Middletown Cogeneration Facility Emission Calculations

Emission Point:	**MWERF-5**
Description:	**MWER Acid Tanks - 93% Sulfuric Acid and 32% Hydrochloric Acid**

		HCl	H2SO4	
Physical	Tank Volume =	6000	6000	gallons
Characteristics	Weight Percent Acid in Water =	32%	93%	
and	Acid Demand =	250	150	gallons/day
Emission Data	Temperature =	68	68	F
	Acid Vapor Pressure =	0.454	0.00002	psia
Inputs shaded in Green	Days in a Year =	365	365	

Acid Tank Data						Vapor Displacement Emissions									
Product	Vessel Volume (gal)	Usage (gal/day)	Density (lb/gal)	Weight (lb/day)	Temp. (R)	Composition	Weight Percent	W Weight (lb.)	MW_L Molec. Wt. Liquid (lb/lb-mol)	N Moles of liq.	m_x Liq. Mole Frac.	$(Pv)_T$ Vap. Pres. (psia)	Pi[1] Part. Pres. (psia)	E_d Displacement Emissions (lb/day)	E_d Displacement Emissions (ton/yr)
HCl	6,000	250	9.6	2,400	528										
						HCl	0.32	768	36.46	21.06	0.19	0.45	0.45	0.10	0.0178
						Water	0.68	1,632	18.00	90.67	0.81	0.34			
							1.00	2,400		111.73	1.00				
H2SO4	6,000	150	15.1	2,265	528										
						H2SO4	0.93	2,106	86.18	24.44	0.74	0.00002	0.00002	0.000006	1.11E-06
						Water	0.07	159	18.00	8.81	0.26	0.34			
							0.93	2,265		33.25	1.00				

1 Assume partial pressure equals vapor pressure for both HCl and H2SO4 for conservative worst case estimate.

Displacement:

E_d =	**$[V/(R*T)]*\Sigma (P_i)*(MW_i)$**
=	**Vapor Displacement Due To Transfer of Material**
MW =	Vapor molecular weight of the individual HAP (lb/lb-mol)
R =	Ideal Gas Law constant (10.73 ft^3*psia/lb-mol*R)
P_i =	Partial pressure of the individual HAP (psia)
V =	Volume of gas displaced (ft^3)
T =	Temperature of the vessel vapor space (R)