

# **ANIMAL WASTE TREATMENT**

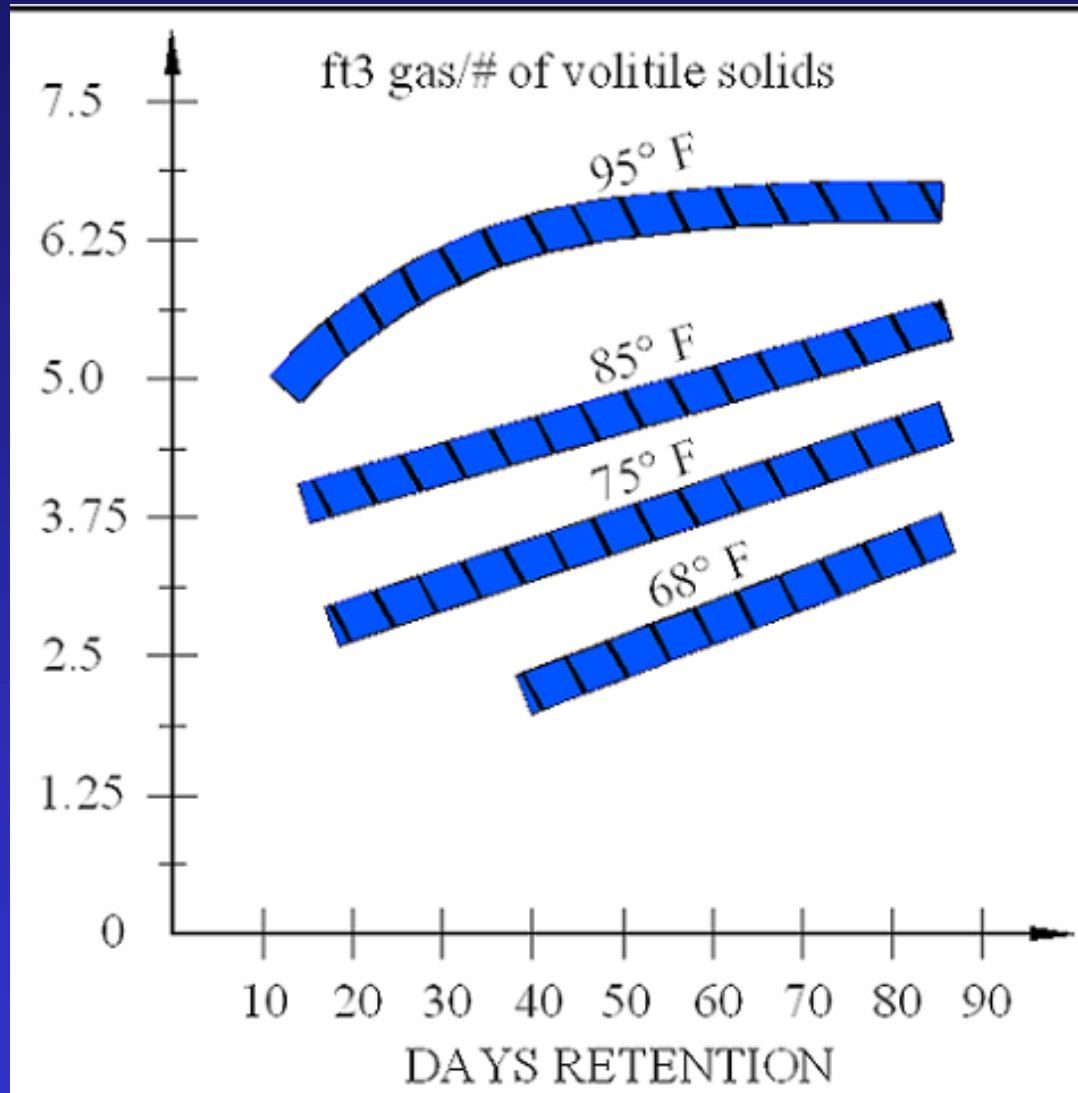
**ANIMAL WASTE  
BECOMES A  
RENEWABLE  
ENERGY  
SOURCE**

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# RETENTION TIME

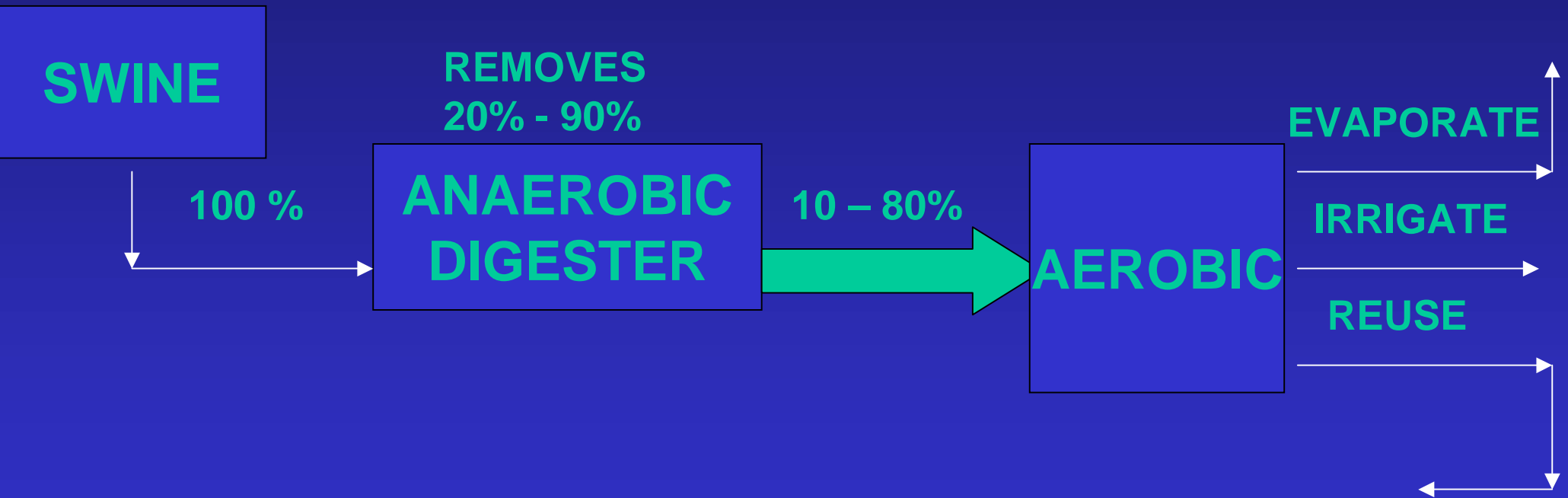


# COMMON PROBLEMS

1) pH: 6.8 - 7.4

2) AMMONIA < 3000 mg/l

# ANAEROBIC DIGESTER COVERS



# DIGESTER SIZE

**AMBIENT 40 – 60 °F - 2 YEARS**

<b>MESOPHILLIC 95 °F</b>	<b>20 DAY</b>	<b>40%</b>
	<b>40 DAY</b>	<b>60%</b>
	<b>60 DAY</b>	<b>80%</b>

**THERMOPHILLIC 150 °F 3 – 5 DAYS**

# AVAILABLE HEAT VERSUS %VOLATILE SOLIDS

	<b>SYSTEM</b>	<b>FLUSH</b>	<b>CONCENTRATOR</b>
	Finishers	10,000	10,000
	Volume gal/day	75,000	N/A
	Concentration gal/day	N/A	15,000
	Pounds/day	624,750	125,000
	Volatile solids #/day	6,345	5,710
	Methane Produced 5.62 ft <sup>3</sup> /#VS	35,600	32,000
