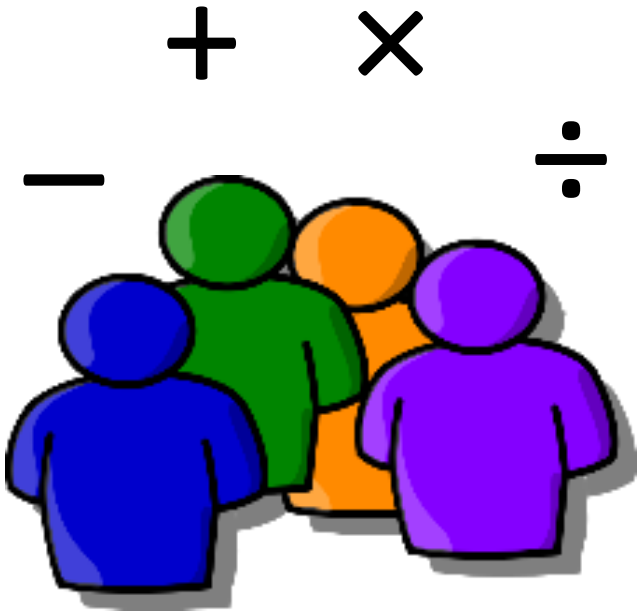




Regulatory Development Process

Stakeholder Engagement

- Stakeholders can be industry, environmental groups, trade associations, the public, and more
- At this step, it is important to engage stakeholders that can offer technical insight and can help craft the regulatory language



Regulatory Development Process

Internal Review

- DNREC staff review the language and comments from stakeholders
- The draft language must ensure that the regulation
  - Accomplishes its goal
  - Is clear and concise
  - Conforms to current statute and regulations
  - Is legally defensible

Regulatory Development Process

Propose Draft Language

- The reviewed draft language is submitted for publication in the Delaware Register of Regulations
- This opens a minimum 30-day comment period on the regulation

Regulatory Development Process

Public Hearing

- Formal setting for public to attend an offer verbal comments on proposed regulatory action
- An additional comment period of at least 15 days opens after the public hearing
- DNREC staff must respond to comments received and then fine-tune language as necessary

Regulatory Development Process

Adopt & Publish Final Regulation

- DNREC staff gather support information and present final language to the Secretary
- The Secretary makes a decision on the action
- They may choose to sign an order to adopt the regulatory action as final
- The Regulation must be re-published as final in the DE Register of Regulations
- Regulations take effect 10 days after published as final
- Appeals may be made within 20 to 30 days of final publishing

Federal vs. DE Regulatory Processes

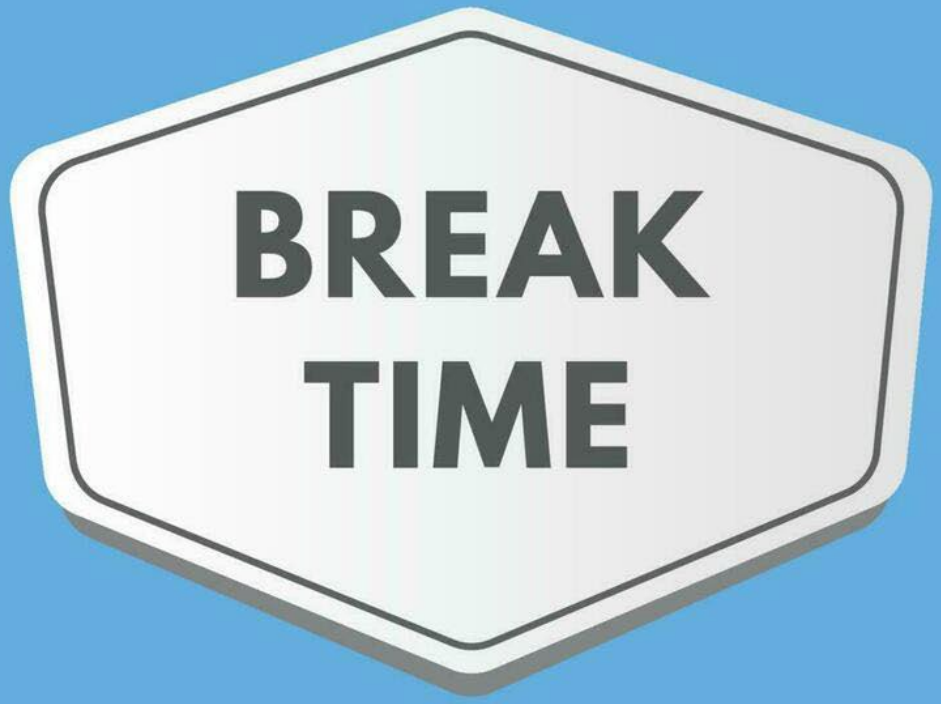
Similarities

- Both involve keeping the public informed and building credible support information
- Both require that a response is provided for each comment received from the public and/or stakeholders

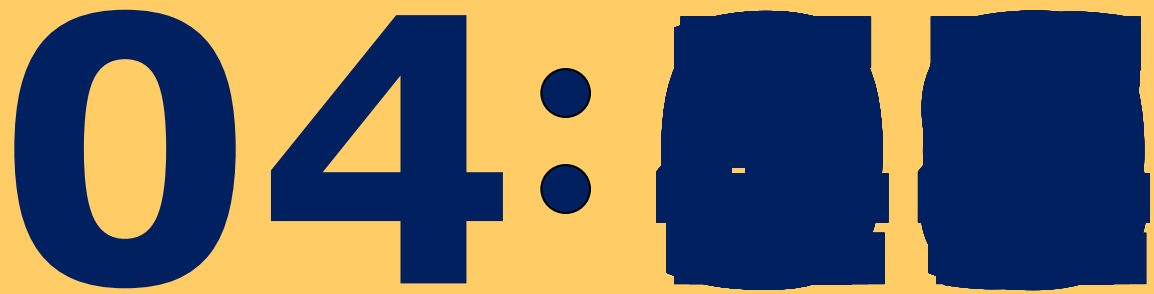
Differences

- EPA is not required to hold a public hearing, like DE is
- EPA effective date of a final rule is no sooner than 30 days after its final version is published (DE is 10 days after final publishing)

This concludes Section 3


BREAK
TIME

“Short Break”



Countdown Clock
By Dr. Jeff Ertzberger

“Short Break”

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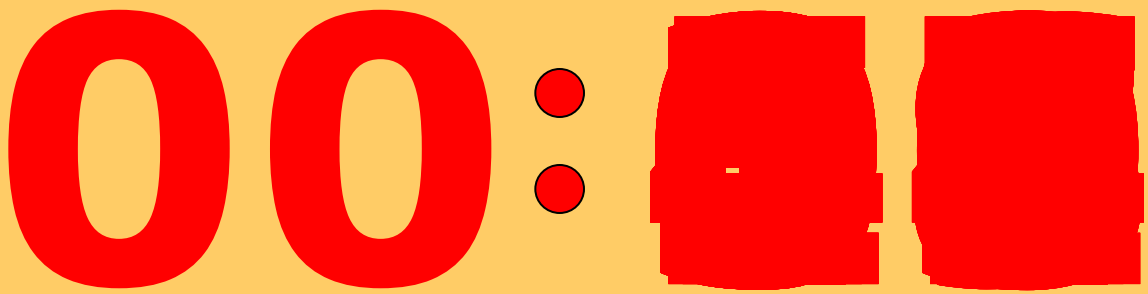


Countdown Clock
By Dr. Jeff Ertzberger

Section 4 Permitting and Point Sources

Air Permit Basics

- What is an Air Permit?
  - Written approval from the State to construct and operate equipment that discharges air contaminants into the atmosphere.
- Why are Air Permits required?
  - To help equipment operators understand how to operate their equipment according to State and Federal Air Regulations.
- When is an Air Permit required?
  - When a source's actual emissions are greater than 10 pounds in one day.

