

US EPA ARCHIVE DOCUMENT

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	TSP Emissions		PM ₁₀ Emissions		PM _{2.5} Emissions		NO _x Emissions	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane	0.28	1.22	0.13	0.58	0.02	0.09		
<u>4</u>	4	Oxide Unloading Bin & Dedusting	0.11	0.49	0.11	0.49	0.08	0.36		
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)	0.25	1.10	0.25	1.10	0.19	0.83		
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)	0.11	0.49	0.11	0.49	0.08	0.36		
<u>7</u>	7	Oxide & Remet Screening & Dedusting	0.71	3.09	0.71	3.09	0.53	2.32		
<u>16</u>	16	Furnace Charge Hopper Loading Silos	0.01	<0.01	0.01	<0.01	0.01	<0.01		
<u>17</u>	17	Charge Hopper	0.10	0.44	0.10	0.44	0.08	0.33	2.02	8.84
<u>29</u>	29	Reformer Main Flue Ejector Stack	8.06	35.30	8.06	35.30	8.06	35.30	88.64	388.25
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	2.50	10.95	2.50	10.95	1.25	5.48	2.02	8.84
<u>9</u>	9	Briquetter Dedusting	3.97	17.38	3.97	17.38	1.98	8.69	1.01	4.42
<u>38</u>	38	Hot Pressure Relief Vent (Flare)	0.51	0.08	0.51	0.08	0.51	0.08	20.26	2.96
<u>11a</u>	11a	HBI Cooling Conveyor 1	1.90	8.34	1.90	8.34	0.95	4.17		
<u>11b</u>	11b	HBI Cooling Conveyor 2	1.90	8.34	1.90	8.34	0.95	4.17		
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)	0.40	1.77	0.40	1.77	0.36	1.59		
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)	0.40	1.77	0.40	1.77	0.36	1.59		
<u>14</u>	14	HBI Pile	0.32	1.39	0.13	0.56	0.04	0.16		
<u>36</u>	36	Remet / Fines Storage	0.17	0.74	0.04	0.20	0.01	0.02		
<u>30</u>	30	Process Water Degasser								
<u>33</u>	33	Salt Water Cooling Tower	2.61	11.44	0.08	0.34	0.08	0.34		
<u>39</u>	39	Paved Road Fugitive Dust	0.25	1.08	0.05	0.21	0.01	0.03		
<u>34</u>	34	Emergency Generator	0.47	0.02	0.47	0.02	0.47	0.02	32.09	1.60
<u>35</u>	35	Fire Pump	0.03	<0.01	0.03	<0.01	0.03	<0.01	2.25	0.11
<u>FugGHG</u>	-	Fugitive Natural Gas								
TOTAL EMISSIONS			25.07	105.42	21.88	91.44	16.05	65.94	148.28	415.03

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	SO ₂ Emissions		CO Emissions		VOC Emissions		CO ₂ Emissions	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane								
<u>4</u>	4	Oxide Unloading Bin & Dedusting								
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)								
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)								
<u>7</u>	7	Oxide & Remet Screening & Dedusting								
<u>16</u>	16	Furnace Charge Hopper Loading Silos								
<u>17</u>	17	Charge Hopper	0.24	1.05	2.82	12.36	0.18	0.81	12,486	54,689
<u>29</u>	29	Reformer Main Flue Ejector Stack	10.51	32.20	123.97	542.98	8.12	35.55	548,516	1,679,829
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	0.24	1.05	2.82	12.36	0.18	0.81	12,486	54,689
<u>9</u>	9	Briquetter Dedusting	0.12	0.52	1.41	6.18	0.09	0.40	6,243	27,345
<u>38</u>	38	Hot Pressure Relief Vent (Flare)	0.02	<0.01	239.36	31.76	0.04	0.02	15,319	2,236
<u>11a</u>	11a	HBI Cooling Conveyor 1								
<u>11b</u>	11b	HBI Cooling Conveyor 2								
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)								
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)								
<u>14</u>	14	HBI Pile								
<u>36</u>	36	Remet / Fines Storage								
<u>30</u>	30	Process Water Degasser			24.26	106.24			252.25	1,104.86
<u>33</u>	33	Salt Water Cooling Tower								
<u>39</u>	39	Paved Road Fugitive Dust								
<u>34</u>	34	Emergency Generator	0.04	<0.01	3.80	0.19	0.99	0.05	3,930.81	196.54
<u>35</u>	35	Fire Pump	<0.01	<0.01	0.27	0.01	0.07	<0.01	256.61	12.83
FugGHG	-	Fugitive Natural Gas								
TOTAL EMISSIONS			11.18	34.82	398.70	712.08	9.68	37.64	599,490	1,820,103

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	CH ₄ Emissions		N ₂ O Emissions		CO ₂ e Emissions		Benzene	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane								
<u>4</u>	4	Oxide Unloading Bin & Dedusting								
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)								
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)								
<u>7</u>	7	Oxide & Remet Screening & Dedusting								
<u>16</u>	16	Furnace Charge Hopper Loading Silos								
<u>17</u>	17	Charge Hopper	0.24	1.05	0.07	0.29	12,512	54,802	<0.01	<0.01
<u>29</u>	29	Reformer Main Flue Ejector Stack	10.5	32.2	2.9	9.0	549,650	1,683,304	<0.01	<0.01
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	0.24	1.05	0.07	0.29	12,512	54,802	<0.01	<0.01
<u>9</u>	9	Briquetter Dedusting	0.12	0.52	0.03	0.15	6,256	27,401	<0.01	<0.01
<u>38</u>	38	Hot Pressure Relief Vent (Flare)	3,277	9.05	0.000	0.001	15,319	2,236		
<u>11a</u>	11a	HBI Cooling Conveyor 1								
<u>11b</u>	11b	HBI Cooling Conveyor 2								
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)								
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)								
<u>14</u>	14	HBI Pile								
<u>36</u>	36	Remet / Fines Storage								
<u>30</u>	30	Process Water Degasser	4.85	21.25			374	1,636		
<u>33</u>	33	Salt Water Cooling Tower								
<u>39</u>	39	Paved Road Fugitive Dust								
<u>34</u>	34	Emergency Generator	0.01	0.0005	0.05	0.002	3,945	197		
<u>35</u>	35	Fire Pump	0.001	0.00003	0.003	0.0001	258	13		
FugGHG	-	Fugitive Natural Gas	0.92	4.01			23	100		
TOTAL EMISSIONS			3,293	65.12	3.14	9.69	600,848	1,824,492	<0.01	<0.01

