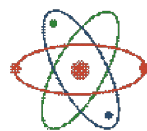
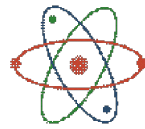


TYPICAL BMP DATA FOR COMPRESSED BIOGAS PLANT			
S.No	Feed Stock	BMP Nm ³ CH ₄ / Ton of VS	
		Lower	Higher
1.0	Agricultural Waste & Crop Residues		
1.1	Maize silage	200	230
1.2	Wheat straw	150	200
1.3	Grass silage	180	220
1.4	Sugar beet pulp	250	300
1.5	Rice straw	200	210
1.6	Potato waste	300	350
1.7	Napier Grass (45 days harvest)	190	208
2.0	Animal Manure		
2.1	Cow manure	100	150
2.2	Pig manure	120	180
2.3	Poultry litter	220	280
2.4	Horse manure	140	180
3.0	Food Waste & Industrial Organic Waste		
3.1	Source-separated food waste	350	500
3.2	Bakery waste	400	600
3.3	Fats, oils, greases (FOG)	800	1200
3.4	Dairy waste (e.g., whey)	400	500
3.5	Brewery waste	350	450
4.0	Sewage Sludge		
4.1	Primary sludge	300	400
4.2	Secondary (waste activated) sludge	150	250
4.3	Mixed sludge	200	300
5.0	Energy Crops		
5.1	Sorghum	200	250
5.2	Jerusalem artichoke	250	300
5.3	Algae (e.g., microalgae)	150	350

CALCULATION OF BIOGAS QUANTITY & COMPOSITION			
1	Quantity (QTY) of Biogas produced	15	TPD
2	QTY of convertible Volatile Solid for rated capacity	45.30	TPD
3	Total Volatile Solid (VS)	69.00	% of TS
4	Convertible ratio of Volatile Solid	48.25	% of VS
5	Actual QTY of Feed required	136.07	TPD
6	Typical Composition of Feed		
6.1	Carbon	38.74	% by weight
6.2	Hydrogen	5.20	% by weight
6.3	Oxygen	36.26	% by weight
6.4	Nitrogen	0.40	% by weight
6.5	Sulphur	0.15	% by weight
6.6	Moisture	0.58	% by weight
6.7	Ash	18.67	% by weight
		100.00	
7	Convert moisture in to Hydrogen & Oxygen		
7.1	Moisture	0.58	% by weight
7.2	Hydrogen	0.06	% by weight
7.3	Oxygen	0.52	% by weight
8	Elemental percentage Mass composition		
8.1	Carbon	38.74	% by weight
8.2	Hydrogen	5.26	% by weight



8.3	Oxygen	36.78	% by weight
8.4	Nitrogen	0.40	% by weight
8.5	Sulphur	0.15	% by weight
8.6	Ash	18.67	% by weight
	Total	100.00	% by weight
9	Molecular weight of Element		
9.1	Carbon	12.01	kg / kg mole
9.2	Hydrogen	1.01	kg / kg mole
9.3	Oxygen	16.00	kg / kg mole
9.4	Nitrogen	14.01	kg / kg mole
9.5	Sulphur	32.07	kg / kg mole
10	Molar Composition		
10.1	Carbon	3.23	kgmol
10.2	Hydrogen	5.21	kgmol
10.3	Oxygen	2.30	kgmol
10.4	Nitrogen	0.03	kgmol
10.5	Sulphur	0.005	kgmol
11	mole ratio of each element calculated by dividing the least mole value.		
	Least mole element considered	Sulphur	
11.1	Carbon	689.64	kgmol / kg mol
11.2	Hydrogen	1114.39	kgmol / kg mol
11.3	Oxygen	491.41	kgmol / kg mol
11.4	Nitrogen	6.10	kgmol / kg mol
11.5	Sulphur	1.00	kgmol / kg mol



12	Chemical composition of Feed	C_aH_bO_cN_dS_e	
13	Estimating Biogas production rate based on the following Stoichimetry Equation		
	$\mathbf{C_aH_bO_cN_dS_e + 0.25(4a-b-2c+3d+2e)H_2O \text{ ----->}}$ $\mathbf{0.125(4a+b-2c-3d-2e)CH_4 + 0.125(4a-b+2c+3d+2e)CO_2 + dNH_3 + eH_2S}$		
14	Co efficient of elements are		
14.1	a	689.64	Nos
14.2	b	1114.39	Nos
14.3	c	491.41	Nos
14.4	d	6.10	Nos
14.5	e	1.00	Nos
16	Using these co efficient the resulting equation is		
	$\mathbf{C_a + H_b + O_c + N_d + S_e \text{ ----->}}$ $\mathbf{xCH_4 + yCO_2 + dNH_3 + eH_2S}$		
17	Mass of Methane produced per ton of Feed	331.12	kg /ton
18	Mass of CO2 produced per ton of Feed	837.55	kg /ton
19	Mass of NH3 produced per ton of Feed	5.98	kg /ton
20	Mass of H2S produced per ton of Feed	1.84	kg /ton
21	NTP Condition		
21.1	Pressure	1.00	atm
21.2	Temperature	0.00	deg.C
21.3	According to Boyle's law $V = (n * R * T) / P$		
	V = Volume of gas in m ³		
	n = Number of moles of gas in kg mol		
	R = Univeral gas constant [62.364 in (m ³ * mmHg) / (kgmol * deg.K)]		
	T = Temperature of gas in deg.K		

P = Pressure of gas in mmHg			
23	Volume of Methane produced	462.41	Nm³ / ton
24	Volume of CO ₂ produced	426.32	Nm³ / ton
25	Volume of H ₂ S produced	1.21	Nm³ / ton
26	Volume of NH ₃ produced	2.16	Nm³ / ton
27	Total Volume of Biogas produced	892.11	Nm³ / ton
28	Composition of Methane	51.83	% v/v
29	Composition of CO ₂	47.79	% v/v
30	Composition of H ₂ S	0.1359	% v/v
31	Composition of NH ₃	0.002	% v/v
32	Anaerobic Digester efficiency	31.00	%
33	Volume of Methane produced	19505.32	Nm³ / day
34	Volume of CO ₂ produced	17983.11	Nm³ / day
35	Volume of H ₂ S produced	51.12	Nm³ / day
36	Volume of NH ₃ produced	91.16	Nm³ / day
37	Total Volume of Biogas produced - daily basis	37630.71	Nm³ / day
38	Total Volume of Biogas produced - hourly basis	1567.95	Nm³ / hr