

2021

Excel Spreadsheet to calculate Air Emissions

<u>1. General Data Acetylene Production</u>			<u>Remarks</u>
1.1 Operating days/a		260	notice: yellow coloured fields contain fixed data. For calculation, you just have to fill in all yellow coloured fields
1.2 Operating hours/d		8	
1.3 Carbide consumption (t/a)		331,7	
1.4 Pressure (mm water column)		300	
1.5 Charging quantity (t/charge)		0,7	
1.6 Water quantity (m ³ /tCaC ₂)		8,7	
1.7 Water volume in circle of acetylene generation (m ³ /a)		2885	
<u>2. Impurities in raw acetylene</u>			
2.1 Phosphine PH ₃ (ppm)		300	
2.2 Ammonia NH ₃ (ppm)		620	
2.3 Hydrogensulfide H ₂ S (ppm)		10	
2.4 Arsine AsH ₃ (ppm)		ignoring	
<u>3. Carbide Dust Emission (Cyclone)</u>			Carbide dust emission is not relevant for closed generator
3.1 Capacity (exhausting volume) (m ³ air/h)		3600	
3.2 Concentration of Carbide dust (mg/m ³ air)		45	
Cyclone operation time (min)		1	
<u>4. Acetylene production</u>			
Practical yield of acetylene Y		1,07	
kg Acetylene per kg Carbide		0,436	
4.1 Acetylene (t/a)		144,5	
4.2 Lime 25% (t/a)		1645	
<u>5. Emissions</u>			
<u>5.1 Charging the generator with Carbide</u>			
<u>Closed generator</u>	C ₂ H ₂ (kg/a)	160,5	replaced by carbide during charging process escaped due to the overpressure in the generator
	PH ₃ (kg/a)	0,067	
	NH ₃ (kg/a)	0,070	
	H ₂ S (kg/a)	0,002	
<u>Open generator</u>	C ₂ H ₂ (kg/a)	155,9	
	C ₂ H ₂ (kg/a)	240,8	
	PH ₃ (kg/a)	0,17	
	NH ₃ (kg/a)	0,17	
	H ₂ S (kg/a)	0,01	
	Carbide dust (cyclone) (kg/a)	1,28	

5.2 Lime pit			Differences in concentration (mg/l water)	
	C ₂ H ₂ (kg/a)	201,97	C ₂ H ₂	70
	PH ₃ (kg/a)	0,08	PH ₃	0,029
	NH ₃ (kg/a)	0,09	NH ₃	0,03
	H ₂ S (kg/a)	0,00	H ₂ S	0,001
5.3 Gasholder			Estimation: 1% of the lime pit emissions	
	C ₂ H ₂ (kg/a)	2,02		
	PH ₃ (mg/a)	836,75		
	NH ₃ (mg/a)	865,61		
	H ₂ S (mg/a)	28,85		
5.4 Overpressure relief system			Estimation: 1% of the lime pit emissions	
	C ₂ H ₂ (kg/a)	2,02		
	PH ₃ (mg/a)	836,75		
	NH ₃ (mg/a)	865,61		
	H ₂ S (mg/a)	28,85		
5.5 Compressors/drying system/filling station			Estimation: 0.5% of acetylene production, ~1% in old or badly maintained compr.	
	C ₂ H ₂ (kg/a)	722,4		
5.6 Cylinder testing			Estimation: 1% of acetylene production, which is a result from a complicated calculation	
	C ₂ H ₂ (kg/a)			
	Acetone (kg/a)			
Acetone emission: If acetone is filled with a gas displacement device, these emissions can be neglected, if acetone vapour disperses into the atmosphere the amount of vapour can be calculated.				
Acetone density liquid (kg/l)	A(dl)	0,79	Acetone emission is calculated: $A(em)=A(con) \times AcetylenexA(dv)/A(dl)$	
Acetone density vapour (kg/l)	A(dv)	0,0026		
Acetone consumption (kg/ton acetylene)	A(con)	29,3		
6. Sum of emissions				
	closed generator		open generator	
	C ₂ H ₂ (kg/a)	1089,0		1325,1
	PH ₃ (kg/a)	0,15		0,25
	NH ₃ (kg/a)	0,16		0,26
	H ₂ S (kg/a)	0,01		0,01
	Carbide dust (kg/a)	0		1,28
		1089,3		