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	Dichlorobenzene		Formaldehyde		n-Hexane		Naphthalene	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane								
<u>4</u>	4	Oxide Unloading Bin & Dedusting								
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)								
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)								
<u>7</u>	7	Oxide & Remet Screening & Dedusting								
<u>16</u>	16	Furnace Charge Hopper Loading Silos								
<u>17</u>	17	Charge Hopper	<0.01	<0.01	<0.01	<0.01	0.01	0.04	<0.01	<0.01
<u>29</u>	29	Reformer Main Flue Ejector Stack	<0.01	<0.01	0.02	0.08	0.41	1.81	<0.01	<0.01
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	<0.01	<0.01	<0.01	<0.01	0.01	0.04	<0.01	<0.01
<u>9</u>	9	Briquetter Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
<u>38</u>	38	Hot Pressure Relief Vent (Flare)								
<u>11a</u>	11a	HBI Cooling Conveyor 1								
<u>11b</u>	11b	HBI Cooling Conveyor 2								
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)								
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)								
<u>14</u>	14	HBI Pile								
<u>36</u>	36	Remet / Fines Storage								
<u>30</u>	30	Process Water Degasser								
<u>33</u>	33	Salt Water Cooling Tower								
<u>39</u>	39	Paved Road Fugitive Dust								
<u>34</u>	34	Emergency Generator								
<u>35</u>	35	Fire Pump								
<u>FugGHG</u>	-	Fugitive Natural Gas								
TOTAL EMISSIONS			<0.01	<0.01	0.02	0.08	0.44	1.91	<0.01	<0.01

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	Toluene		PAH		Lead		Mercury	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane					<0.01	<0.01	<0.01	<0.01
<u>4</u>	4	Oxide Unloading Bin & Dedusting					<0.01	<0.01	<0.01	<0.01
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)					<0.01	<0.01	<0.01	<0.01
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)					<0.01	<0.01	<0.01	<0.01
<u>7</u>	7	Oxide & Remet Screening & Dedusting					<0.01	<0.01	<0.01	<0.01
<u>16</u>	16	Furnace Charge Hopper Loading Silos								
<u>17</u>	17	Charge Hopper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>29</u>	29	Reformer Main Flue Ejector Stack	<0.01	<0.01	<0.01	<0.01	<0.01	0.01		
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>9</u>	9	Briquetter Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>38</u>	38	Hot Pressure Relief Vent (Flare)					<0.01	<0.01		
<u>11a</u>	11a	HBI Cooling Conveyor 1					<0.01	<0.01	<0.01	<0.01
<u>11b</u>	11b	HBI Cooling Conveyor 2					<0.01	<0.01	<0.01	<0.01
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)					<0.01	<0.01	<0.01	<0.01
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)					<0.01	<0.01	<0.01	<0.01
<u>14</u>	14	HBI Pile					<0.01	<0.01	<0.01	<0.01
<u>36</u>	36	Remet / Fines Storage					<0.01	<0.01	<0.01	<0.01
<u>30</u>	30	Process Water Degasser								
<u>33</u>	33	Salt Water Cooling Tower								
<u>39</u>	39	Paved Road Fugitive Dust								
<u>34</u>	34	Emergency Generator								
<u>35</u>	35	Fire Pump								
<u>FugGHG</u>	-	Fugitive Natural Gas								
TOTAL EMISSIONS			<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	Cadmium		Chromium		Magnesium (as MgO)		Manganese	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
<u>4</u>	4	Oxide Unloading Bin & Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>7</u>	7	Oxide & Remet Screening & Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
<u>16</u>	16	Furnace Charge Hopper Loading Silos								
<u>17</u>	17	Charge Hopper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>29</u>	29	Reformer Main Flue Ejector Stack								
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	<0.01	<0.01	<0.01	<0.01	0.02	0.07	<0.01	0.01
<u>9</u>	9	Briquetter Dedusting	<0.01	<0.01	<0.01	<0.01	0.02	0.10	<0.01	0.01
<u>38</u>	38	Hot Pressure Relief Vent (Flare)								
<u>11a</u>	11a	HBI Cooling Conveyor 1	<0.01	<0.01	<0.01	<0.01	0.01	0.05	<0.01	<0.01
<u>11b</u>	11b	HBI Cooling Conveyor 2	<0.01	<0.01	<0.01	<0.01	0.01	0.05	<0.01	<0.01
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
<u>14</u>	14	HBI Pile	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
<u>36</u>	36	Remet / Fines Storage	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<u>30</u>	30	Process Water Degasser								
<u>33</u>	33	Salt Water Cooling Tower								
<u>39</u>	39	Paved Road Fugitive Dust								
<u>34</u>	34	Emergency Generator								
<u>35</u>	35	Fire Pump								
<u>FugGHG</u>	-	Fugitive Natural Gas								
TOTAL EMISSIONS			<0.01	<0.01	<0.01	<0.01	0.08	0.35	0.01	0.03

SUMMARY TABLE: voestalpine Direct Reduction Iron Facility Emissions Totals

Emission Point ID	Modeling Stack No.	Air Emission Source Description	Nickel		Copper		Zinc		Total HAPs	
			Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr	Average lb/hr	Average tons/yr
<u>1</u>	1	Dock Ore Unloading / Product Loading Gantry Crane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>4</u>	4	Oxide Unloading Bin & Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>5</u>	5	Oxide Pellet Pile Transfer & Dedusting (Pre Domes)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>6</u>	6	Oxide Transfer & Dedusting (Post Domes)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>7</u>	7	Oxide & Remet Screening & Dedusting	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>16</u>	16	Furnace Charge Hopper Loading Silos							0.00	0.00
<u>17</u>	17	Charge Hopper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.04
<u>29</u>	29	Reformer Main Flue Ejector Stack							0.43	1.90
<u>8</u>	8	Furnace Dedusting (BSG Dust Collection)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.05
<u>9</u>	9	Briquetter Dedusting	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.03
<u>38</u>	38	Hot Pressure Relief Vent (Flare)							0.00	0.00
<u>11a</u>	11a	HBI Cooling Conveyor 1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.01
<u>11b</u>	11b	HBI Cooling Conveyor 2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.01
<u>12</u>	12	Transfer & Product Screening Station No. 1 (Pre Pile)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>13</u>	13	Transfer & Product Screening Station No. 2 (Post Pile)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>14</u>	14	HBI Pile	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>36</u>	36	Remet / Fines Storage	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
<u>30</u>	30	Process Water Degasser							0.00	0.00
<u>33</u>	33	Salt Water Cooling Tower							0.00	0.00
<u>39</u>	39	Paved Road Fugitive Dust							0.00	0.00
<u>34</u>	34	Emergency Generator							0.00	0.00
<u>35</u>	35	Fire Pump							0.00	0.00
<u>FugGHG</u>	-	Fugitive Natural Gas							0.00	0.00
TOTAL EMISSIONS			<0.01	0.02	<0.01	0.01	<0.01	0.01	0.46	2.05

