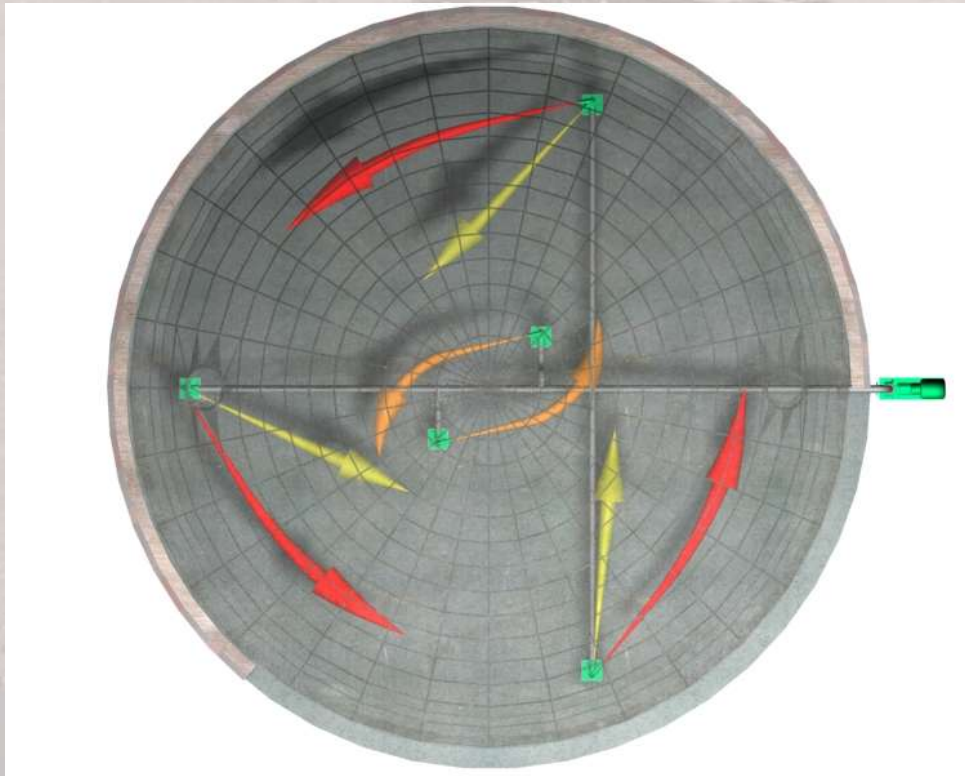


Cost Effective and Efficient Aerobic Digesters

2010 IWEA Conference



WHAT IS THE CONCEPT

- SEPARATION OF MIXING AND AERATION DESIGN POINTS
(AEROBIC DIGESTION, FLOW EQUALIZATION, ANOXIC, SLUDGE STORAGE)
- REDUCES AEROBIC DIGESTION DESIGN BY 70%
- PROVIDES INDEPENDENT INTERMITTENT OPERATION OF THE MIXING AND AERATION SYSTEMS
- ALLOWS FOR SIGNIFICANT INCREASE IN LOADING (5-6% SLUDGE), WHICH IN MANY CASES WILL REDUCE THE TANKAGE REQUIRED
- INTERMITTENT OPERATION OFFERS SIGNIFICANT POWER SAVINGS AND PEAK SHAVING CAPABILITY
- INTERMITTENT OPERATION IS DETERMINED BY OXYGEN UPTAKE RATES WHICH WILL NEED TO BE DETERMINED IN EACH INSTALLATION

10 STATES STANDARD DESIGN BASIS

85.4 Mixing

Aerobic digesters shall be provided with mixing equipment which can maintain solids in suspension and insure complete mixing of the digester contents. Refer to paragraph 85.5.