	Heat Energy BTU/day @ 80%	28,500,000	25,600,000
<b>Heat Required for liquid BTU/day</b>	Summer Δ T 35°F	22,000,000	4,375,000
	Winter Δ T 50°F	31,000,000	6,250,000
<b>Basin Cover</b>	Surface Area ft <sup>2</sup>	40,000	10,000
<b>Heatloss Cover BTU/day</b>			
<b>Non Insulated U= 5BTU/oF/ft2/hr</b>	Summer Δ T 25°	120,000,000	30,000,000
	Winter Δ T 50°	240,000,000	60,000,000
<b>Insulated U= 0.2 BTU/oF/ft2/hr</b>	Summer Δ T 25°	9,600,000	1,200,000
	Winter Δ T 50°	19,200,000	2,400,000
<b>Total Heat Required</b>	Summer	31,600,000	5,575,000
<b>Excess Heat</b>	Winter	50,200,000	8,450,000
	Summer	4,000,000	26,425,000
	Winter	<15,000,000>	23,550,000
	Summer	N/A	N/A
	Electricity @ 28%	N/A	100 KVA
	Recoverable Heat/day (48% of total)	N/A	12,280,000
<b>Excess Heat</b>	Summer BTU/day	N/A	6,700,000
	Winter BTU/day	N/A	3,830,000