Air Permit Basics

- Who needs an Air Permit?
  - Most stationary equipment operators

Dover Air Force Base, Dover

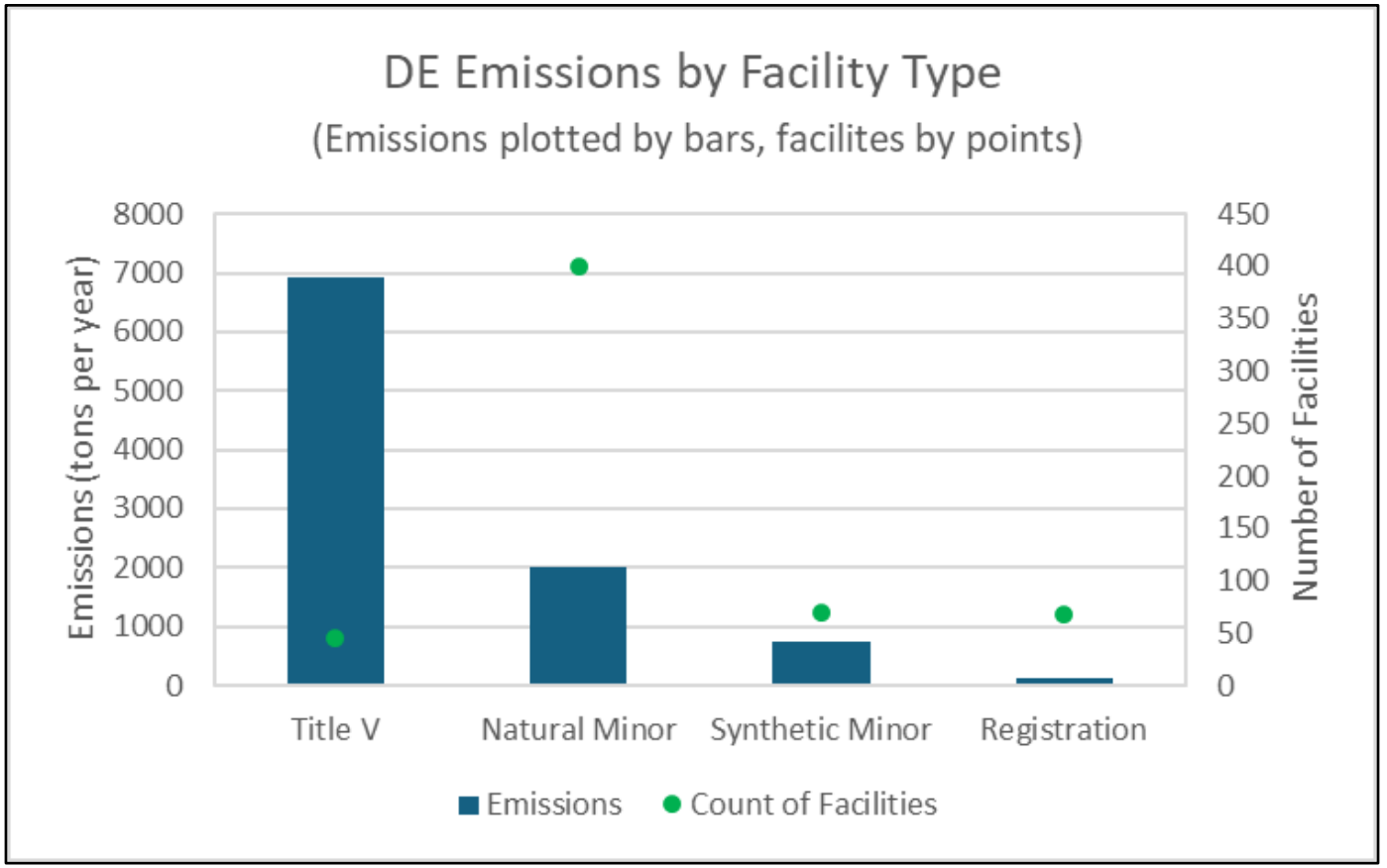

HandyTube LLC, Camden


Delaware Solid Waste Authority, Cherry Island


Croda Bio-ethylene Oxide Plant, New Castle

Air Permit Basics

Delaware Emissions by Facility Type



Permitting Process – Order of Events

A) Draft Construction permit is written and reviewed by management.

B) Permitting Engineer reviews application. Completes AERSCREEN modeling and a regulation review.

C) Application completed by facility and submitted to AQ.

D) Permitting Engineer makes changes as necessary based on public comments, and issues final Construction permit.

E) Facility constructs equipment.

F) Draft Construction permit is advertised for comment to the public, neighboring states, and the EPA.

G) After a successful inspection, the Permitting Engineer issues an Operation Permit to the Facility.

H) Once construction is complete, the Permitting Engineer conducts a “construction to operation” inspection.

1.

2.

3.

4.

5.

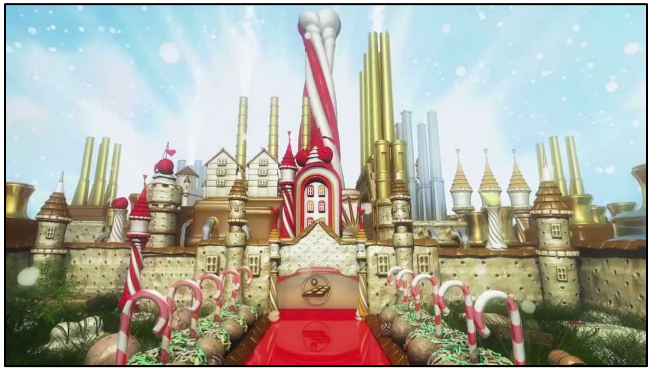
6.

7.

8.

Permitting Example

- Tilly Tonka, Inc. has submitted an application to construct a chocolate factory in Dover, DE. They will need air permits for their cocoa bean roasting and processing operations including roasters & cyclones, conveyors, coolers, grinders, baghouses, and boilers.



Permit Types

1. Title V (TV) Permit
   - Sources that are capable of emitting large quantities of pollutants.
2. Synthetic Minor (SM) Permit
   - Sources that are capable of emitting large quantities of pollutants but don't.
3. Natural Minor (NM) Permit
   - Sources that emit relatively low amounts of pollutants.
4. Registration (R)
   - Sources whose emissions are too low to require a permit.

Permit Type

Two factors decide how the facility is defined.

1. Emissions

2. Major Source Thresholds

Emissions

- Potential To Emit (PTE) is the amount of emissions a facility is capable of producing if they operated under worst case normal operating conditions all day, every day for a year.

