

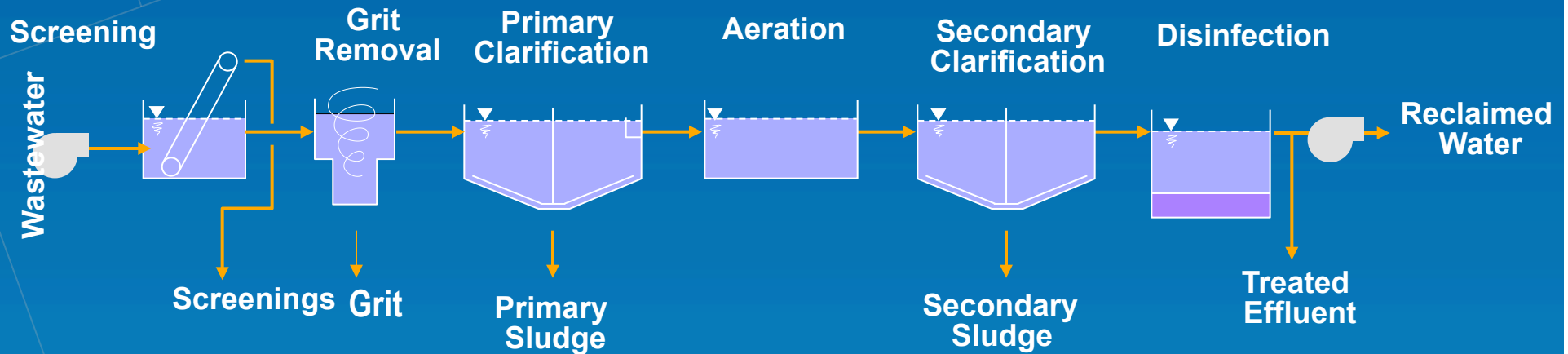
# EPA New England – Anaerobic Digestion Seminar

- Biosolids Digestion – John F. Donovan, CDM Smith  
Natalie Sierra, RMC Water and Environment
  - a. Types of Sludges
  - b. Digestion Mass Balance and biosolids Management
  - c. Digester Pre-Treatment
  - d. EPA Part 503 Regulations
  - e. Why isn't everyone doing it if it is such a good idea?
  - f. How much more sludge is available to digest?

# Digestion Mass Balance

- Feed Quantities Depend On:
  - Waste Strength
  - Efficiency of Primary Treatment
  - Method of Secondary Treatment
  - Use of Chemicals
  - Degree of Thickening
- Biosolids Quantities Depend On:
  - PS/WAS Ratio
  - Digester “Basics”