85.5 Air Requirements

Sufficient air shall be provided to keep the solids in suspension and maintain dissolved oxygen between 1 and 2 milligrams per liter (mg/l). For minimum mixing and oxygen requirements, an air supply of 30 cfm per 1000 cubic feet (0.5 L/s/m³) of tank volume shall be provided with the largest blower out of service. If diffusers are used, the nonclog type is recommended, and they should be designed to permit continuity of service. If mechanical turbine aerators are utilized, at least two turbine aerators per tank shall be provided to permit continuity of service.

AEROBIC DIGESTION

- Digestion process consists of bacteria in the sludge feeding on organic waste and converting it to carbon dioxide
- Solids reduction is created when there is a lack of organic material to feed all the bacteria and they die which then creates a food source for new bacteria which enter the tank (Endogenous Respiration)
- **Typical** aeration design for 1-3% sludge is 30-35 SCFM/1000 ft³. This includes 70% just for mixing
- This approach allows design for 5-6% sludge at 15 SCFM / 1000ft³ with supplemental mixing
- Remember aerobic digestion may be best alternative but **typical** system cost made anaerobic digestion best choice. This system approach changes that

ANAEROBIC AND AEROBIC COMPARISON

- ANAEROBIC BACTERIA USE A SERIES OF COMPLEX FOOD CHAINS TO BREAK DOWN CELL TISSUES THROUGH THE RELEASE OF GAS WHICH WILL GENERATE IT OWN ENERGY SOURCE (METHANE)
- CLOSED TANKS KEEP SLUDGE AT IDEAL TEMPERATURE
- NORMAL SLUDGE CONCENTRATION IS 4-6%
- AEROBIC DIGESTIONS USES ALTERNATIVE SOURCE TO MAINTAIN DIGESTION (BLOWERS). GOAL OF DIGESTION IS DEVELOPMENT OF CARBON DIOXIDE AND WATER
- AMBIENT TEMPERATURE HAS DRAMATIC IMPACT UNLESS HEATED
- NOTMAL SLUDGE CONCENTRATION IS 1-2%







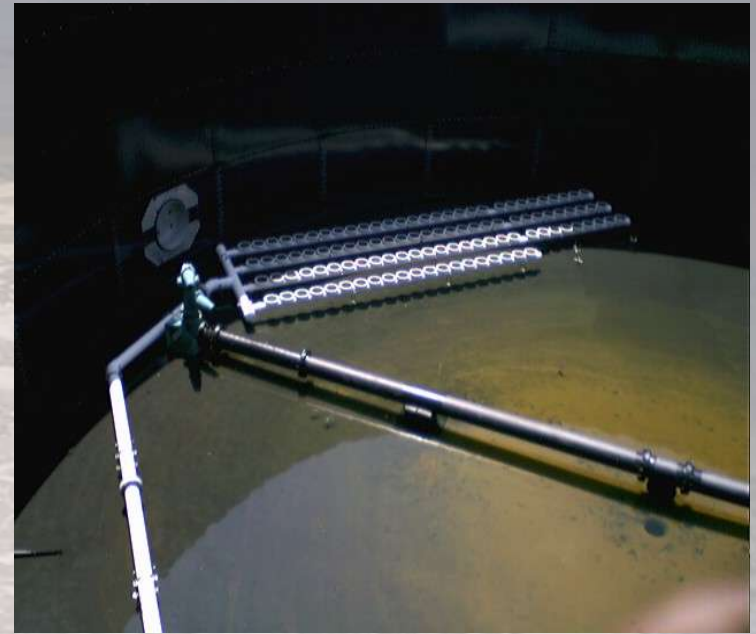


A large, circular industrial tank, likely a wastewater treatment tank, is shown from an elevated perspective. The tank is filled with a thick, frothy, brownish liquid, possibly activated sludge. The surface of the liquid is highly textured with numerous small, irregular bubbles and foam. The tank's metal walls are visible at the top and bottom edges, and the overall scene is brightly lit, suggesting an outdoor or well-lit indoor environment.