- Actual Emissions are the amount of emissions that are released into the atmosphere on an annual basis.

PTE Calculation

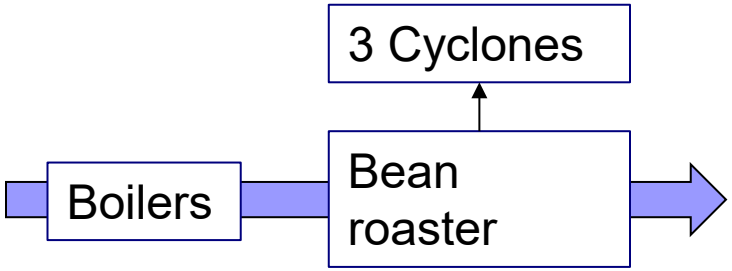
Steps:

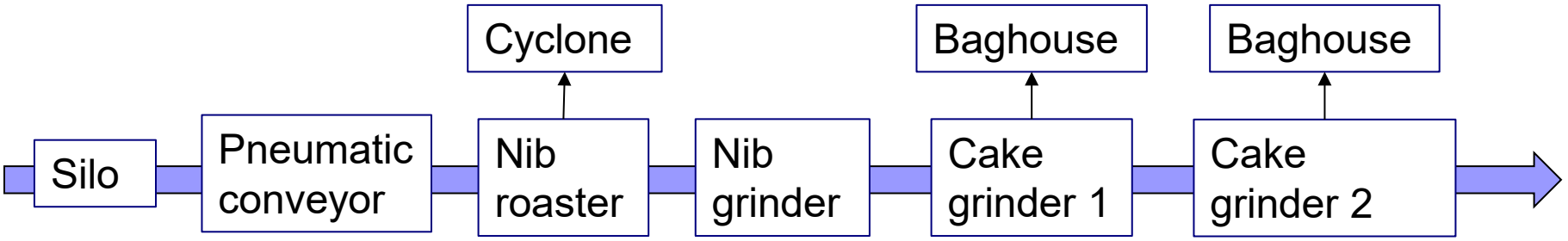
1. Identify all emission sources.
2. Identify all pollutants that the source emits.
3. Select a method to determine emissions.
4. Calculate maximum emissions from each process or equipment.
5. Sum all the emissions for the facility.

PTE Calculation
Step 1: Identify emission sources

- Two (2) cake grinders and baghouses
- Cocoa bean roaster and cyclone
- Nib pneumatic conveyor
- Nib roaster and cyclone
- Nib cooler
- Four (4) nib grinders
- Two (2) Boilers

COCOA PROCESSING





PTE Calculation
Step 2: Identify all pollutants

Unit	PM	VOC	NO_X	SO_2	CO
Cake grinders and baghouses	✓				
Cocoa bean roaster and cyclone	✓	✓			
Pneumatic conveyor	✓				
Nib roaster and cyclone	✓	✓			
Nib cooler	✓				
Nib grinders	✓				
Boilers	✓	✓	✓	✓	✓

PTE Calculation
Step 3: Select method to determine emissions

- Test data (stack test)
- Material balance calculations
- Source specific models
- Emission factors (EPA, vendors)

PTE continued

Tilly Tonka decided to conduct stack tests on the roaster units because there was little reliable emissions information for them. They used the manufacturer's pollutant documentation for the remaining units.

PTE Calculation
Step 4: Calculate max emissions

CAP Emissions Based on Processing Rate
(pounds pollutant per 1,000 lbs material processed)

Unit	PM	VOC	NO_X	SO_2	CO	Material processed (hourly)
Boilers	0.06	0.05	0.80	0.005	0.70	
Cocoa bean roaster and cyclones	0.005	0.30				7,000
Nib pneumatic conveyor	0.10					8,000
Nib roaster and cyclone	0.01	0.5				8,000
Nib cooler	0.10					8,000
Nib grinders	0.075					9,000
Cake grinder and baghouse	0.025					2,000

Calculation Example

- Hourly

$$0.10\ lbs\ PM * \frac{8\ units\ of\ nibs}{hour} = \frac{\mathbf{0.80\ lbs\ PM}}{\mathbf{hour}}$$

- Annual

$$\frac{0.80\ lb\ PM}{hour} * \frac{8{,}760\ hours}{year} * \frac{1\ ton}{2{,}000\ lbs}$$

$$= \mathbf{3.5\ tons\ per\ year}$$

PTE Calculation
Step 5: Sum all Emissions from Facility

Annual PTE for each Processing Unit by Pollutant Type

UNIT	PM tons	VOC tons	NO_X tons	SO_2 tons	CO tons
Boilers	0.26	0.22	3.59	0.02	3.07
Cocoa bean roaster and cyclones	0.153	9.20			
Nib pneumatic conveyor	3.50				
Nib roaster and cyclone	0.35	17.52			
Nib cooler	3.50				
Nib grinders	2.96				
Cake grinder and baghouse	0.22				
Total	**20**	**27**	**7**	**0.04**	**6**

PTE versus Major Source Threshold

- Compare PTE to Major Source Thresholds
  - Emit criteria pollutants in quantities **less** than the major source threshold.
    - Natural minor permit
  - Emit criterial pollutants **equal to or greater** than the major source threshold:
    - Title V permit
    - Synthetic Minor - have the potential to emit above the Major Source Threshold but have limits in a permit to keep their actual emissions below these levels

Major Source Thresholds

Major Source Thresholds for Delaware Counties (TPY)							
	VOCs	NOx	CO	SO_2	PM	HAPs*	Other
New Castle	25	25	100	100	100	10/25	100
Kent	25	25	100	100	100	10/25	100
Sussex	50	100	100	100	100	10/25	100

*The threshold of 10 TPY for HAPs is for a single HAP. The annual total threshold for all HAPs is 25 TPY.

Tillie Tonka Factory Permit

Is the chocolate factory in Dover, DE a major or minor source?

Pollutant	Major Source Threshold	Facility Wide PTE (TPY)
VOC	25	27
NO_x	25	7
CO	100	6
SO_2	100	0.04
PM	100	20
HAP	10	0

Tillie Tonka Factory Permit

Is the chocolate factory in Dover DE facility a major or minor source?

Pollutant	Major Source Threshold	Facility Wide PTE (TPY)
VOC	**25**	**27**
NO_x	25	7
CO	100	6
SO_2	100	0.04
PM	100	20
HAP	10	0

Major source for VOCs in Kent County

Synthetic Minor Source

Emit criteria pollutants in quantities **greater** than the major source threshold when operating at highest capacity 24/7.

Have volunteered to follow **enforceable restrictions** to their operation and/or use control technology. These restrictions limit PTE to quantities **less** than the major source threshold.

Synthetic Minor Source

Enforceable Restrictions Examples

- Using a control technology
- Fuel limits
- Raw material limits
- Limit quantity of final product
- Operation time limits

Synthetic Minor Source

Enforceable Restrictions Examples

- Using a control technology- Tilly Tonka uses controls like a cyclone to reduce PM emissions.
- Raw material limits- Tilly Tonka could limit that amount of cocoa beans delivered to the facility.

Permitting Process - Regulation Review

- In the permit are all the state and federal regulations that a unit, process, or facility must meet.
- Regulations can be based on the industry, the type and quantity of pollutants emitted, the area where the unit is located (attainment vs non-attainment), and much more.