Emission Point Source Calculations

Emission Point Identifier: 17
 Description: Charge Hopper

Inputs

Description	Value	Units
Annual Hours of Operation	8,760	hr/yr
Designed Production Rate	3,197,250	tons/yr
Design Volumetric Vent Rate	10,000	Nm ³ /hr
Gas Dust Loading	4.57	mg/Nm ³
PM ₁₀ Mass Fraction	100%	%
PM _{2.5} Mass Fraction (uncontrolled 15%, AP-42)	75.0%	%

Emissions Summary

Pollutant	Calculation	Process Emission Rate (lb/hr)	Process Emission Rate (tpy)
TSP	Below	0.10	0.441
PM ₁₀	Below	0.10	0.441
PM _{2.5}	Below	0.076	0.331
NOx	Seal Gas	2.02	8.8
SO2	Seal Gas	0.24	1.05
CO	Seal Gas	2.82	12.4
CO2	Seal Gas	12486	54689
CH4	Seal Gas	0.24	1.05
N2O	Seal Gas	0.07	0.29
CO2e	Seal Gas	12512	54802
VOC	Seal Gas	0.18	0.81
Lead (Pb)	Seal Gas	5.71E-05	2.50E-04
Benzene	Seal Gas	1.10E-05	4.80E-05
Dichlorobenzene	Seal Gas	6.27E-06	2.74E-05
Formaldehyde	Seal Gas	3.92E-04	1.72E-03
n-Hexane	Seal Gas	9.40E-03	4.12E-02
Naphthalene	Seal Gas	3.19E-06	1.40E-05
Toluene	Seal Gas	1.78E-05	7.78E-05
PAH	Seal Gas	4.39E-07	1.92E-06
Hg	Below	1.01E-08	4.41E-08
Cd	Below	5.04E-08	2.21E-07
Cr	Below	5.04E-06	2.21E-05
Mg (as MgO)	Below	6.05E-04	2.65E-03
Mn	Below	5.34E-05	2.34E-04
Ni	Below	3.02E-05	1.32E-04
Cu	Below	1.01E-05	4.41E-05
Zn	Below	2.02E-05	8.83E-05

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Calculate Emissions

Pollutant	Normal Dedusting Airflow Rate	Maximum Clean gas Dust Loading	Mass Fraction of Total PM	Average Emission Rate	Annual Emission Rate
	(Nm ³ /hr)	(mg/Nm ³)	%	(lb/hr)	(tons/yr)
TSP	10,000	4.57	100%	0.10	0.441
PM ₁₀	10,000	4.57	100%	0.10	0.441
PM _{2.5}	10,000	4.57	75.0%	0.076	0.331

Metal Emissions (based on ore content)

Pollutant	Concentration (ppm)	Average Emission Rate	Annual Emission Rate
		(lb/hr)	(tpy)
Hg	0.1	1.01E-08	4.41E-08
Cd	0.5	5.04E-08	2.21E-07
Cr	50	5.04E-06	2.21E-05
Mg (as MgO)	6000	6.05E-04	2.65E-03
Mn	530	5.34E-05	2.34E-04
Pb	50	5.04E-06	2.21E-05
Ni	300	3.02E-05	1.32E-04
Cu	100	1.01E-05	4.41E-05
Zn	200	2.02E-05	8.83E-05

Emission Point Source Calculations

Emission Point Identifier: 29
 Description: Reformer Main Flue Ejector Stack

Inputs

Description	Value	Units	Comments
Annual Hours of Operation	8,760	hr/yr	
Designed Production Rate, Annual	2,205,000	tons/yr	Manufacturer
Designed Production Rate, Hourly	360	ton HBI / hr	Manufacturer
Maximum Production Rate Ratio	110%	%	Design Maximum
Total Reformer Vented Rate, wet @ 1.9% O2	464,300	Nm ³ /hr	Design Maximum
Seal Gas System Off-take	25,000	Nm ³ /hr	Manufacturer
Normal Reformer Firing Rate	1,591	MMBtu/hr	Main and Aux burners plus Top Gas
Nominal Natural Gas Supplement Rate	15.5%	%	Manufacturer
Total PM Emission Factor, dry @3%O2	10.0	mg/Nm ³	Vendor Guarantee, total
Filterable PM Emission Factor	25.0%	%	AP-42, Chapter 1, Section 4
NO _x Uncontrolled Concentration, dry at 3% O2	110.0	mg/Nm ³	Vendor Guarantee, total
PM ₁₀ Filterable Mass Fraction	100%		Worst case
PM _{2.5} Filterable Mass Fraction	100%		Worst case
CO Emission Factor	84.0	lbs / mmft ³	AP-42, Chapter 1, Section 4, Table 1.4-1
CO2 Emission Factor	120,000	lbs / mmft ³	AP-42, Chapter 1, Section 4, Table 1.4-2
CH4 Emission Factor	2.3	lbs / mmft ³	AP-42, Chapter 1, Section 4, Table 1.4-2
N2O Emission Factor	0.64	lbs / mmft ³	AP-42, Chapter 1, Section 4, Table 1.4-2
SO ₂ Emission Factor	2.3	lbs / mmft ³	Manufacturer
VOC Emission Factor	5.50	lbs / mmft ³	AP-42, Chapter 1, Section 4, Table 1.4-2
Natural Gas, fuel and reduction gas raw materials	380	Nm ³ /ton HBI	Manufacturer, total

Emissions Summary

Pollutant	Average Emission Rate (lb/hr)	Annual Emission Rate (tpy)
TSP	8.06	35.3
PM ₁₀	8.06	35.3
PM _{2.5}	8.06	35.3
NO _x	88.6	388
SO ₂	10.51	32.2
CO	124	543
CO2	548,516	1,679,829
CH4	10.51	32.2
N2O	2.93	9.0
CO2e	549,650	1,683,304
VOC	8.12	35.6
Lead (Pb)	2.29E-03	7.00E-03
Benzene	4.82E-04	2.11E-03
Dichlorobenzene	2.75E-04	1.21E-03
Formaldehyde	0.0172	0.0754
n-Hexane	0.413	1.81
Naphthalene	1.40E-04	6.13E-04
Toluene	7.80E-04	3.42E-03
PAH	1.93E-05	8.44E-05

Calculate Emissions

Via Outlet Concentrations (Manufacturer)

