



State of Oregon Department of Environmental Quality

Source	CO		Reference	Operating		Emissions (tons/yr)
	Factor	Units		factor	units	
Heater #3 (HTR-3)		5 lbs/kgal	DEQ AQ-EF04	324.94	kgal/yr	0.81
Heater #4 (HTR-4)		5 lbs/kgal	DEQ AQ-EF04	81.36	kgal/yr	0.20
Thermal oxidizer (TO-01)		84 lbs/mmcf	DEQ AQ-EF05	8.49	mmcf/yr	0.36
Refinery (PESCO)	0.0659	lbs/hr	Engineered Value	8760	hrs/yr	0.29
oil polishing system (OPS-1)		5 lbs/kgal	AP42	52.87	kgal/yr	0.13
Sulfonation process (Sulfo-1)		lbs/kgal	AP42			
Sulfur tank boilers (B-1 & B2)		84 lbs/mmcf	DEQ AQ-EF05	8.54	mmcf/yr	0.36
TOTAL						2.15
HTR-3 distilate #2 burned		324.94 kgal/yr				
HTR-4 distalate #2 burned		81.36 kgal/yr				
TO-1 NG burned		8.49 mmcf/yr	Based on 1 mmBtu/hr burner, 8760 hrs/yr and 1032 Btu/scf NG			
Refinery ?????		6720 kgal/yr				
OPS oil processed		52.87 kgal/yr				
SULFO-1 Oil processed						
Sulfur tank boilers (B-1 & B2)		8.54 mmcf/yr	Based on 2x 0.503mmBtu/hr boilers, 8760 hrs/yr and 1032 Btu/scf NG			



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Source	NOX			Emissions	
	Factor	Units	Reference	Operating factor	units (tons/yr)
Heater #3 (HTR-3)		20 lbs/kgal	DEQ AQ-EF04	324.94	kgal/yr 3.25
Heater #4 (HTR-4)		20 lbs/kgal	DEQ AQ-EF04	81.36	kgal/yr 0.81
Thermal oxidizer (TO-01)		100 lbs/mmcf	DEQ AQ-EF05	8.49	mmcf/yr 0.42
Refinery (PESCO)	0.063	lbs/hr	Engineered Value	8760	hours/yr 0.28
oil polishing system (OPS-1)		20 lbs/kgal	AP42	52.87	kgal/yr 0.53
Sulfonation process (Sulfo-1)		lbs/kgal	AP42		
Sulfur tank boilers (B-1 & B2)		100 lbs/mmcf	DEQ AQ-EF05	8.54	mmcf/yr 0.43
TOTAL					5.72



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Source	PM		Operating factor	Emissions (tons/yr)
	Factor	Units		
Heater #3 (HTR-3)	3.3	lbs/kgal	DEQ AQ-EF04	0.54
Heater #4 (HTR-4)	3.3	lbs/kgal	DEQ AQ-EF04	0.13
Thermal oxidizer (TO-01)	2.5	lbs/mmcf	DEQ AQ-EF05	0.01
Refinery (PESCO)		lbs/kgal		
oil polishing system (OPS-1)	3.3	lbs/kgal	DEQ AQ-EF04	0.09
Sulfonation process (Sulfo-1)		lbs/kgal		
Sulfur tank boilers (B-1 & B2)	2.5	lbs/mmcf	DEQ AQ-EF05	0.01
TOTAL				0.78



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Source	PM10			Operating factor	Emissions (tons/yr)
	Factor	Units	Reference		
Heater #3 (HTR-3)	2.3	lbs/kgal	DEQ AQ-EF04	324.94 kgal/yr	0.37
Heater #4 (HTR-4)	2.3	lbs/kgal	DEQ AQ-EF04	81.36 kgal/yr	0.09
Thermal oxidizer (TO-01)	2.5	lbs/mmcf	DEQ AQ-EF05	8.49 mmcf/yr	0.01
Refinery (PESCO)		lbs/kgal			
oil polishing system (OPS-1)	2.3	lbs/kgal	DEQ AQ-EF04	52.87 kgal/yr	0.06
Sulfonation process (Sulfo-1)		lbs/kgal	AP42		
Sulfur tank boilers (B-1 & B2)	2.5	lbs/mmcf	DEQ AQ-EF05	8.54 mmcf/yr	0.01
TOTAL					0.55



