Manure Treatment

a home study module

prepared as part of the

“Managing Livestock for Competitiveness and Environmental Quality” Grant Project

Alternative Treatments

- **Anaerobic digestion**
- **Aerobic treatment**
- **Partial aerobic treatment**
- **Solids separation**
- **Pit additives**
- **Constructed wetlands**

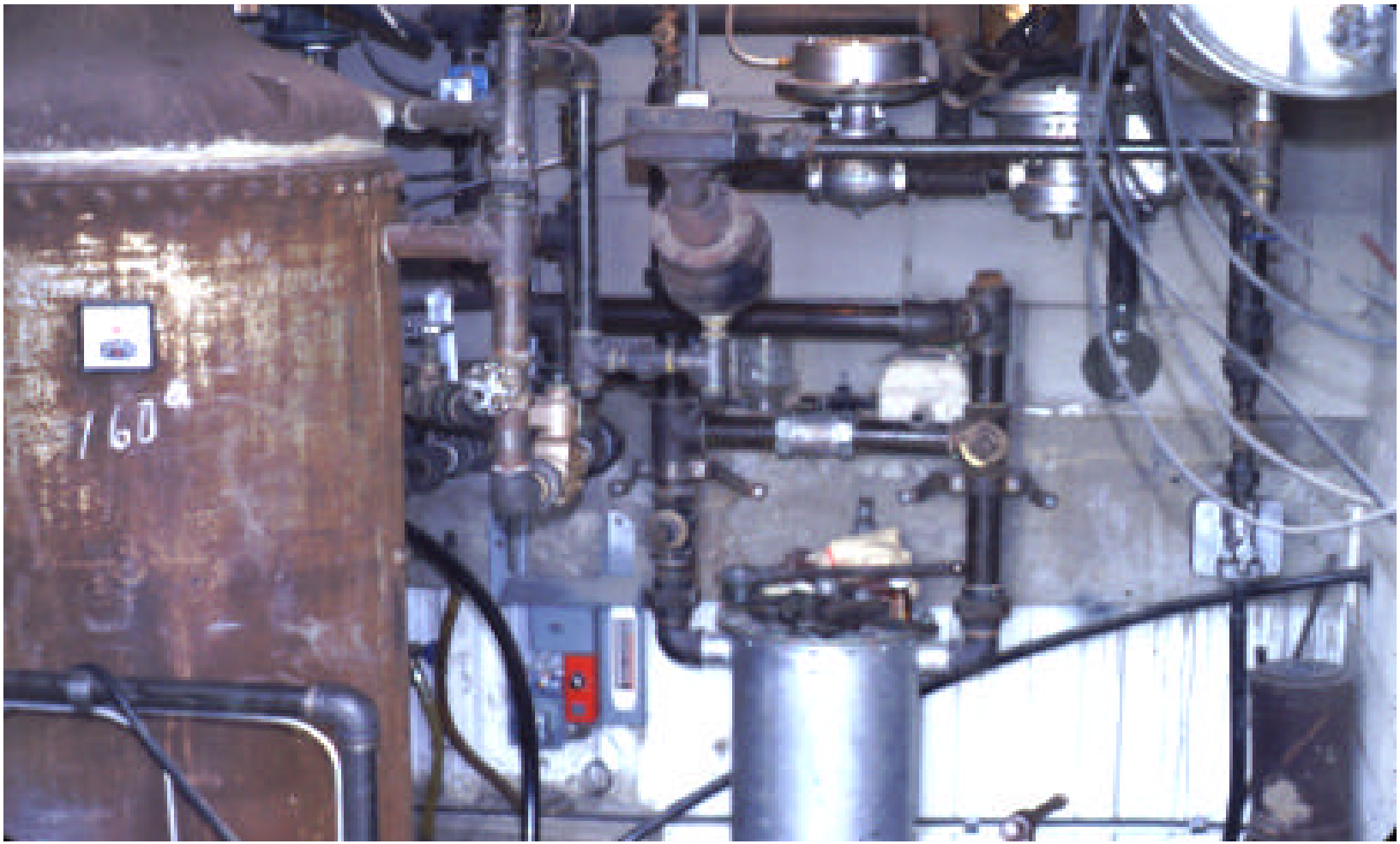
Anaerobic Digestion

Species	Biogas Prod. ft3/day-1000 lbs bw	Heat Prod. BTU/day
Dairy	39	20,700
Beef	22	11,700
Swine	28	16,400
Layers	37	22,700
Broilers	51	30,400

Anaerobic Digestion

- **Old technology**
  - **Concrete facilities**
  - **Warm temperatures**
- **Controls odors**
- **Equal or more volume & nutrients**
  - **Requires storage pit or lagoon after digestor**
- **Cost and management requirements are significant**

Anaerobic Digestor



Anaerobic Lagoons

- **Old technology**
- **Large volume**
- **Low nutrient concentration**
  - **high dilution rates**
  - **volatilization - nitrogen**
  - **solids settling - phosphorus**
- **Management often problem**
  - **lack of adaquate dilution**
  - **timely pumpout required**

Mechanical Aerobic Treatment

- **Aerobic treatment adds oxygen to manure storages to eliminate odors.**
- **The technology works.**
- **Costs are a barrier to adoption**

Mechanical Aerobic Treatment

Aerobic Treatment Example

- **1000 head of finishing swine**
  - **465 lbs BOD production per day**
  - **aerators provide 3 lb oxygen/kilowatt-hour**
  - **465/3 = 155 kilowatt-hours per day**
- **Cost = $9.30 per day (0.06$/kwh X 155kwh/day)**
  - **$3394 per year**
  - **$3.39 per pig space per year**
  - **$1.13 per pig marketed**

Partial Aerobic Treatment

- **Only the top of lagoons or pits is maintained aerobic**
- **Decreases power requirements to provide the necessary oxygen**
- **Still untested technology**

Solids Separation

Solids separation removes total and volatile solids, and allows smaller lagoon sizes.

DNR allows a reduction in lagoon design loading of 0.5 lb VS for each pound VS removed

Solids Separation

Several types of separation possible

- **Stationary screens**
- **Vibrating screens**
- **Centrifuges**
- **Screw presses**
- **Settling basins**

Solids Separation

In general solids separation for dairy and beef manure is more efficient (45 - 70%) than it is for swine manure (14 - 45%). Screens only remove 14 - 20% of solids from swine manure.

Pit Additives

Numerous pit additives are on the market.

Four basic modes of action are:

- **Masking agents**
- **pH adjustment**
- **Bacteria and/or enzymes**
- **Disinfectants**

Pit Additive Testing

ISU Ag Engineers have tested some pit additives. Odor reductions have ranged from 31% to 87% in the laboratory.

Results of the additive tests can be found on the Worldwide Web at

http://www.ae.iastate.edu