AVAILABLE TECHNOLOGIES

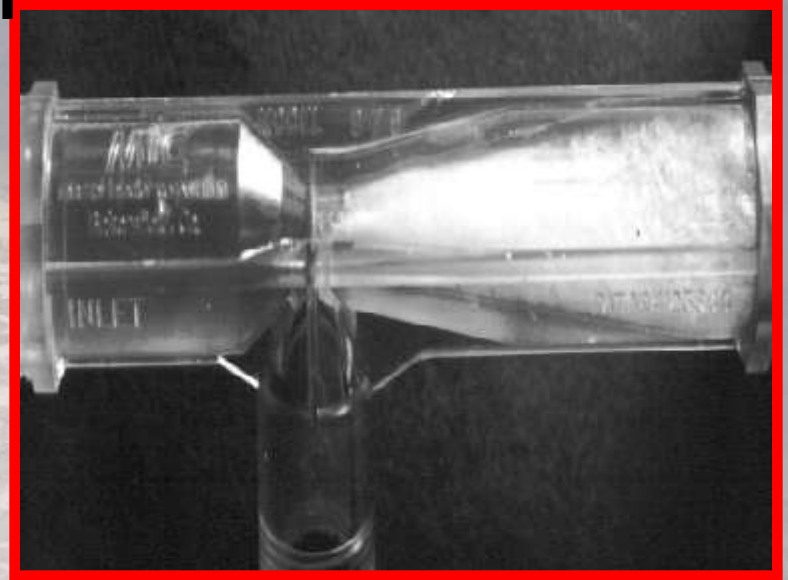
Fine or Coarse Bubble Diffusers

- Reduces diffuser grid requirements
- Significant aeration system reduction
- Allows for thicker material without added HP (not for secondary aeration tanks)
- Allows for intermittent operation



In-Line Aspiration

- No other forms of aeration are required
- No buildings required
- Simple in-line installation
- Allows for intermittent operation
- Handles solids over 5%
- Requires additional HP



Mechanical Aerators

- Allows for efficient and cost effective oxygen transfer
- Easily accessible
- No buildings required
- Simplifies control schemes
- No special shaft length required
- Available in fixed position or fluctuating liquid levels