Pollutant	Normal Vented Flue Flow Rate (Nm ³ /hr)	Dry Vented Flue Flow Rate (dNm ³ /hr)	Component Concentration @ 3% O ₂ (mg/dNm ³)	Control Efficiency (%)	Average Emission Rate (lb/hr)	Annual Emission Rate (tons/yr)
NO _x	439,300	344,367	110.0	0%	88.6	388
TSP	439,300	344,367	10.0	0%	8.06	35.3
PM ₁₀	439,300	344,367	10.0	0%	8.06	35.3
PM _{2.5}	439,300	344,367	10.0	0%	8.06	35.3

Emission rate correction to 3% O₂: dNm³ * mg/dNm³ / 453600 * ((20.9-1.9)/(20.9-3))

Via AP-42 Emission Factor, Chapter 1, Section 4, Tables 1.4-1 and 1.4-2

Pollutant	Normal Reformer Firing Rate (MMBtu/hr)	Emission Factor (lbs/mmBtu NG)	Control Efficiency (%)	Seal Gas Compensation (-)	Average Emission Rate (lb/hr)	Annual Emission Rate (tons/yr)
CO	1,591	0.0824	0%	0.946	124.0	543
VOC	1,591	0.00539	0%	0.946	8.12	35.6

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Via Reducing Gas and Fuel Maximum

Pollutant	Total NG as Fuel and Raw Material	Max HBI output		Emission Factor	Control Efficiency	Seal Gas Compensation	Average Emission Rate	Annual Emission Rate
	(Nm ³ /ton)	(ton HBI/hr)	(ton HBI/yr)	(lbs/mmcf NG)	%	-	(lb/hr)	(tons/yr)
SO2	380	360	2,205,000	2.30	0%	0.946	10.51	32.2
CO2	380	360	2,205,000	120,000	0%	0.946	548,516	1,679,829
CH4	380	360	2,205,000	2.3	0%	0.946	10.5	32.2
N2O	380	360	2,205,000	0.64	0%	0.946	2.9	9.0
CO2e	380	360	2,205,000	120,248	0%	0.946	549,650	1,683,304
Lead (Pb)	380	360	2,205,000	5.00E-04	0%	0.946	2.29E-03	0.0070

Calculate HAP Emissions

Pollutant	Normal Reformer Firing Rate	AP-42 Emission Factor	Nominal Natural Gas Supplement Rate	Seal Gas System Compensation	Average Emission Rate	Annual Emission Rate
	(MMBtu/hr)	(lb/MBtu)	%	(-)	(lb/hr)	(tons/yr)
Benzene	1,591	2.06E-06	15.5%	0.946	4.82E-04	2.11E-03
Dichlorobenzene	1,591	1.18E-06	15.5%	0.946	2.75E-04	1.21E-03
Formaldehyde	1,591	7.35E-05	15.5%	0.946	1.72E-02	7.54E-02
n-Hexane	1,591	1.76E-03	15.5%	0.946	4.13E-01	1.81E+00
Naphthalene	1,591	5.98E-07	15.5%	0.946	1.40E-04	6.13E-04
Toluene	1,591	3.33E-06	15.5%	0.946	7.80E-04	3.42E-03
PAH	1,591	8.24E-08	15.5%	0.946	1.93E-05	8.44E-05
Arsenic	1,591	1.96E-07	15.5%	0.946	4.59E-05	2.01E-04
Barium	1,591	4.31E-06	15.5%	0.946	1.01E-03	4.42E-03
Beryllium	1,591	1.18E-08	15.5%	0.946	2.75E-06	1.21E-05
Cadmium	1,591	1.08E-06	15.5%	0.946	2.52E-04	1.11E-03
Chromium	1,591	1.37E-06	15.5%	0.946	3.21E-04	1.41E-03
Cobalt	1,591	8.24E-08	15.5%	0.946	1.93E-05	8.44E-05
Copper	1,591	8.33E-07	15.5%	0.946	1.95E-04	8.54E-04
Manganese	1,591	3.73E-07	15.5%	0.946	8.72E-05	3.82E-04
Mercury	1,591	2.55E-07	15.5%	0.946	5.96E-05	2.61E-04
Molybdenum	1,591	1.08E-06	15.5%	0.946	2.52E-04	1.11E-03
Nickel	1,591	2.06E-06	15.5%	0.946	4.82E-04	2.11E-03
Selenium	1,591	2.35E-08	15.5%	0.946	5.51E-06	2.41E-05
Vanadium	1,591	2.25E-06	15.5%	0.946	5.28E-04	2.31E-03
Zinc	1,591	2.84E-05	15.5%	0.946	6.65E-03	2.91E-02

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Emission Point Source Calculations

Source ID: **38**
 Description: **Hot Pressure Relief Vent (Flare)**
Startup, Shutdown and Malfunction estimates

Inputs	Value	Units
Pilot Natural Gas Flowrate (Average)	459	scf/hr
Operation Hours	8,760	hr/yr
Higher Heating Value, Natural Gas	1,000	Btu/scf
Number of Startup/Shutdown Events	26	events/yr
Startup Venting Duration	8.00	hours
Startup Venting Volume	160,000	Nm ³
Startup Venting Heating Value	94	Btu/scf
Shutdown Venting Duration	0.500	hours
Shutdown Venting Volume	15,000	Nm ³
Shutdown Venting Heating Value	272	Btu/scf
Maximum Venting Rate	100%	%
Control Efficiency	98%	%

Emissions Summary

Pollutant	Max Hourly Emissions	Annual Emission Rate
	(lb/hr)	(tpy)
TSP ¹	0.51	0.0763
PM ₁₀ ¹	0.51	0.0763
PM _{2.5} ¹	0.51	0.0763
NO _x	20.3	2.96
SO ₂	0.0189	0.00360
CO	239	31.8
VOC	0.042	0.0152
CH ₄	3,277	9.05
N ₂ O	0.000	0.0013
CO ₂ e	15,319	2,236
Lead (Pb)	2.30E-07	1.01E-06

¹ Assume PM₁₀=PM_{2.5}=TSP

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Start Up Venting Emission Calculations

Calculate Flue Gas Components

Component	Concentration (ppmv)	Partial Volumetric Flow Rate* (Nm ³ /hr)	Molar Vent Rate (kg-mol/hr)	Molecular Weight (kg/kg-mol)	Average Flow Rate (kg/hr)	Average Flow Rate (lb/hr)	Maximum Flow Rate (lb/hr)
CO _{2e}	46,300	890	39.7	44.0	1,748.37	3,854.48	3,854.48
H ₂ O	46,300	890	39.73	18.0	715.47	1,577.34	1,577.34
N ₂	515,300	9,910	442	28.0	12,385.91	27,306.23	27,306.23
CO	60,800	1,169	52.2	28.0	1,461.25	3,221.50	3,221.50
H ₂	263,300	5,063	226	2.02	455.41	1,004.00	1,004.00
CH ₄	108,000	2,077	93	16.0	1,486.62	3,277.44	3,277.44
Total	1,040,000	20,000	892	-	18,253.03	40,241.00	40,241.00

* - Assumes ideal gas behavior.

