



K-State SBEAP

Introduction To Calculating Emissions



This video is funded in part by the Kansas Department of Health and Environment Bureau of Air



Pollution Prevention Institute

KDHE Bureau of Air



A screenshot of the KDHE Bureau of Air website. The header features the Kansas Department of Health and Environment logo and a scenic landscape. Navigation tabs include Home, Public Health, Environment, Health Care Finance, Laboratories, and News. The main content area is titled "Air" and includes contact information for the Bureau of Air (BoA) in Topeka, KS. A mission statement is displayed: "Mission - To protect the public and the environment from air pollution." Below this, there is a "Notice of Request for Information - Volkswagen Settlement" and four columns of links: Asbestos, Compliance and Enforcement, Emissions Inventory, and Residential Lead Hazard Prevention. A "Links" sidebar on the right lists various resources like "Contact Us", "Clean Air Act Section 111d", and "Air Monitoring Data/Air Quality Index".

<https://www.kdheks.gov/bar/index.html>

What are air pollutants?

Categories of Pollutants (covered in another video)

- Criteria pollutants
 - Oxides of Nitrogen – NO_x, NO₂
 - Oxides of Sulfur – SO_x, SO₂
 - Carbon Monoxide – CO
 - Particulate Matter – PM, PM₁₀, PM_{2.5}
 - Ground-level Ozone – O₃
 - Lead
- Volatile organic compounds
- Hazardous Air Pollutants

Resources on pollutants

- <https://www.epa.gov/criteria-air-pollutants> - describes the criteria pollutants and provides technical and NAAQS information
- <https://www.epa.gov/ground-level-ozone-pollution/volatile-organic-compound-exemptions> - VOC exemptions
- <https://www.epa.gov/haps/what-are-hazardous-air-pollutants> - air toxics or HAPs



Understanding Your Process



Before you can calculate you need to know, for example:

- Manufacturer's information such as fuel fired, horsepower, maximum rating of burners, operational specifications or maximum rated throughputs (tons per hour), process temperatures, etc.
- Material composition from SDS sheets

- Examples of simple –
 - Combustion emissions from a boiler, dryer, or engine
 - Painting and coating metal parts
 - Welding
- Example of complex –
 - Incinerating municipal or hazardous waste
 - Chemical processing and manufacturing
 - Petroleum refining

Potential to Emit

- K.A.R. 28-19-200 (yy)

"the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, 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. Secondary emissions shall not be considered in determining the potential-to-emit of a stationary source."

- Worst case operations or maximum operations
- Maximum capacity or rating of equipment
- Maximum process capability
- No bottlenecks
- No hours restricted
- No control devices (uncontrolled emissions)
- 24 hours a day/7 days a week/52 weeks a year or 8,760 hours
- This is not actual emissions – it is Potential

EVERY facility in Kansas should know their PTE and Actual Emissions!!!



Acceptable Methods to Use for PTE Calculations



- **CEMS** (continuous emission monitoring systems)
- **Stack tests** (of similar units)
- **Material balance** (usage per year) – to understand how to use a Safety Data Sheet to identify potential pollutants in your materials see “P2 and Understanding Safety Data Sheets” on the K-State PPI YouTube channel, <https://youtu.be/Xg6SoUviKRY>
- **Emission factors** (EPA AP-42, Manufacturer testing of unit)
- **Engineering judgement**
- Other approved method (Manufacturer general testing of similar units)

PTE and Emission Calculators



K-State SBEAP has several excel spreadsheets that can be used to calculate potential to emit and actual emissions.

www.sbeap.org

A screenshot of the SBEAP website. The browser address bar shows "sbeap.org/air-quality/tools". The website header includes the Kansas State University logo and the text "Pollution Prevention Institute". A navigation menu is visible with options: Air Quality, Water Quality, Waste Management, Pollution Prevention, Resources, and Events. The "Air Quality" menu is selected, leading to "Emission Calculators". On the left, there are three buttons: "VOC calculator for Wyandotte and Johnson County", "Small Business Environmental Compliance Assistance", and "Featured Compliance Tools". The main content area is titled "Emission Calculators" and contains a paragraph explaining the purpose of the calculators, a link to "Potential to Emit Calculation Spreadsheets", and a list of activities covered by the tools. A yellow box on the right contains contact information for SBEAP.

