# Anaerobic Manure Digestion

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# The Basics of Digestion

- **Air tight, oxygen free environment**
- **With the help of bacteria in the manure, organic matter is broken down generating;**
  - Methane ($CH_4$)
  - Carbon dioxide ($CO_2$)
  - Nutrient rich liquid effluent (N, P, K)
- **Heat used to enhance the digestion process**
  - Generally 95 - 105ºF
  - 30% of generated energy may be needed for heating

# Manure Digestion, why do it

- **Burn biogas to produce energy:**
  - Run generator with biogas to produce energy
  - Biogas 60% methane
  - Defined as green/renewable energy
  - Energy savings/sale key to funding system
    - Enter into agreement with electric company
    - Addresses uncertainty of future energy costs
  - Heat energy to heat the manure and facilities
- **Odor reduction**
  - Important for acceptance of manure applications
- **Reduces pathogen by approximately 95%**
  - Reduced environmental risk for application
  - Important if solids used for bedding

# Manure Digestion, why do it
## *Continued*

- **Kills weed seeds**
- **Reduces GHG (carbon credits?)**
- **Kills fly eggs**
- **Breaks down organic solids to gas**
  - Reduction in solids
  - From 13% to 9% in dairy manure (4% less volume)
- **Improved availability of N**
- **Increases soil pH when applied**
- **Allows operation to take other wastes**
- **Retains nutrients in the effluent/solids**
  - Homogenous material for processing

# Manure Digestion, then why NOT

- **Time, expertise to operate the system**
- **COST to build**
  - Generally only considered viable for larger operations (greater than 500 cows or so)
- **Cost to maintain and repair**
  - Solids settling out in system
- **Safety concerns (perceived and real)**
- **Need continuous, consistent flow**
- **Not compatible with sand bedding**
- **Does not work with solid manure**
- **Retains nutrients in the effluent/solids**

# Regional Digesters

- **Addressing barriers to on-farm digesters:**
  - Spreads costs across more animals
  - Can hire sufficient trained staff
  - Can provide better for non-ag inputs
  - Better arrangements for sale of energy & other exports
- **Barriers for regional digesters:**
  - Continuity of inputs
  - Manure transportation costs (more energy used)
  - Loss of nutrients/organic matter on farms
  - Loss of energy on participating farms
  - Long term agreements from participating farms
  - Approval required due to scope and off farm inputs
  - Need fresh manure
- **Difficult to get these projects off the ground**

# In conclusion

- **Anaerobic digestion is a great idea for:**
  - Energy,
  - Pathogens,
  - Odor, weed control, GHG reduction, etc
- **Not a practice that reduces nutrients in manure**
- **In Pa**
  - 18 in operation, 7 under construction, 10 in planning
- **This can be an important technology to allow farms to coexist with their neighbors**
  - Allow for wider acceptance of manure as a fertilizer
- **It will take an added component (separation) to use the system for nutrient reductions**