Startup Concentrations estimate from Manufacturer

Calculate Flue Gas Emissions

Component	Emission Factor (lb/MMBtu)	Venting Heat Value (MMBtu/hr)	Average Flow Rate (lb/hr)	Maximum Flow Rate (lb/hr)	Control Efficiency	Average Emission Rate (lb/hr)	Annual Emission Rate (tpy)
CO _{2e}	-	-	3,854.48	3,854.48	0%	3,854.48	401
CO	-	-	3,221.50	3,221.50	98%	64.4	6.70
CH ₄	-	-	3,277.44	3,277.44	98%	65.5	6.82
TSP	0.00760	66	-	-	-	0.50	0.0525
NOx	0.0700	66	-	-	-	4.6	0.483
SO ₂	0.0000648	66	-	-	-	0.00	4.47E-04
VOC	5.94E-04	66	-	-	-	0.04	4.10E-03

* - Assumes ideal gas behavior.

Shut Down Venting Emission Calculations

Calculate Flue Gas Components

Component	Concentration (ppmv)	Partial Volumetric Flow Rate* (Nm ³ /hr)	Molar Vent Rate (kg-mol/hr)	Molecular Weight (kg/kg-mol)	Average Flow Rate (kg/hr)	Average Flow Rate (lb/hr)	Maximum Flow Rate (lb/hr)
CO ₂	184,015	3,539	158	44.0	6,948.71	15,319.27	15,319.27
H ₂ O	70,632	1,358	60.6	18.0	1,091.47	2,406.28	2,406.28
N ₂	5,576	107	4.78	28.0	134.03	295.49	295.49
CO	225,836	4,343	194	28.0	5,427.69	11,966.00	11,966.00
H ₂	478,625	9,204	411	2.02	827.84	1,825.06	1,825.06
CH ₄	35,316	679	30.3	16.0	486.13	1,071.72	1,071.72
Total	1,000,000	19,231	858	-	14,915.87	32,883.83	32,883.83

* - Assumes ideal gas behavior.

Shutdown Concentrations estimate from Manufacturer

Calculate Flue Gas Emissions

Component	Emission Factor (lb/MMBtu)	Venting Heat Value (MMBtu/hr)	Average Flow Rate (lb/hr)	Maximum Flow Rate (lb/hr)	Control Efficiency	Average Emission Rate (lb/hr)	Annual Emission Rate (tpy)
CO _{2e}	-	-	15,319.27	15,319.27	0.00%	15,319.27	1,593
CO	-	-	11,966.00	11,966.00	98.0%	239	24.9
CH ₄	-	-	1,071.72	1,071.72	98.0%	21.4	2.23
TSP	2.68E-04	288.2	0.00441	0.00441	0.00%	0.082	0.00850
NOx	7.00E-02	288.2	-	-	-	20.2	2.10
SO ₂	6.48E-05	288.2	-	-	-	0.0187	0.00194
VOC	0.00	288.2	0.00	0.00	98.0%	0.00	0.00

* - Assumes ideal gas behavior.

Pilot Lights Emission Calculations

Flare pilot emission calculations are based on AP-42 Section 1.4 (07/98) Natural Gas Combustion, Table 1.4-1 and Table 1.4-2 factors for Large Wall-Fired Boilers, Uncontrolled (Post-NSPS)

(1) Calculate average/maximum heat input values (MMBtu/hr) based on natural gas flowrate

Fuel Component	Natural Gas Flowrate (Average) ¹	Natural Gas Flowrate (Maximum) ¹	Gross Heating Value	Average Hourly Heat Input	Maximum Hourly Heat Input
	(scf/hr)	(kg/hr)	(BTU/scf)	(MMBtu/hr)	(MMBtu/hr)
Natural Gas	459	459	1,000	0.459	0.459

(2) Calculate average (lb/hr and tons/yr) and maximum hourly (lb/hr) emissions

Pollutant	Emission Factor ²	Emission Factor	Average Hourly Heat Input	Average Emission Rate	Annual Emission Rate
	(lb/ 10 ⁶ scf)	(lb/MMBtu)	(MMBtu/hr)	(lb/hr)	(tpy)
TSP ¹	7.60	0.00760	0.459	0.00349	0.0153
NO _x	190	0.190	0.459	0.0872	0.382
SO ₂ ³	0.600	6.00E-04	0.459	2.75E-04	1.21E-03
CO	84.0	0.0840	0.459	0.0386	0.169
VOC	5.50	5.50E-03	0.459	2.52E-03	1.11E-02
CO ₂ ²	120,000	1.20E+02	0.459	5.51E+01	2.41E+02
CH ₄ ²	2.3	2.30E-03	0.459	1.06E-03	4.62E-03
N ₂ O ²	0.64	6.40E-04	0.459	2.94E-04	1.29E-03
CO ₂ e	120,248	1.20E+02	0.459	5.52E+01	2.42E+02
Lead (Pb)	5.00E-04	5.00E-07	0.459	2.30E-07	1.01E-06

¹ Assume PM₁₀=PM_{2.5}=TSP

² Emission Factors from AP-42 Table 1.4-1 and Table 1.4-2

³ SO₂ AP-42 emission factor adjusted for typical natural gas Sulfur content

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Emission Point Source Calculations

Emission Point Identifier: NA
 Description: Seal Gas Generator

Inputs

Description	Value	Units
Annual Hours of Operation	8,760	hr/yr
Designed Production Rate	2,205,000	tons/yr
Designed Production Rate, Hourly	360	ton HBI / hr
Total Reformer Volumetric Vent Rate	464,300	Nm ³ /hr
Seal Gas System Off-take	25,000	Nm ³ /hr
Normal Reformer Firing Rate	1,591	MMBtu/hr
Nominal Natural Gas Supplement Rate	15.5%	lb/MMBtu
NO _x Uncontrolled Concentration, dry at 3% O ₂	110.0	mg/Nm ³
CO Emission Factor	84.0	lbs / mmft ³
SO ₂ Emission Factor	2.300	Manufacturer
VOC Emission Factor	5.50	lbs / mmft ³
Natural Gas, fuel and reduction gas raw materials	380	Nm ³ /ton HBI

NOTE:

Seal gas consists of Reformer Flue Gas. Emissions for theseal gas generator are calculated in the same manner as total emissions from the Reformer, and then adjusted by the ratio of flue gas diverted to the seal gas system. The Seal Gas Generator takes exhaust gas from the main ejector stack (Stack ID 29), cools and dehydrates the gas. This gas is then used to seal the tower. While most of the gas remains in the system (i.e. the tower) and exits via the Top Gas, it is assumed for worst-case permitting purposes to be emitted from the BSG Baghouse (Stack ID 8), the Briquetter Baghouse (Stack ID 9) and the Charge Hopper Baghouse (Stack ID 17). Emissions are calculated on this sheet then distributed by the proportions as follows: BSG Baghouse 40%; Charge Hopper Baghouse 40%; Briquetter 20%. Particulate Emissions are based on baghouse performance guarantees.