NSR
MNSR
MACT
GACT
NSPS
BACT
RACT
LAER

What is in a Permit

1. General Conditions

   Provides information that is the same for all permits.

   What to do if ownership of the facility changes.

2. Emission Limits

   Provides short- and long-term limits for all pollutants.

   VOC emissions shall not exceed 22.5 tons per year.

What is in a Permit

3. Operational Limits

   Any requirements based on state and/or federal regulations or manufacturer recommendations. These conditions let you know how to operate to be in compliance with the emission limits of the permit.

   The nib roaster shall only use natural gas as a fuel source.

What is in a Permit

4. Monitoring

   Any requirements or information on stack testing, visible emissions, and/or continuous monitoring are included in this section.

   The facility shall conduct stack tests on the nib roaster every five years.

What is in a Permit

5. Recordkeeping

   This section provides information on any logs and records that the operator must keep in order to show that they are in compliance with the emission limits, operation limits, and testing or monitoring requirements.

   The facility shall calculate and record annual total facility wide VOC emissions and provide them as stated.

What is in a Permit

6. Reporting

This section gives information on who to report to and how to report excess emissions or permit deviations.

Emissions in excess of any permit condition or emissions which create a condition of air pollutions shall be reported to the Department immediately upon discovery.

What is in a Permit

- Technical Memo
  - Background information
  - Model and serial numbers
  - Emission calculations
  - PTE calculations
  - AERSCREEN model results, and a regulation review.

Emissions Modeling

AERSCREEN

- A screening model for single sources.
- Used to determine the effect of emissions of a new permit on the surrounding area.
- We need two numbers to decide if a unit is safe for the surrounding area:
  - Maximum Downwind Concentration (MDC)
  - Threshold Limit Value (TLV)

Control Technologies

The equipment used to reduce or remove substances that can be harmful to the environment or human health, before being released into the atmosphere.

- May be required by federal regulations

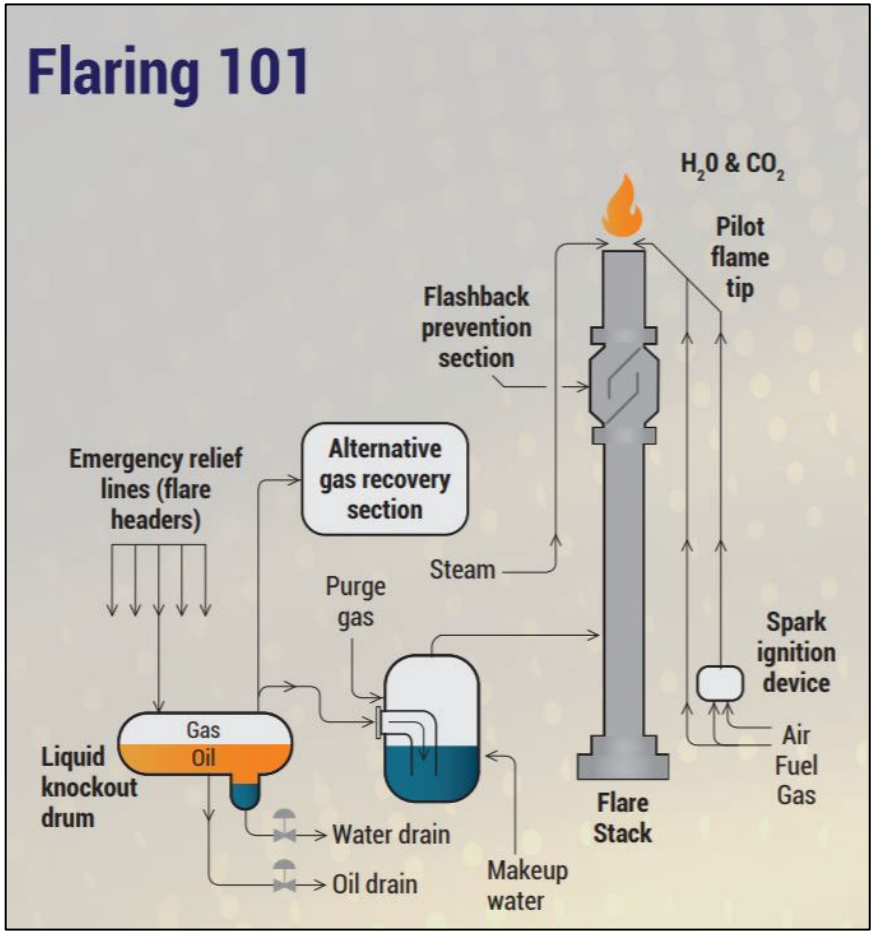
- Chosen based on:
  - Desired Removal Efficiency
  - Cost
  - Operational Parameters

Control Technologies

Flare

Controlled Pollutants:

- VOC
- HAPs

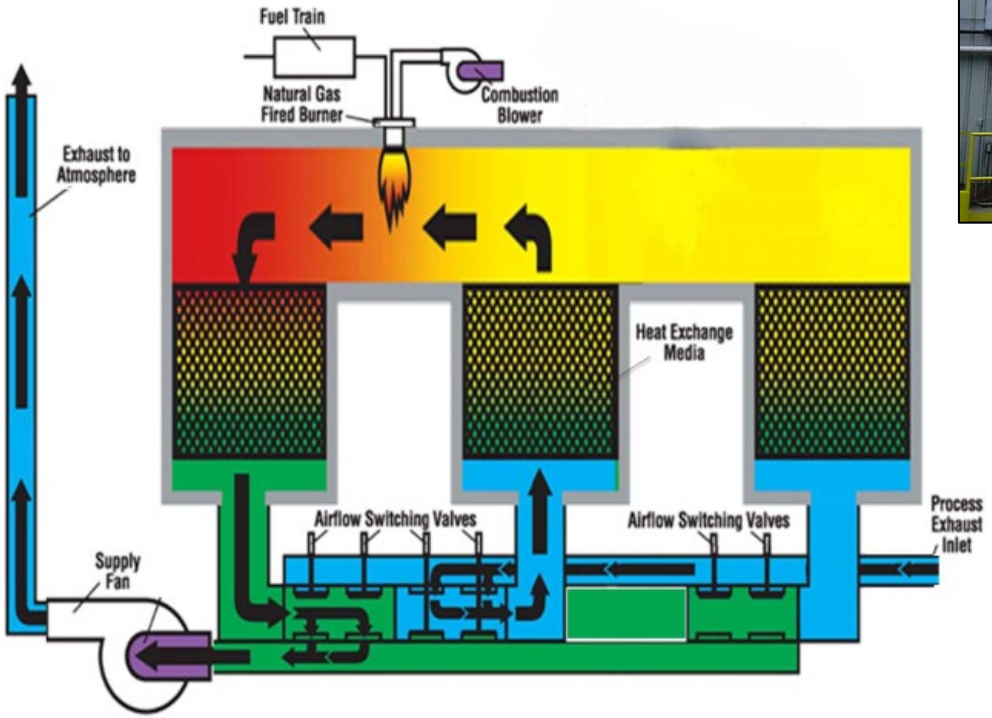


Control Technologies

Thermal Oxidizer

Controlled Pollutants:

- VOC
- HAPs

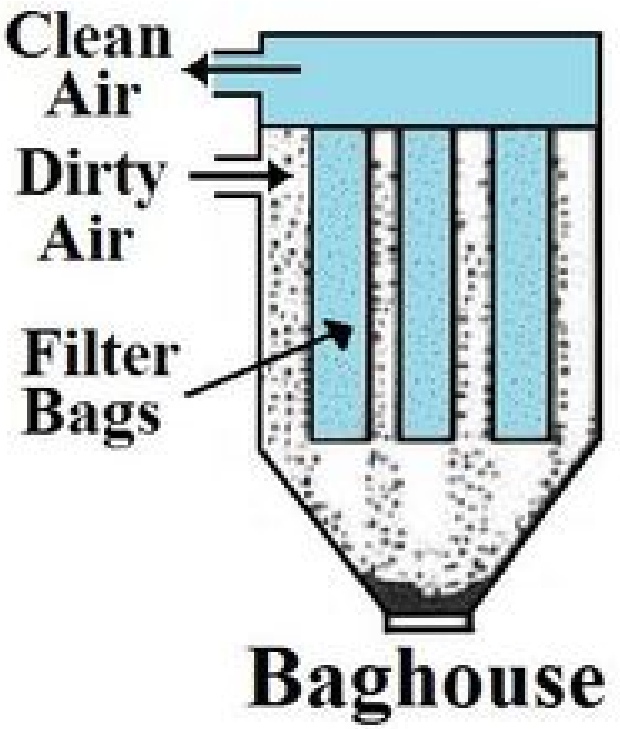


Control Technologies

Fabric Filters / Baghouses

Controlled Pollutants:

- PM

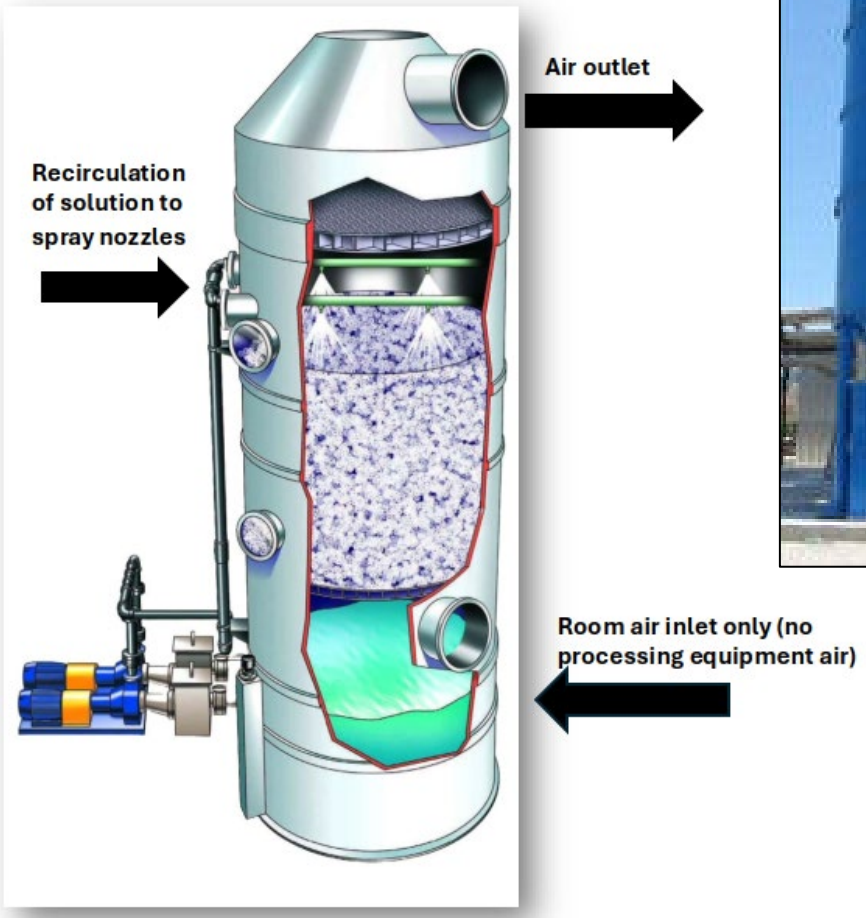


Control Technologies

Scrubber

Controlled Pollutants:

- VOC
- SO_2
- HAP
- PM

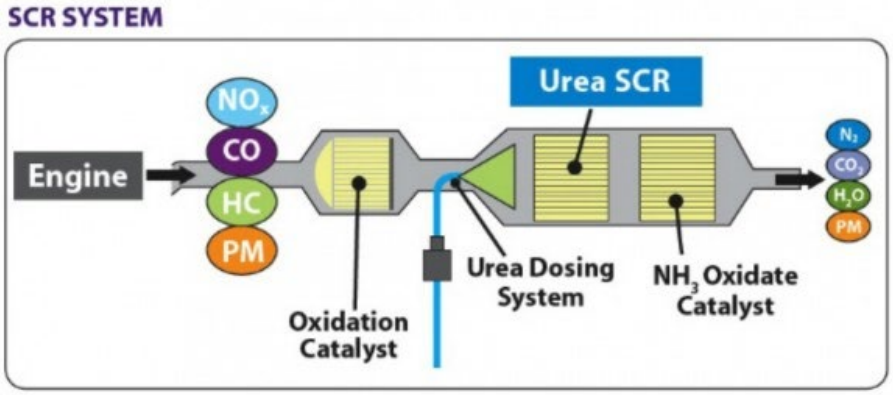


Control Technologies

Selective Catalytic Reduction (SCR)

Controlled Pollutants:

- NO_x



Compliance Monitoring

- Compliance Evaluations (Inspections)
- Stack Testing
- Enforcement

Compliance Evaluations

Purpose: to ensure that permit holders are following the conditions of the permit as well as all applicable state and federal regulations.

TV: 2 years (EPA Requirement)

SM: 5 years (EPA Requirement)

NM: 5 years (Delaware Requirement)

Compliance Evaluations

- DAQ engineer conducts the inspection.
- Meets with the facility's environmental, health, and safety personnel, managers, maintenance team, unit operators, and/or environmental consultants.
- Review of Records
- Visual Inspection

Compliance Evaluations

- PPE is required
  - Safety shoes, ear protection, hard hat, etc.
- Monitoring equipment
  - Digital cameras, infrared cameras, flame ionization devices, etc.
- Engineers are trained and certified semi-annually to read the opacity of smoke.