# AVAILABLE HEAT VERSUS %VOLATILE SOLIDS

	<b>SYSTEM</b>	<b>SCRAPE</b>	<b>3%</b>	<b>2.50%</b>
	Finishers	10,000	10,000	10,000
	Volume gal/day	N/A	N/A	N/A
	Concentration gal/day	19,000	25,400	30,470
	Pounds/day	158,625	211,500	253,800
	Volatile solids #/day	6,345	6,345	6,345
	Methane Produced 5.62 ft <sup>3</sup> /#VS	35,600	35,600	35,600
	Heat Energy BTU/day @ 80%	28,500,000	28,500,000	28,500,000
<b>Heat Required for liquid BTU/day</b>	Summer Δ T 35°F	5,552,000	7,402,500	8,883,000
	Winter Δ T 50°F	8,000,000	10,575,000	12,690,000
<b>Basin Cover</b>	Surface Area ft <sup>2</sup>	10,000	16,000	19,200
<b>Heatloss Cover BTU/day</b>				
<b>Non Insulated U= 5BTU/oF/ft2/hr</b>	Summer Δ T 25°	30,000,000	30,000,000	30,000,000
	Winter Δ T 50°	60,000,000	60,000,000	60,000,000
<b>Insulated U= 0.2 BTU/oF/ft2/hr</b>	Summer Δ T 25°	1,200,000	1,920,000	2,304,000
	Winter Δ T 50°	2,400,000	3,846,000	4,608,000
<b>Total Heat Required  Excess Heat</b>	Summer	6,752,000	9,322,500	11,187,000
	Winter	10,400,000	14,415,000	17,298,000
	Summer	28,848,000	6,277,500	24,413,000
	Winter	25,200,000	21,185,000	18,302,000
	Electricity @ 28%	105 KVA	105 KVA	105 KVA
	Recoverable Heat/day (48% of total)	13,680,000	13,680,000	13,680,000
<b>Excess Heat</b>	Summer BTU/day	6,928,000	4,358,000	2,493,000
	Winter BTU/day	3,280,000	<735,000>	<3,618,000>

# AEROBIC TREATMENT

## TYPICAL 1700 HEAD SOW – FARROW TO FINISH

<b>Retention Day</b>	<b>20</b>	<b>80</b>
<b>Influent Concentration</b>	<b>45,000</b>	<b>45,000</b>
<b>Influent # TS</b>	<b>13,765</b>	<b>13,765</b>
<b>Influent # VS (80% of TS)</b>	<b>11,012</b>	<b>11,012</b>
<b>Decomposition</b>	<b>60%</b>	<b>95%</b>
<b>Effluent Con. Mg/l</b>	<b>18,000</b>	<b>2,250</b>
<b>Effluent #/day</b>	<b>4,404</b>	<b>550</b>
<b>BOD<sub>5</sub>/VS</b>	<b>2.81</b>	
<b>BOD<sub>5</sub> Con.mg/l</b>	<b>6,404</b>	<b>800</b>
<b>BOD<sub>5</sub> – Quantity</b>	<b>1,563</b>	<b>195</b>
<b>Oxygen demand – BOD @ 1/1.5</b>	<b>2,348</b>	<b>293</b>
<b>Ammonia Con. mg/l</b>	<b>2,300</b>	<b>2,300</b>
<b>Ammonia Quantity #/day</b>	<b>562</b>	<b>562</b>
<b>Oxygen demand – NH<sub>3</sub> ratio</b>	<b>2.18</b>	<b>2.18</b>
<b>Oxygen demand ammonia</b>	<b>1,226</b>	<b>1,226</b>
<b>Total Oxygen demand #/day</b>	<b>3,574</b>	<b>1,519</b>
<b>Diffuser efficiency</b>	<b>20%</b>	<b>20%</b>
<b>Percent Oxygen in atmosphere</b>	<b>21%</b>	<b>21%</b>
<b>Density of air @ 70°F, 50% RH</b>	<b>0.074 #/ft<sup>3</sup></b>	<b>0.074 #/ft</b>
<b>Total volume of air required</b>	<b>798 cfm</b>	<b>340</b>
<b>Blower hose power calculated</b>	<b>55</b>	<b>23.7</b>