Emissions Summary

Pollutant	Average Emission Rate (lb/hr)	Annual Emission Rate (tpy)	BSG (Stk 8) 40% (lb/hr)	BSG (Stk 8) 40% (tpy)	Charge Hopper (Stk 17) 40% (lb/hr)	Charge Hopper (Stk 17) 40% (tpy)	Briquetter (Stk 9) 20% (lb/hr)	Briquetter (Stk 9) 20% (tpy)
NO _x	5.04	22.1	2.02	8.8	2.02	8.8	1.01	4.4
SO ₂	0.60	2.62	0.24	1.05	0.24	1.05	0.12	0.52
CO	7.05	30.9	2.82	12.4	2.82	12.4	1.41	6.2
CO ₂	31,215	136,723	12,486	54,689	12,486	54,689	6,243	27,345
CH ₄	0.598	2.621	0.239	1.048	0.239	1.048	0.120	0.524
N ₂ O	0.166	0.729	0.067	0.292	0.067	0.292	0.033	0.146
CO ₂ e	31,280	137,006	12,512	54,802	12,512	54,802	6,256	27,401
VOC	0.462	2.02	0.185	0.81	0.185	0.81	0.092	0.40
Lead (Pb)	1.30E-04	5.70E-04	5.20E-05	2.28E-04	5.20E-05	2.28E-04	2.60E-05	1.14E-04
Benzene	2.74E-05	1.20E-04	1.10E-05	4.80E-05	1.10E-05	4.80E-05	5.48E-06	2.40E-05
Dichlorobenzene	1.57E-05	6.86E-05	6.27E-06	2.74E-05	6.27E-06	2.74E-05	3.13E-06	1.37E-05
Formaldehyde	9.79E-04	4.29E-03	3.92E-04	1.72E-03	3.92E-04	1.72E-03	1.96E-04	8.58E-04
n-Hexane	2.35E-02	1.03E-01	9.40E-03	4.12E-02	9.40E-03	4.12E-02	4.70E-03	2.06E-02
Naphthalene	7.96E-06	3.49E-05	3.19E-06	1.40E-05	3.19E-06	1.40E-05	1.59E-06	6.98E-06
Toluene	4.44E-05	1.94E-04	1.78E-05	7.78E-05	1.78E-05	7.78E-05	8.88E-06	3.89E-05
PAH	1.10E-06	4.80E-06	4.39E-07	1.92E-06	4.39E-07	1.92E-06	2.19E-07	9.61E-07

Calculate Emissions

Via Outlet Concentrations (Manufacrtrr)

Pollutant	Normal Vented Flue Flow Rate (Nm ³ /hr)	Dry Vented Flue Flow Rate (dNm ³ /hr)	Component Concentration @ 3% O ₂ (mg/dNm ³)	Control Efficiency (%)	Average Emission Rate (lb/hr)	Annual Emission Rate (tons/yr)
NO _x	25,000	19,598	110	0.00%	5.04	22.1

Emission rate correction to 3% O₂: dNm³ * mg/dNm³ / 453600 * ((20.9-1.9)/(20.9-3))

Via AP-42 Emission Factor, Chapter 1, Section 4, Tables 1.4-1 and 1.4-2

Pollutant	Normal Reformer Firing Rate (MMBtu/hr)	Emission Factor (lbs/mmBtu NG)	Seal Gas Compensation	Control Efficiency (%)	Average Emission Rate (lb/hr)	Annual Emission Rate (tons/yr)
CO	1,591	0.0824	0.0538	0.00%	7.05	30.9
VOC	1,591	0.00539	0.0538	0.00%	0.462	2.02

Via Reducing Gas and Fuel Maximum

Pollutant	Total NG as Fuel and RM (Nm ³ /ton)	Max HBI output (ton HBI/hr)	Emission Factor (lbs/mmcf NG)	Control Efficiency (%)	Seal Gas Compensation	Average Emission Rate (lb/hr)	Annual Emission Rate (tons/yr)
SO ₂	380	360	2.3	0.00%	0.0538	0.598	2.621
CO ₂	380	360	120,000	0.00%	0.0538	31215	136723
CH ₄	380	360	2.3	0.00%	0.0538	0.598	2.62
N ₂ O	380	360	0.6	0.00%	0.0538	0.166	0.73
CO ₂ e	380	360	120,248	0.00%	0.0538	31280	137006
Lead (Pb)	380	360	5.00E-04	0.00%	0.0538	1.30E-04	5.70E-04

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Calculate HAP Emissions (AP-42)

Pollutant	Normal Reformer Firing Rate	AP-42 Emission Factor	Nominal Natural Gas Supplement Rate	Seal Gas System Compensation	Average Emission Rate	Annual Emission Rate
	(MMBtu/hr)	(lb/MBtu)	%	(-)	(lb/hr)	(tons/yr)
Benzene	1,591	2.06E-06	15.5%	0.0538	2.74E-05	1.20E-04
Dichlorobenzene	1,591	1.18E-06	15.5%	0.0538	1.57E-05	6.86E-05
Formaldehyde	1,591	7.35E-05	15.5%	0.0538	9.79E-04	4.29E-03
n-Hexane	1,591	1.76E-03	15.5%	0.0538	2.35E-02	1.03E-01
Naphthalene	1,591	5.98E-07	15.5%	0.0538	7.96E-06	3.49E-05
Toluene	1,591	3.33E-06	15.5%	0.0538	4.44E-05	1.94E-04
PAH	1,591	8.24E-08	15.5%	0.0538	1.10E-06	4.80E-06
Arsenic	1,591	1.96E-07	15.5%	0.0538	2.61E-06	1.14E-05
Barium	1,591	4.31E-06	15.5%	0.0538	5.74E-05	2.52E-04
Beryllium	1,591	1.18E-08	15.5%	0.0538	1.57E-07	6.86E-07
Cadmium	1,591	1.08E-06	15.5%	0.0538	1.44E-05	6.29E-05
Chromium	1,591	1.37E-06	15.5%	0.0538	1.83E-05	8.01E-05
Cobalt	1,591	8.24E-08	15.5%	0.0538	1.10E-06	4.80E-06
Copper	1,591	8.33E-07	15.5%	0.0538	1.11E-05	4.86E-05
Manganese	1,591	3.73E-07	15.5%	0.0538	4.96E-06	2.17E-05
Mercury	1,591	2.55E-07	15.5%	0.0538	3.39E-06	1.49E-05
Molybdenum	1,591	1.08E-06	15.5%	0.0538	1.44E-05	6.29E-05
Nickel	1,591	2.06E-06	15.5%	0.0538	2.74E-05	1.20E-04
Selenium	1,591	2.35E-08	15.5%	0.0538	3.13E-07	1.37E-06
Vanadium	1,591	2.25E-06	15.5%	0.0538	3.00E-05	1.32E-04
Zinc	1,591	2.84E-05	15.5%	0.0538	3.79E-04	1.66E-03