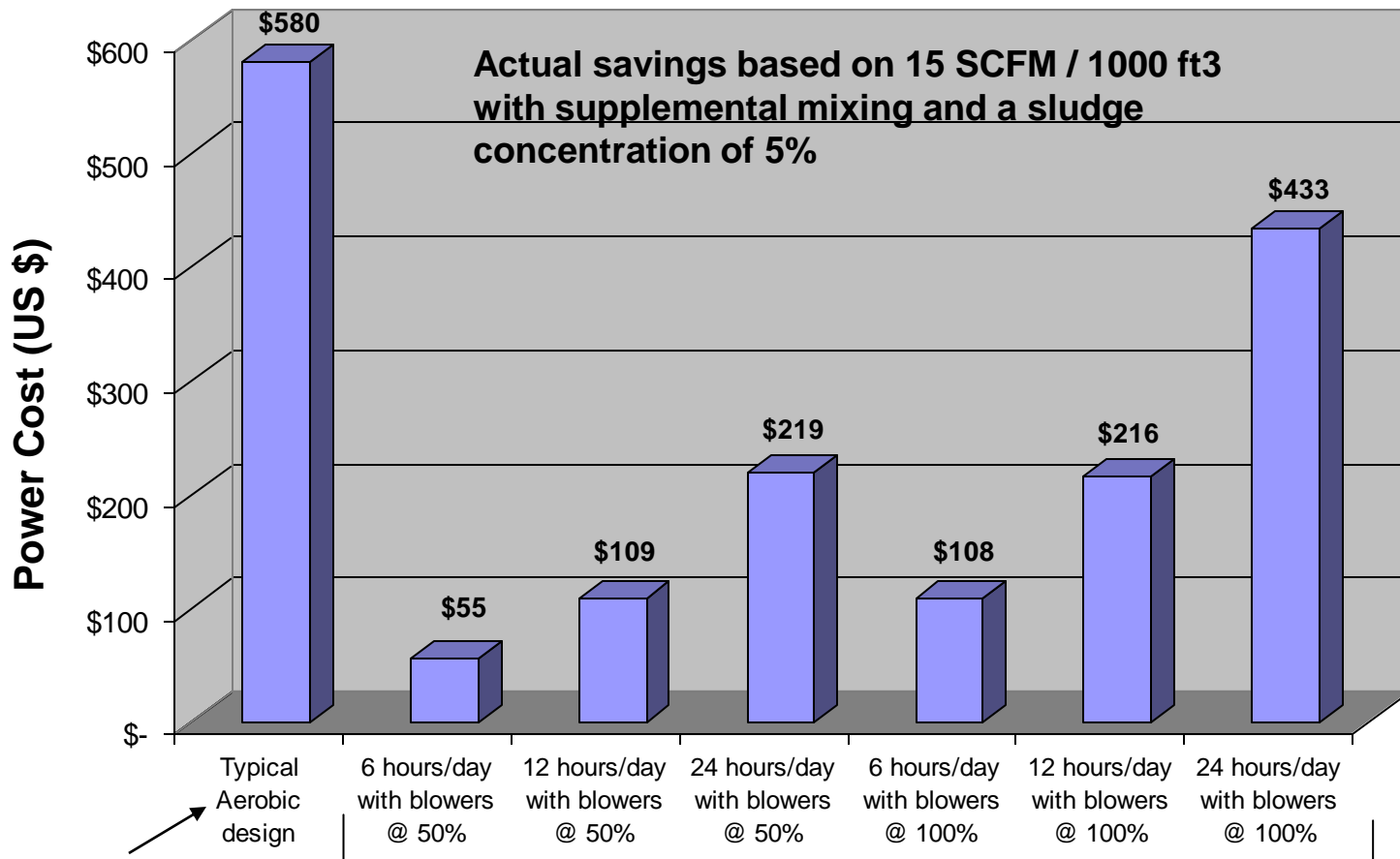


WHAT ARE THE ADVANTAGES ?

- REDUCE AERATION SYSTEM DESIGNS IN PROCESS APPLICATIONS
- INCREASE PROCESS FLEXIBILITY FOR OPERATORS WITH INTERMITTENT OPERATION AND DECANTING
- EXCELLENT DEWATERING
- REDUCED AERATION MAY REDUCE POTENTIAL ODOR ISSUES AND PUMP GAS BINDING POTENTIAL
- ALLOWS FOR THICKER SLUDGE IN AEROBIC DIGESTION
- OPTIMIZES DIGESTER SIZING REQUIREMENTS
- MIXING SYSTEM IS NOT LIQUID LEVEL DEPENDENT ALLOWING FOR OPERATION AT ANY POINT FROM FULL TO EMPTY
- EXISTING FLOOR GEOMETRIES ARE NOT AN ISSUE
- NO EXPLOSION PROOF EQUIPMENT REQUIRED
- EASY OPERATION
- NO HEATING EQUIPMENT
- LOWER CAPITAL COST??
- REGULATORY AGENCY APPROVED

Energy Savings

Operational Cost per Day



Based on 2% sludge
@ 30-35 SCFM/1000 ft³

RO₂MIX

A large circular tank, likely a wastewater treatment component, is shown from an elevated perspective. The tank's interior is filled with a thick, brown, foamy sludge layer that covers most of the bottom. The foam has a distinct, irregular, cellular texture. The tank's dark, metallic walls curve around the perimeter, and a sliver of green foliage is visible in the upper right corner. The word "QUESTIONS" is overlaid in the center of the image.

QUESTIONS