[Air Quality](#) > Emission Calculators

VOC calculator for Wyandotte and Johnson County

Small Business Environmental Compliance Assistance

Featured Compliance Tools

Pollution Prevention Intern Program

Emission Calculators

If you plan to install new equipment, or have installed new equipment and are not sure if you need an air construction approval or permit, you can use these calculators to help determine your PTE. Additionally all applications for construction approval, permits or operating permits must be submitted through the [Kansas Environmental Information Management System \(KEIMS\)](#).

Potential to Emit Calculation Spreadsheets

By clicking on the link above you will access PTE tools (in Microsoft Excel format) designed to assist your facility in estimating its potential to emit (PTE) from various operations including the following:

- Painting and coating
- Welding
- Abrasive blasting
- Plasma/laser cutting
- Boilers and furnaces
- Engines
- Air curtain incinerators
- Grain elevators
- Hemp processing

NEED HELP?

The Small Business Environmental Assistance Program, or SBEAP, can provide free on-site assistance to small businesses who need help understanding environmental compliance requirements. Contact SBEAP at 800-578-8898 or sbeap@ksu.edu.

PTE Example – Boiler Emissions



K-State SBEAP has an excel spreadsheet for boilers, ovens and dryers.

- Facility plans to install a 600 hp boiler.
- The boiler can fire on natural gas or diesel fuel.
- The facility needs to know the PTE so it can determine if it needs to obtain any permits from KDHE Bureau of Air.

PTE Example – Boiler Emissions



Boiler information and results:					Need for air permit			Tons/year					
Input boiler data					Const. approval?	Const. permit?	Operating permit?	NO _x	SO _x ⁵	CO	VOC	PM/PM ₁₀	Formaldehy
Year, manufacturer, and model number ¹	Boiler or furnace type ²	# of units	Boiler size (MMBTU/hr) ²	Hours run/ 12-month period ³				No	Operating permit:	100	100	100	100
3) To calculate the potential to emit, use 8,760 hours.					Operating permit:			100	100	100	100	100	10
4) Johnson and Wyandotte Counties were once non-attainment for ozone; they are now in a maintenance area and are subject to lower VOC thresholds for construction approvals. The thresholds are 15 lbs/24 hrs and 3 lbs/hour, both of which must be met.					Construction permit			40	40	100	40	15	10
5) Sulfur content for distillate oil #1 or #2 is assumed to be .0015% (15 PPM) and 0.5% (5000 PPM) for residual oil #5 or #6. These values can be changed in the <i>Em Factors&data</i> worksheet/tab.					Construction approval:			-	-	-	-	-	-
					Construction approval: (for Jo. and Wy. counties) ⁴			-	-	-	-	-	-
					Size converter (if you know boiler size only in units of boiler horsepower):								
					Boiler size (boiler horsepower):		600	Boiler efficiency		80%			
					Boiler size (units of MMBTU/hr heat input):		25.08						
					Source: www.sbcapcd.org/eng/tech/tech_faq.htm								

PTE Example – Boiler Emissions



Boiler information and results:					Emission data (results)									
Input boiler data					Emission data (results)									
Located in Johnson or Wyandotte county?					No									
Year, manufacturer, and model number ¹	Boiler or furnace type ²	# of units	Boiler size (MMBTU/hr) ²	Hours run/ 12-month period ³	Tons/year							lb/hr		
					NO _x	SO _x ⁵	CO	VOC	PM/PM ₁₀	Formaldehyde	CO ₂	SO _x ⁵	VOCs	PM/PI
Example 1	Distillate oil #1 or #2 or diesel fuel (<100MMBTU/hr input)	1	25.08	8760	15.693	0.169	3.923	0.436	1.569	0.048	17,498	0.039	0.100	0.35
TOTAL (ALL BOILERS)					15.7	0.2	3.9	0.4	1.6	0.05	17,498	0.0	0.1	0.4

1) If your boiler was constructed, modified, or reconstructed after June 9, 1989, and heat input capacity is ≥ 10 MMBTU/hr and ≤

PTE Example – Painting Emissions



K-State SBEAP has an excel spreadsheet for painting and coating.