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Emission Point Source Calculations

Emission Point Identifier: 8
Description: Furnace Dedusting (BSG Dust Collection)

Inputs

Description	Value	Units
Annual Hours of Operation	8,760	hr/yr
Iron Oxide Consumption Rate	2,205,000	tons/yr
Design Volmetric Vent Rate	63,000	Nm ³ /hr
Clean Gas Concentration	18.0	mg/Nm ³
PM ₁₀ Mass Fraction	100%	%
PM _{2.5} Mass Fraction (Process Experience)	50%	%

Emissions Summary

Pollutant	Calculation	Emission Rate (lb/hr)	Emission Rate (tpy)
TSP	Below	2.50	11.0
PM ₁₀	Below	2.50	11.0
PM _{2.5}	Below	1.25	5.5
NOx	Seal Gas	2.02	8.8
SO2	Seal Gas	0.24	1.05
CO	Seal Gas	2.82	12.4
CO2	Seal Gas	12486	54689
CH4	Seal Gas	0.24	1.05
N2O	Seal Gas	0.07	0.29
CO2e	Seal Gas	12512	54802
VOC	Seal Gas	0.18	0.81
Lead (Pb)	Seal Gas	1.77E-04	7.75E-04
Benzene	Seal Gas	1.10E-05	4.80E-05
Dichlorobenzene	Seal Gas	6.27E-06	2.74E-05
Formaldehyde	Seal Gas	3.92E-04	1.72E-03
n-Hexane	Seal Gas	9.40E-03	4.12E-02
Naphthalene	Seal Gas	3.19E-06	1.40E-05
Toluene	Seal Gas	1.78E-05	7.78E-05
PAH	Seal Gas	4.39E-07	1.92E-06
Hg	Below	2.50E-07	1.10E-06
Cd	Below	1.25E-06	5.48E-06
Cr	Below	1.25E-04	5.48E-04
Mg (as MgO)	Below	1.50E-02	6.57E-02
Mn	Below	1.33E-03	5.80E-03
Ni	Below	7.50E-04	3.29E-03
Cu	Below	2.50E-04	1.10E-03
Zn	Below	5.00E-04	2.19E-03

Calculate Emissions

Pollutant	Normal Dedusting Airflow Rate	Maximum Clean gas Dust Loading	Mass Fraction of Total PM	Average Emission Rate	Annual Emission Rate
	(Nm ³ /hr)	(mg/Nm ³)	%	(lb/hr)	(tons/yr)
TSP	63,000	18.00	100%	2.50	11.0
PM ₁₀	63,000	18.00	100%	2.50	11.0
PM _{2.5}	63,000	18.00	50%	1.25	5.5

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Metal Emissions (based on ore content)

Pollutant	Concentration (ppm)	Average Emission Rate	Annual Emission Rate
		(lb/hr)	(tpy)
Hg	0.1	2.50E-07	1.10E-06
Cd	0.5	1.25E-06	5.48E-06
Cr	50	1.25E-04	5.48E-04
Mg (as MgO)	6000	1.50E-02	6.57E-02
Mn	530	1.33E-03	5.80E-03
Pb	50	1.25E-04	5.48E-04
Ni	300	7.50E-04	3.29E-03
Cu	100	2.50E-04	1.10E-03
Zn	200	5.00E-04	2.19E-03

Emission Point Source Calculations

Emission Point Identifier: **9**
 Description: **Briquetter Dedusting**

Inputs

Description	Value	Units
Annual Hours of Operation	8,760	hr/yr
Designed Production Rate	2,205,000	tons/yr
Design Volumetric Vent Rate	100,000	Nm ³ /hr
Clean Gas Concentration	18.0	mg/Nm ³
PM ₁₀ Mass Fraction	100%	%
PM _{2.5} Mass Fraction	50.0%	%

Emissions Summary

Pollutant	Calculation	Emission Rate (lb/hr)	Emission Rate (tpy)
TSP	Below	3.97	17.4
PM ₁₀	Below	3.97	17.4
PM _{2.5}	Below	1.98	8.7
NOx	Seal Gas	1.01	4.4
SO2	Seal Gas	0.12	0.52
CO	Seal Gas	1.41	6.2
CO2	Seal Gas	6243.07	27344.63
CH4	Seal Gas	0.12	0.52
N2O	Seal Gas	0.03	0.15
CO2e	Seal Gas	6255.98	27401.19
VOC	Seal Gas	0.09	0.40
Lead (Pb)	Seal Gas	2.24E-04	9.83E-04
Benzene	Seal Gas	5.48E-06	2.40E-05
Dichlorobenzene	Seal Gas	3.13E-06	1.37E-05
Formaldehyde	Seal Gas	1.96E-04	8.58E-04
n-Hexane	Seal Gas	4.70E-03	2.06E-02
Naphthalene	Seal Gas	1.59E-06	6.98E-06
Toluene	Seal Gas	8.88E-06	3.89E-05
PAH	Seal Gas	2.19E-07	9.61E-07
Hg	Below	3.97E-07	1.74E-06
Cd	Below	1.98E-06	8.69E-06
Cr	Below	1.98E-04	8.69E-04
Mg (as MgO)	Below	2.38E-02	1.04E-01
Mn	Below	2.10E-03	9.21E-03
Ni	Below	1.19E-03	5.21E-03
Cu	Below	3.97E-04	1.74E-03
Zn	Below	7.94E-04	3.48E-03

Calculate Emissions

Pollutant	Normal Dedusting Airflow Rate	Maximum Clean gas Dust Loading	Mass Fraction of Total PM	Average Emission Rate	Annual Emission Rate
	(Nm ³ /hr)	(mg/Nm ³)	%	(lb/hr)	(tons/yr)
TSP	100,000	18.00	100%	3.97	17.4
PM ₁₀	100,000	18.00	100%	3.97	17.4
PM _{2.5}	100,000	18.00	50%	1.98	8.7

Metal Emissions (based on ore content)