Stack Testing

- Measures the amount of a specific regulated pollutant emitted
- Demonstrates the efficiency of a capture system
- Demonstrates the destruction efficiency of a system

Enforcement

- Notice of Violation
  - Formal letter from the Division
- Administrative Action
  - Signed Order by DNREC Secretary
  - Monetary Penalty and/or;
  - Environmental Improvement Project
- Civil Action
- Criminal Action

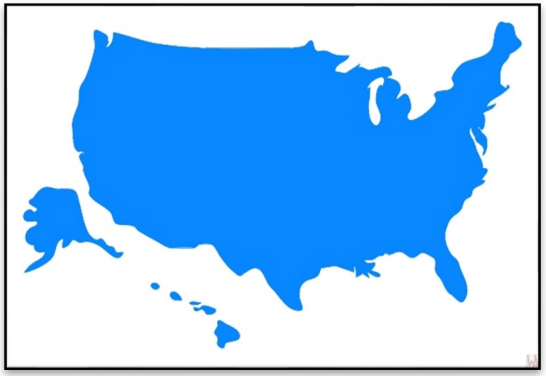
This concludes Section 4

Section 5
History and Trends

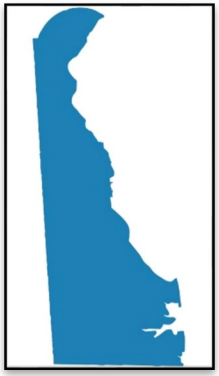
Air Trends

Considering the Policy, Permitting, Monitoring, and Enforcement actions that have occurred since the implementation of the Clean Air Act…

How has our Air Quality improved over time?



❑ ***Big Picture***



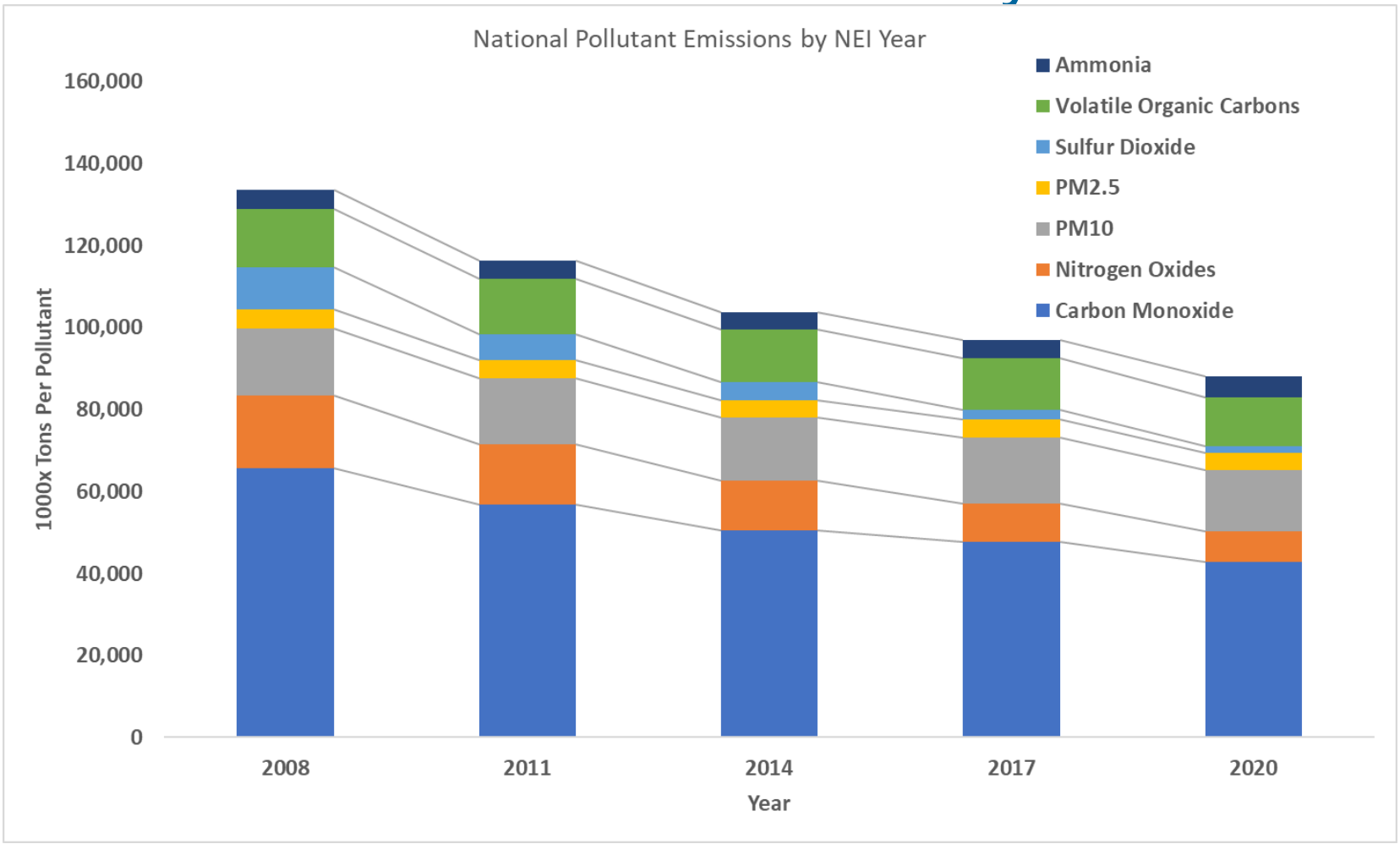
❑ ***Closer to Home***

❑ ***Focus on Point Sources***

Air Trends: Big Picture
The National Emissions Inventory

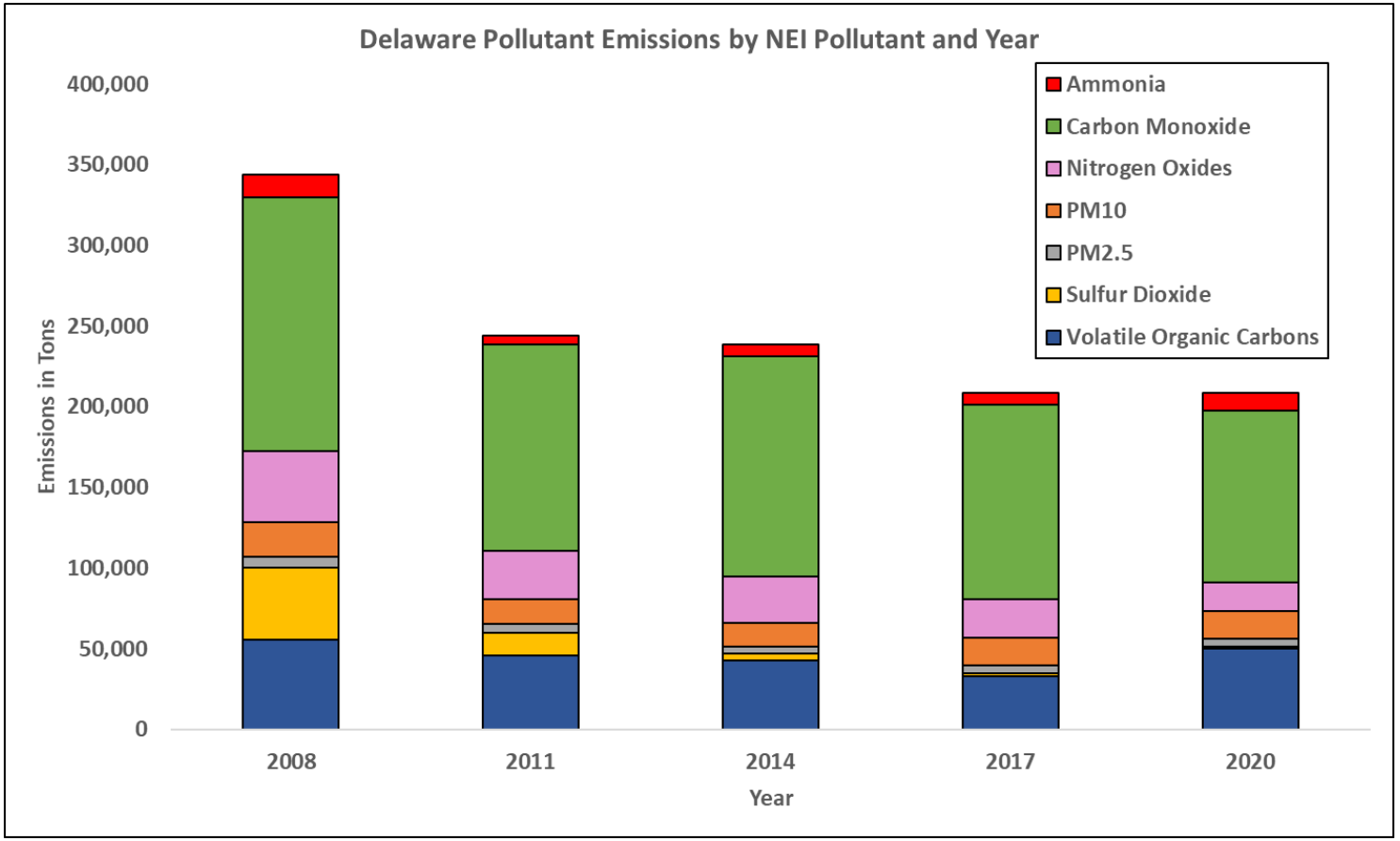
- An emissions Inventory is a database that lists, by source, the amount of air pollutants discharged into the atmosphere during a specific period
- EPA develops the National Emissions Inventory (NEI)
  - Triannual (every 3 years) inventory
- NEI is a detailed estimate of air emissions of CAP, CAP precursors, and HAP from air emission sources:
  - Point
  - Nonpoint
  - Onroad
  - Nonroad
  - Event
- NEI can be used to demonstrate trends for emissions on the national and state level