- Facility uses 300 gallons of red paint annually.
- Facility paints on one shift or 2080 hours per year.
- Painters use a High Volume Low Pressure Gun – HVLP.
- SDS says paint has 25% Ethylbenzene, 10% Xylene, 10% toluene, and 55% solid component.

PTE Example - Painting Emissions



1	HAP	Cas Number	* Source: http://www.epa.gov/ttn/atw/188polls.html
2	1,1,2,2-Tetrachloroethane	79345	
3	1,1,2-Trichloroethane	79005	
4	1,1-Dimethyl hydrazine	57147	
5	1,2,4-Trichlorobenzene	120821	
6	1,2-Dibromo-3-chloropropane	96128	
7	1,2-Diphenylhydrazine	122667	
8	1,2-Epoxybutane	106887	
9	1,2-Propylenimine (2-Methyl aziridine)	75558	
10	1,3-Butadiene	106990	
11	1,3-Dichloropropene	542756	
12	1,3-Propane sultone	1120714	
13	1,4-Dichlorobenzene(p)	106467	
14	1,4-Dioxane (1,4-Diethyleneoxide)	123911	
15	2,2,4-Trimethylpentane	540841	
16	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	
17	2,4,5-Trichlorophenol	95954	
18	2,4,6-Trichlorophenol	88062	
19	2,4-D, salts and esters	94757	
20	2,4-Dinitrophenol	51285	
21	2,4-Dinitrotoluene	121142	
22	2,4-Toluene diamine	95807	
23	2,4-Toluene diisocyanate	584849	
24	2-Acetaminofluorene	53063	

[Instructions](#)
[Product Info](#)
[List of HAPs](#)
[Summary-Printout](#)
+

PTE Example - Painting Emissions



7						
8	Individual HAP		(tons/yr)			No threshold
9	Toluene	0.165	0.694	10.0	10.0	
10	Ethyl benzene	0.412	1.7	10.0	10.0	
11	Xylene	0.165	0.7	10.0	10.0	
12	HAP	0.000	0.0	10.0	10.0	
13	HAP	0.000	0.0	10.0	10.0	
14	HAP	0.000	0.0	10.0	10.0	
15		0.00	0.000	10.0	10.0	
16		0.00	0.000	10.0	10.0	
17		0.00	0.000	10.0	10.0	
18		0.00	0.000	10.0	10.0	
19		0.00	0.000	10.0	10.0	
20		0.00	0.000	10.0	10.0	
21		0.00	0.000	10.0	10.0	
22		0.00	0.000	10.0	10.0	
23						
24			(tons/yr)		(tons/yr)	(tons/yr)
25	Total HAPs	0.7	3.1	25.00	25.00	No threshold
26						
27			(tons/yr)			
28	Total VOCs	0.7	3.12	100.00	40.00	
29			(lbs/24 hours)			

PTE example - Painting emissions



31			(lbs/hour)			
32			0.71			
33						
34			(tons/yr)			
35	PM₁₀ (based on TE)	0.4	1.5	100.00	15.00	
36			(lbs/hour)			
37			0.348			2 lbs/ hr
38	Current Date	January 2, 2021				
39	Assumptions			Permits Needed		
40	In Johnson or Wyandotte County?	No		Class I/II Permit Needed?		NO
41	Annual hours of operation:	2080		Construction Permit Needed?		NO
42	Transfer Efficiency (TE):	0.60		Construction Approval Needed?		NO
43	60% - Transfer Efficiency (TE) of an HVLP gun					
44	45% - Average Transfer Efficiency					
45	30% - Transfer Efficiency of a conventional gun		*Threshold is 15 lbs/24 hrs (or 3 lbs/hr) in Johnson and Wyandotte Counties			
46						
47						
48						
49						
50						
51						
52						
53						

Conclusion



K-State SBEAP emission calculators: <https://www.sbeap.org/air-quality/tools/pte-calc>

National SBEAP Air Quality Tools by State
<https://nationalsbeap.org/compliance/air/tools-by-state>

Free, Confidential Air Permitting and Compliance Assistance



K-State Small Business Environmental Assistance Program or SBEAP provides free technical assistance to small businesses.

Contact us at sbeap@ksu.edu, call 1-800-878-889, or visit our website at www.sbeap.org

Outside of Kansas? There are SBEAPs in nearly every state. Check out the National SBEAP website at <https://nationalsbeap.org/states>.