Pollutant	Concentration (ppm)	Average Emission Rate	Annual Emission Rate
		(lb/hr)	(tpy)
Hg	0.1	3.97E-07	1.74E-06
Cd	0.5	1.98E-06	8.69E-06
Cr	50	1.98E-04	8.69E-04
Mg (as MgO)	6000	2.38E-02	1.04E-01
Mn	530	2.10E-03	9.21E-03
Pb	50	1.98E-04	8.69E-04
Ni	300	1.19E-03	5.21E-03
Cu	100	3.97E-04	1.74E-03
Zn	200	7.94E-04	3.48E-03

Emission Point Source Calculations

Emission Point Identifier: 30
Description: Process Water Degassers

Inputs

Description	Value	Units	Comments
Annual Hours of Operation	8,760	hr/yr	
Designed Production Rate	2,205,000	tons/yr	Manufacturer
Total Vapor Exhaust Rate	55,000	kg/hr	Manufacturer
CO Mass Fraction	200	ppm	Manufacturer
CO2 Mass Fraction	2080	ppm	Manufacturer
Methane Mass Fraction	40	ppm	Manufacturer

Emissions Summary

Pollutant	ppm	Average Emission Rate (lb/hr)	Annual Emission Rate (tpy)
CO	200	24.3	106
CO2	2080	252	1,105
CH4	40	4.9	21
CO2e	3080	374	1,636

Emission Point Source Calculations

Case: 34
Description: Emergency Generator

Given:

- 1) 2500kWe Diesel Emergency Power Generator
- 2) Nominal Emissions data provided by a NSPS Certified manufacturer

Mechanical	kWm	2500
	Load %	100
NOx	g/kWh	5.822
HC	g/kWh	0.179
CO	g/kWh	0.689
PM	g/kWh	0.085

	Fuel consumption (gph)	Emissions (lbs/gal)
CO2	174.6	22.51
CH4	174.6	0.000052
N2O	174.6	0.00026

- 3) Fuel: 15ppm (0.0015%) Sulfur Diesel
- 4) SO2 emission factor: AP42 Chapter 3, Section 4: $8.09E-3 * S = 8.09E-3 * .0015 = 1.2E-5 \text{ lb/hph} = 0.0077 \text{ g/kWh}$
- 5) NSPS IIII Hours based on Readiness and Maintenance limit of 100 hours (emergency use not limited)

Nominal Emissions Calculation - Requested Limit

Pollutant	100% Load (g/kWh)	100% Hourly Per Unit (lbs/hr)	100% Annual Emission Rate (tpy)
NOx	5.822	32.09	1.60
HC	0.179	0.99	0.049
CO	0.689	3.80	0.190
PM	0.085	0.47	0.023
SO2	0.0077	0.04	0.002
CO2	-	3930.81	196.540
CH4	-	0.01	0.000
N2O	-	0.05	0.002
CO2e	-	3,944.57	197.228

Hours	Per Unit
100%	100

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Emission Point Source Calculations

Case: 35
Description: Fire Pump

Given:

- 1) 175kWe Diesel Emergency Power Generator
- 2) Nominal Emissions data provided by a NSPS Certified manufacturer

Mechanical	kWm	175
	Load %	100
NOx	g/kWh	5.822
HC	g/kWh	0.179
CO	g/kWh	0.689
PM	g/kWh	0.085

	Fuel consumption (gph)	Emissions (lb/gal)
CO2	11.4	22.51
CH4	11.4	0.000052
N2O	11.4	0.00026

- 3) Fuel: 15ppm (0.0015%) Sulfur Diesel
- 4) SO2 emission factor: AP42 Chapter 3, Section 4: $8.09E-3 * S = 8.09E-3 * 0.0015 = 1.2E-5 \text{ lb/hph} = 0.0077 \text{ g/kWh}$
- 5) NSPS IIII Hours based on Readiness and Maintenance limit of 100 hours (emergency use not limited)

Nominal Emissions Calculation - Requested Limit

Pollutant	100% Load (g/kWh)	100% Hourly Per Unit (lbs/hr)	100% Annual Emission Rate (tpy)
NOx	5.822	2.25	0.112
HC	0.179	0.07	0.003
CO	0.689	0.27	0.013
PM	0.085	0.03	0.002
SO2	0.0077	0.00	0.000
CO2	-	256.61	12.831
CH4	-	0.001	0.00003
N2O	-	0.003	0.00015
CO2e	-	257.51	12.876

Hours	Per Unit
100%	100

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Emission Fugitives Calculations

Case: NA
Description: Natural Gas fugitive losses
Process Equipment IDs: NA

Given:

1) Emission factors derived from information presented in "Handbook for Estimating Methane Emissions from Canadian Natural Gas Systems" prepared for GRI Canada on May 25, 1998" page nos. 34-35.

Equipment	Reference *	Number of Pieces	Emissions Factor (kg/h/src)	Methane Emissions (tons/yr)	GHGe Emissions (tons/yr)
Onsite Equipment Inventory					
Flexible Hoses - Main Burner A	Connector	200	1.10E-04	2.12E-01	5.30E+00
Compensator	Other Flow Meter	200	9.06E-06	1.75E-02	4.38E-01
Flexible Hoses - Main Burner B	Connector	80	1.10E-04	8.48E-02	2.12E+00
Compensator	Other Flow Meter	80	9.06E-06	7.00E-03	1.75E-01
Flexible Hoses - NG	Connector	80	1.10E-04	8.48E-02	2.12E+00
Compensator - NG Outlet Manifold	Other Flow Meter	4	9.06E-06	3.50E-04	8.75E-03
Compensator - NG Outlet Manifold	Other Flow Meter	4	9.06E-06	3.50E-04	8.75E-03
Equipment after pressure reducing and metering station:					
Pressure Regulation Valves (PRV)	PRV	5	1.67E-02	8.04E-01	2.01E+01
Safety Valves (PSV)	PRV	2	1.67E-02	3.22E-01	8.04E+00
Shut Off Valves (SOV)	Block Valve	7	1.11E-03	7.50E-02	1.87E+00
Flow Control Valves (FV)	Control Valve	8	1.97E-02	1.52E+00	3.80E+01
Vent Valve	PRV	1	1.67E-02	1.61E-01	4.02E+00
Equipment after TOP from Houston/KM:					
Flow Control Valves (FCV)	Control Valve	2	1.97E-02	3.80E-01	9.51E+00
Shut Off Valves (SOV)	Block Valve	2	1.11E-03	2.14E-02	5.36E-01
Pressure Control Valves (PCV)	PRV	2	1.67E-02	3.22E-01	8.04E+00
			Total	4.0	100

* Reference refers to the equipment list