Air Trends: Big Picture
The National Emissions Inventory



According to the NEI, national CAP and CAP-related emissions from **all major emission source types** have decreased by 34% between 2008 and 2020.

Air Trends: Closer to home
The National Emissions Inventory



According to the NEI, Delaware CAP and CAP-related emissions from **all major emission source types** have decreased by 39% between 2008 and 2020.

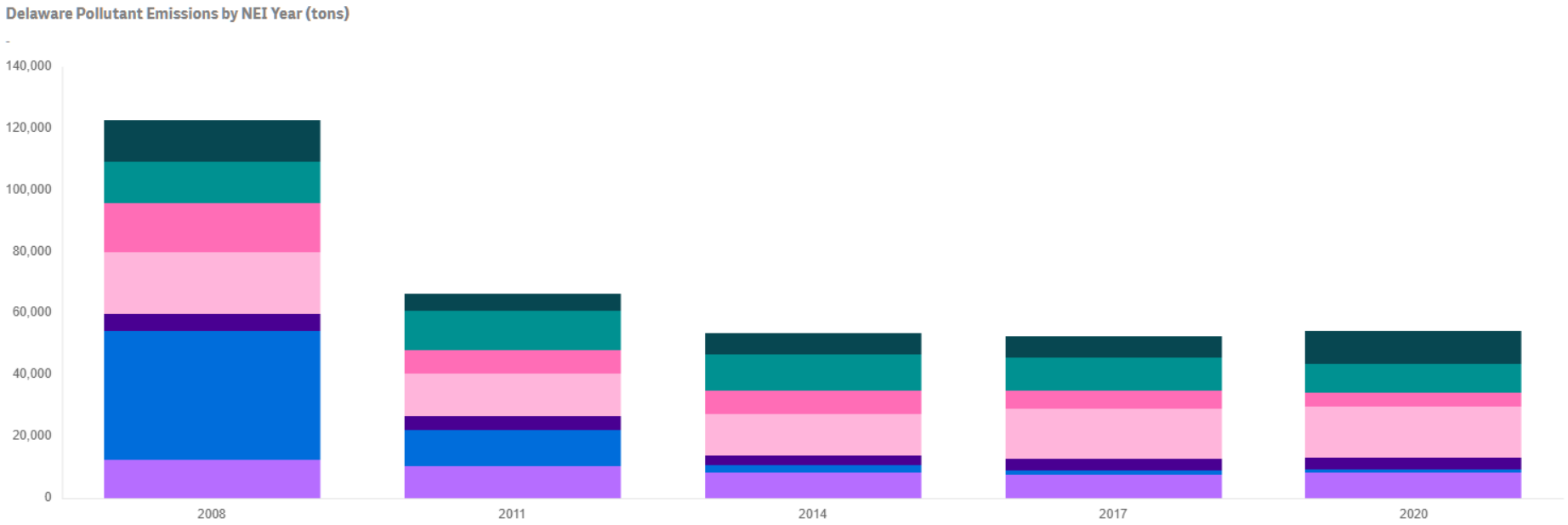
Air Trends: Point Source Focus

- Stationary source emission reductions are a result of CAA programs
- CAA programs have prompted technologies and have helped drive innovations that reduce emissions from stationary sources.
- Emission control technologies widely deployed today:
  - Selective catalytic reduction (SCR) and ultra-low NOx burners to reduce NOx emissions
  - Scrubbers which achieve 95% and even greater SO2 control on boilers
  - Sophisticated new valve seals and leak detection equipment, including cameras that can see leaks, for refineries and chemical plants
  - Routine use of continuous monitoring technology that provides data more quickly
- NEI can be used to evaluate stationary source emission reductions

Air Trends: Point Source Focus National

According to the NEI, national CAP and CAP-related emissions from **stationary sources** have decreased by 27% between 2008 and 2020. This decrease was from a total of 58 million tons down to 42 million tons.

Air Trends: Point Source Focus Delaware



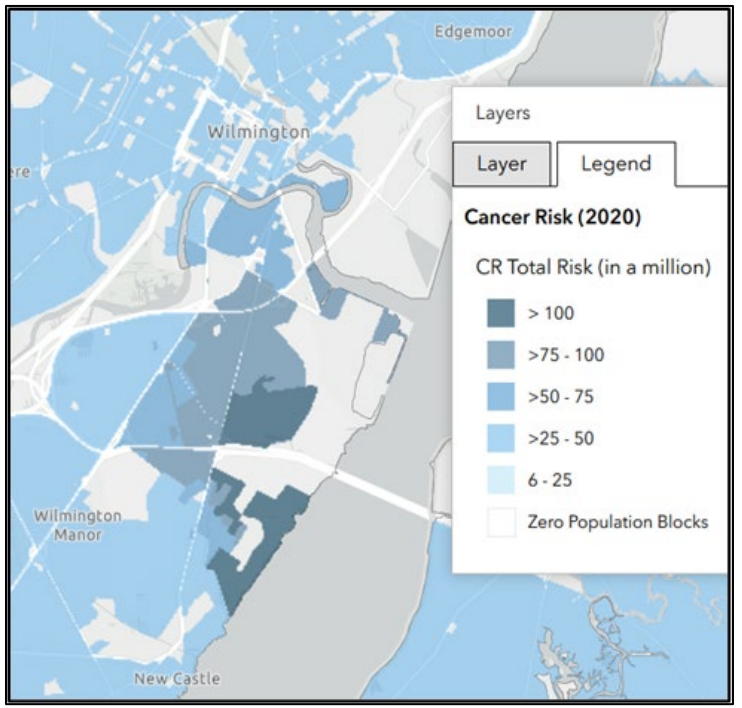
According to the NEI, Delaware CAP and CAP-related emissions from **stationary sources** have decreased by 56% between 2008 and 2020. The total pollutants from 2008 was 122,864.56 tons and was reduced to 54,148.81 tons.

