The use and daily maintenance of Puxin Biogas Digester

1. The first batch feeding and initial operation of the biogas plant

Inoculums: The fresh cow dung, the biogas residue (biogas slurry) of the operation biogas digester, the activated sludge in the sewer, or the sediment at the bottom of the dung pit, they can be used as inoculum. The black active sludge from pond, channel etc. is also good inoculums. The inoculums is normally rating around 30% of total fermentation material for the first batch feeding for the biogas digester.

The first batch feeding: Mix the raw materials with the inoculums and put them together into the biogas plant. In the first batch feeding for initial operation the total concentration in digester should be 4 ~ 6%.

The water added into the biogas plant can be domestic wastewater, river water, reservoir water; it also can be well water or tap water, but can't be toxic wastewater. The temperature of the water should be above 20 ° C. In cold winter warm well water is a good choice.

Without enough inoculums, the fermentation powder needed for different models of biogas digesters are as follows:

Digester model	1.2M3	2.65M3	3.4M3	15M3(A)	15M3(B)	66M3(A)	66M3(B)	210M3	20GP	40GP
Fermentation capacity	0.6M3	1.6M3	1.7M3	8.8M3	12.7M3	35M3	50M3	100M3	12M3	32M3
Fermentation powder	1kgs	3kgs	3kgs	15kgs	21kgs	58kgs	83kgs	166kgs	20kgs	53kgs

Igniting test: After the biogas plant has been sealed with water, usually in 3-10 days the biogas plant will produce biogas. At the beginning usually the biogas produced can't be lighted up because the methane content is too low. If the biogas can't be lighted up, you should release all the biogas in the digester and recollect the biogas, and repeat this process until the biogas can be lighted up.

Initial operation adjustments: In the event of **acidification** (during the event the biogas usually can't be lighted for a long time, or the gas production decreases rapidly, or even completely stops, the color of the liquid becomes yellow.) there are different ways can be used to treat the acidification according to the different levels of acidification. If the pH value is not below 6.0, the biogas plant can adjust its pH value automatically, the pH value will grows up gradually and the gas production will become normal, but the process will takes a relatively long time. Put some more inoculums into the biogas plant may shorten the process.

If the pH value is below 6.0, take some liquid out from the biogas plant and put more inoculums into the biogas plant. At the same time add some lime or plant ash in the biogas plant to adjust the pH value to above 6.0.

If the pH value has been adjusted to about 7.0 and the biogas plant still do not produce biogas that means the liquid of the biogas plant contains chemicals that can kill the methane bacteria. In this case you should clean the biogas plant and refill it with raw materials and inoculums.

If the pH value has been adjusted to about 7.0 and the biogas plant works normally but the gas production is very low that means there are gas leakages in the pipe system. In this case you should check the pipe system, find and repair the leakages. When the temperature in the biogas plant is below 10°C, the biogas plant will stop gas production. Therefore, in winter the biogas plant should be thermal insulated by covering an insulation layer or a green house on the biogas plant.

2. The daily maintenance of biogas plant

1) To keep a constant gas production, after about 30 days from the day when the biogas plant begin to produce biogas normally you should add raw fermentation materials into the biogas plant regularly.

2) For a 10m3 biogas plant to keep a 5m3/d biogas production, 150kg cow dung or 110kg pig dung is needed daily.

3) In the period of normal operation you can increase the concentration of the feeding materials up to 8 ~ 10%. The liquid from the biogas plant can be recycled.

Day 8: Add 10% of the raw waste materials, mix a certain amount of water, and feed the dry matter concentration to about 10%.

Day 9: Add 15% of the raw materials, mix a certain amount of water, and feed the dry matter concentration to about 10%.

In this proportion, until

Day 18: Add 100% of the raw materials, mix a certain amount of water, and charge about 10% of the dry matter.

After that, 100% of the raw materials are added every day, and a certain amount of water is mixed, and the dry matter concentration is about 10%.

Part Three: Appendix

3. The data about gas production for different raw materials

1) Relationship between the volume of biogas plant and the livestock keepers

Item	unit	pig	cow	Sheep	Chicken
Daily Feces	kg	3.0	30.0	1.5	0.1
Dry material content	%	18	17	25	30.0
a 6m3 biogas plant		20	3	50	400
a 8m3 biogas plant		25	4	60	530
a 10m3 biogas plant		33	5	70	667

2) Raw material needed to produce 1 cubic meters biogas

Raw material	Water content (%)	Dray material gas production rate (m3/kg)	Raw material needed to produce 1 cubic meters biogas(kg)	
			Dry material	Fresh material
Pig Manure	82	0.25	4.00	22.23
cow Manure	83	0.19	5.26	30.96
Chicken Manure	70	0.25	4.00	13.34
Human Manure	80	0.30	3.33	16.67
Rice Straw	15	0.26	3.84	4.53
Wheat Straw	15	0.27	3.70	4.36
Corn stalks	18	0.29	3.45	4.21
Fresh grass	76	0.455	2.20	9.17
Water Hyacinth	93	0.31	3.23	46.15

3) Raw material parameters

Raw material	C%	N%	C:N	Methane content of biogas produced (%)	Gas duration (d)	Dry material content (%)	Dry material biogas production rate (L/.KG)	Raw material biogas production rate (L/.KG)
Dry Wheat Straw	46	0.53	87:1	59		82	425	348
Dry Rice Straw	42	0.63	67:1	61		83	409	340
Corn stalks	40	0.75	53:1	53~59	90	80	412	
Fresh grass	11	0.54	26:1	70	60	24	455	107
Fresh Sheep Manure	16	0.55	29:1					
Fresh cow Manure	7.3	0.29	25:1	50~60	90	17	205	35
Fresh Pig Manure	7.8	0.60	13:1	65	60	18	425	77
Fresh Human Manure	2.5	0.65	2.9:1	50	30	20	426	85
Fresh Horse Manure	10	0.24	24:1	60	90		279	