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Source	PM2.5			Operating factor	Emissions (tons/yr)
	Factor	Units	Reference		
Heater #3 (HTR-3)		1.6 lbs/kgal	DEQ AQ-EF04	324.94 kgal/yr	0.26
Heater #4 (HTR-4)		1.6 lbs/kgal	DEQ AQ-EF04	81.36 kgal/yr	0.07
Thermal oxidizer (TO-01)		2.5 lbs/mmcf	DEQ AQ-EF05	8.49 mmcf/yr	0.01
Refinery (PESCO)		lbs/kgal			
oil polishing system (OPS-1)		1.6 lbs/kgal	DEQ AQ-EF04	52.87 kgal/yr	0.04
Sulfonation process (Sulfo-1)		lbs/kgal	AP42		
Sulfur tank boilers (B-1 & B2)		2.5 lbs/mmcf	DEQ AQ-EF05	8.54 mmcf/yr	0.01
TOTAL					0.39



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Source	SO2			Operating		Emissions (tons/yr)
	Factor	Units	Reference	factor	units	
Heater #3 (HTR-3)		71 lbs/kgal	DEQ AQ-EF04	324.94	kgal/yr	11.54
Heater #4 (HTR-4)		71 lbs/kgal	DEQ AQ-EF04	81.36	kgal/yr	2.89
Thermal oxidizer (TO-01)		1.7 lbs/mmcf	DEQ AQ-EF05	8.49	mmcf/yr	0.01
Refinery (PESCO)		lbs/kgal				
oil polishing system (OPS-1)	6.95	lbs/kgal	mat. balance	6,666.67	kgal/yr	23.17
Sulfonation process (Sulfo-1)		lbs/kgal				
Sulfur tank boilers (B-1 & B2)		1.7 lbs/mmcf	DEQ AQ-EF05	8.54	mmcf/yr	0.01
TOTAL						37.60

Oil Polishing system SO2 Assumes 6,666,667 gallons processed per year with input sulfur content of 875 ppm output sulfur content of 300 ppm, 6.04 lbs per gallon of oil processed.
 So, sulfur remaining in system is 0.0575 wt percent x 6,666,667 gallons x 6.04 lbs/gallon = 23,153 lbs S/yr or 11.6 tpy sulfur removed. SO2 emissions = 11.6 S tpy x 2 tons SO2/ton S or 23.2 tons/yr

NOTE: if any of the assumptions are found to be incorrect (such as input sulfur content higher, or output sulfur content lower) the material balance calculations for sulfur dioxide will need to be adjusted accordingly.

NOTE: Calculation is based on the assumption 100% of the sulfur removed by the OPS is volatilized and sent to the RTO through the OPS vacuum system. In practice, the % sent to RTO will be less than 100%.



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Source	VOC			Operating		Emissions (tons/yr)
	Factor	Units	Reference	factor	units	
Heater #3 (HTR-3)		0.2 lbs/kgal	DEQ AQ-EF04	324.94	kgal/yr	0.03
Heater #4 (HTR-4)		0.2 lbs/kgal	DEQ AQ-EF04	81.36	kgal/yr	0.01
Thermal oxidizer (TO-01)		5.5 lbs/mmcf	DEQ AQ-EF05	8.49	mmcf/yr	0.02
Refinery (PESCO)	1.443	lbs/hr	Engineered Value	8760	hrs/yr	6.32
oil polishing system (OPS-1)		0.2 lbs/kgal	DEQ AQ-EF04	52.87	kgal/yr	0.01
Sulfonation process (Sulfo-1)		lbs/kgal				
Sulfur tank boilers (B-1 & B2)		5.5 lbs/mmcf	DEQ AQ-EF05	8.54	mmcf/yr	0.02
TOTAL prior to TO control						6.41
Controlled VOC emissions (HTR-3, HTR-4, PESCO, OPS-1 controlled 97%)						0.24