This concludes Section 5

Section 6
Point Sources and Air Toxics

Managing our Air Toxics

- In 1990 the EPA designed the National Air Toxics Assessment, a comprehensive screening tool for state, local, and tribal air agencies
- Gives administrators and citizens a snapshot of their localized air quality
- Empowers citizens to make local decisions about their community health
- Local projects often improve air quality faster than federal regulations alone!
- Evolved into other air toxic and pollutant screening and mapping programs such as AirToxScreen and EJScreen



Wilmington, DE
Based on 2020 Emissions

Air Toxics Screening Tools

NATA	AirToxScreen	EJScreen
Assessments cover 1996, 1999, 2002, 2005, 2011, and 2014	Assessments cover 2017, 2018, 2019, and 2020 (released May 2024)	Used internally by EPA in early 2000s, first public release in 2015
Shows Cancer, Non-cancer risk, emissions	Has layers for total cancer risk, cancer risk from specific pollutants or source type, non-cancer risk, and more	Environmental and demographical info
Census Tract Level (1,200-8000 people)	Census Block Level (<10 to a few hundred people)	Census Block Group Level (600-3000) people

- Data is acquired through means of Continuous Emissions Monitoring Systems (CEMS), source compliance testing, and mandatory reporting from companies. Primarily through the NEI with state refinement.
- Large facilities often have many point sources that are individually modeled.
- Used as guidance tools to screen for areas in need of prioritization

Screening Map Example

- Use AirToxScreen to observe the cancer risk of the city of Wilmington
- https://experience.arcgis.com/experience/a0deb771dbcd40d0a46fbe83adc51747/
- Use DE EJ Area Viewer to look at EJScreen Index Exceedences throughout Delaware
- https://experience.arcgis.com/experience/dbb99894d4ca4b1c81e675be184cca79

Emergency Planning and Community Right-to-Know Act (EPCRA)

- Created in 1986 to help communities plan for chemical emergencies
- Requires industries to report on the storage, use and releases of hazardous substances to federal, state, and local governments.
- Creates a community emergency response plan including at minimum:
  - Elected state and local officials
  - Police, fire, civil defense, and public health professionals
  - Environment, transportation, and hospital officials
  - Local facility representatives
  - Representatives from community groups and the media

Toxics Release Inventory (TRI)

- Formation of EPCRA also Created the toxics release inventory (TRI)
- Tool used to track the management of certain toxic chemicals that pose a threat to human health and the environment
  - 595 individually listed chemicals, and 33 chemical categories
- Federally mandated program that qualifying facilities must comply with
  - Any facility manufacturing, processing, or handling must submit annual reporting forms for each chemical
  - Not reporting results by July 1 can result in a $71,545 fine per day
- Provides public with information about releases of toxic chemicals in their community
- EPA requires reporting of toxic releases in units of pounds, rather than concentrations or volumes which can misguide the public

Toxics Release Inventory (TRI)

Mandatory Reportable Releases to the TRI

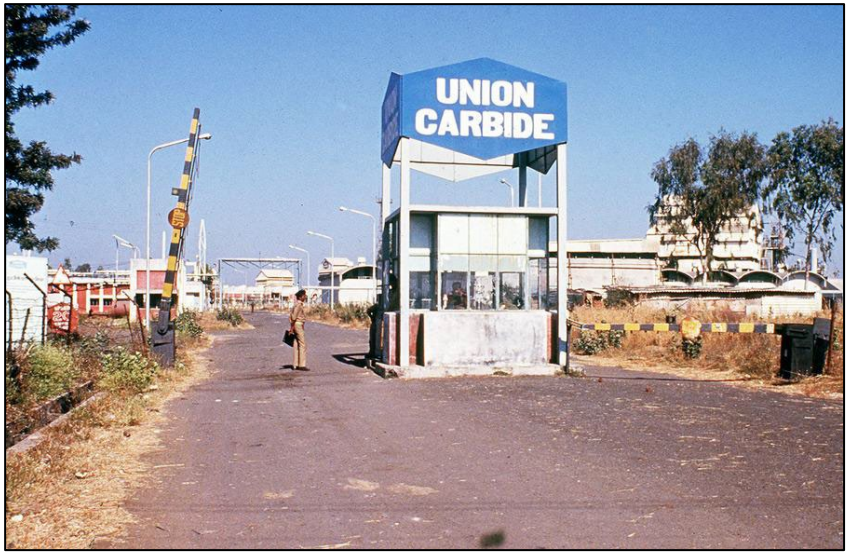
- **Hazardous Air Pollutants (HAP)**: 188 pollutants or toxics associated with adverse health effects including cancer
- **Urban Hazardous Air Pollutants (Urban HAP):** 30 of the 188 HAP determined to present the greatest risk to public health in urban areas
- **Criteria Air Pollutants:** carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, ozone, and lead
- **Precursors to Air Pollutants:** volatile organic compounds, nitrogen oxides, and ammonia
- **Persistent Bioaccumulative and Toxic Chemicals (PBTs):** 16 chemicals and 5 chemical compounds, including lead, mercury, and dioxin-like compounds, that are not only toxic, but also remain in the environment for a long time, are not readily destroyed, and build up or accumulate in body tissue.

Delaware Environmental Release Notification System (DERNS)

- Notification system that promptly alerts Delawareans to releases or discharges of contaminants & pollutants
- https://derns.dnrec.delaware.gov/

Union Carbide Pesticide Plant

- December,1984: Bhopal, India
- Release of 30 tons of Toxic methylisocyanate
- Exposed 600,000 people to deadly gas
  - Killed 2,000 people overnight
  - Thousands more died within the following week
- No emergency planning in place from city or facility
- Congress used this example to encourage the mandate of EPCRA



This concludes Section 6

Section 7
Summary

Summary

- Air pollution affects our health, our economy and it degrades our natural environment.

- Air pollution can be divided into four sources:
  - Point
  - Nonpoint
  - Mobile (on-road and non-road)
  - Event

Summary

- Progress in reducing air pollution has been made over time
  - Nationally, combined CAP and CAP-related emissions from all major source types have decreased by 14% between 2008 and 2020, while Delaware is at a 39% reduction
  - In Delaware, stationary source pollution has been reduced by almost 55% between 2008 and 2020.

- Policy requiring reductions in air pollution has been important part of the reductions.

Summary

- We learned how regulations are set, the process to make new regulations, and how the public can get involved in the process.
- Because of the efforts of federal and state regulatory entities, air pollution has been reduced.
- Continued efforts are needed to ensure that our air is healthy and clean.


Any Questions?

Closing Remarks

- Thank you!
- Training guide and PowerPoint are posted on the website.
- Good luck in the competition! ☺