# Energy Efficient Water Reclamation



## ■ Enhanced Primary Treatment

- Chemical
- Biological

## ■ Aeration

- Fine bubble
- High efficiency blowers

## ■ Activated sludge

- High rate BOD removal
- Nutrient removal

## ■ Pumping

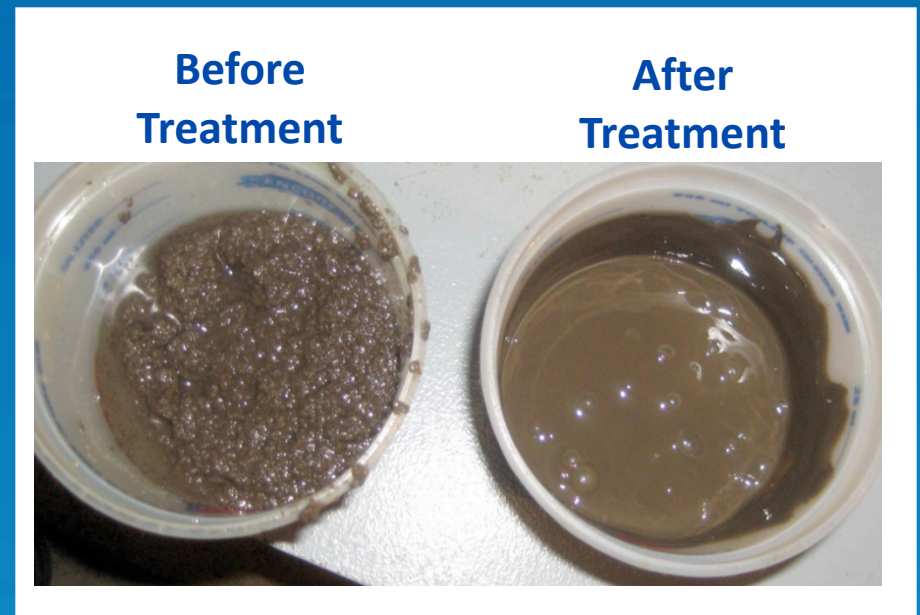
- Influent
- Intermediary
- Effluent

# Digestion Enhancements – Sludge Pretreatment

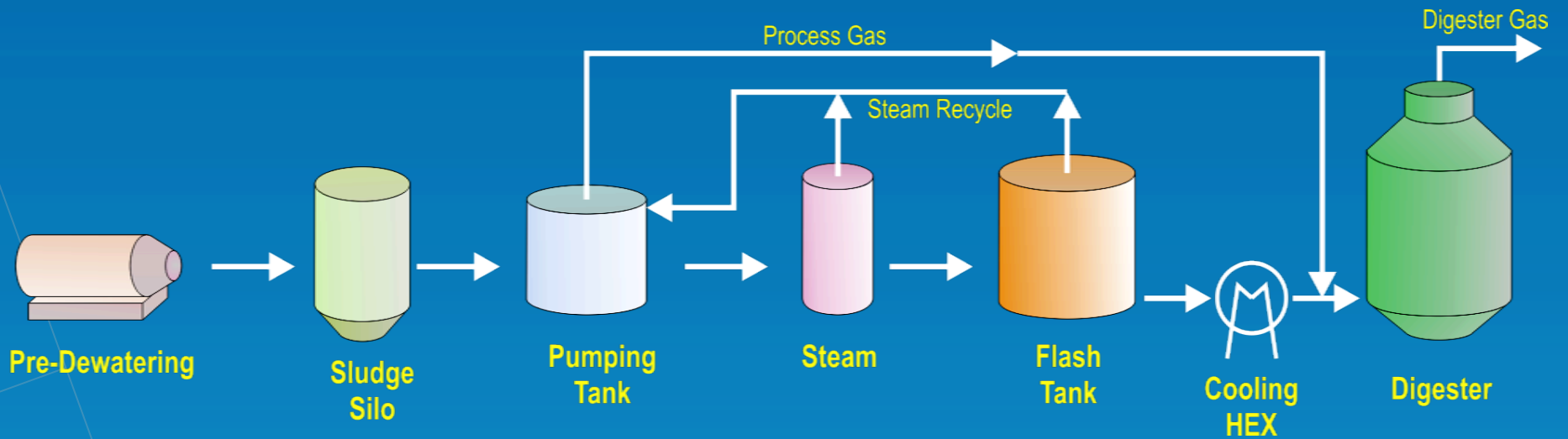
- Purpose – To reduce operating costs by increasing volatile solids reduction and increasing biogas production
- Benefits
  - Less residual biosolids to be disposed of
  - More biogas available for use in boilers, CHP, sale as methane, etc
  - Increase in digester capacity
  - Improve dewatering
- General Method – Hydrolysing material so it is easier to digest by microbes

# Existing Technologies for Hydrolysis

- Physical / Chemical
  - Microsludge
  - Kady Bio-Lysis
  - Biogest CROWN
- Electrical
  - OpenCEL
- Other
  - Ultrasonic (Sonix/Sonico, Eimco Ultrawaves)
  - Microwave
  - Milling Centrifuge (Lysatec)



# Thermal Treatment: CAMBI





# Thermal Treatment: CAMBI



Dublin, IRL

- **Benefits**
  - Class A Biosolids
  - Increased processing capacity (200%)
  - Increased VSR
  - Improved dewatering characteristics
  - Reduced solids production
  - Reduced foam formation
- **Challenges**
  - Complex operation
  - High operating costs
  - High pressure steam
  - Unproven in U.S.

# Thermal Treatment: CAMBI

## Required Facilities

- High pressure steam boiler
- Heat recovery equipment
- Multiple small vessel digesters
- Acid phase off-gas handling equipment
- Additional dewatering equipment



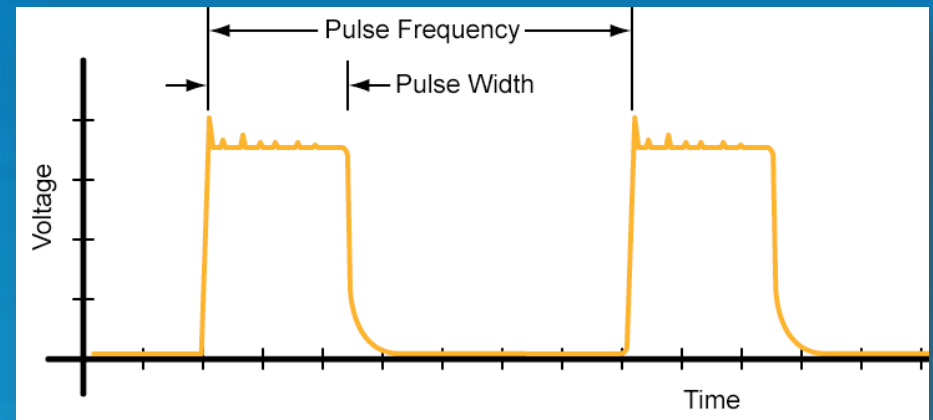
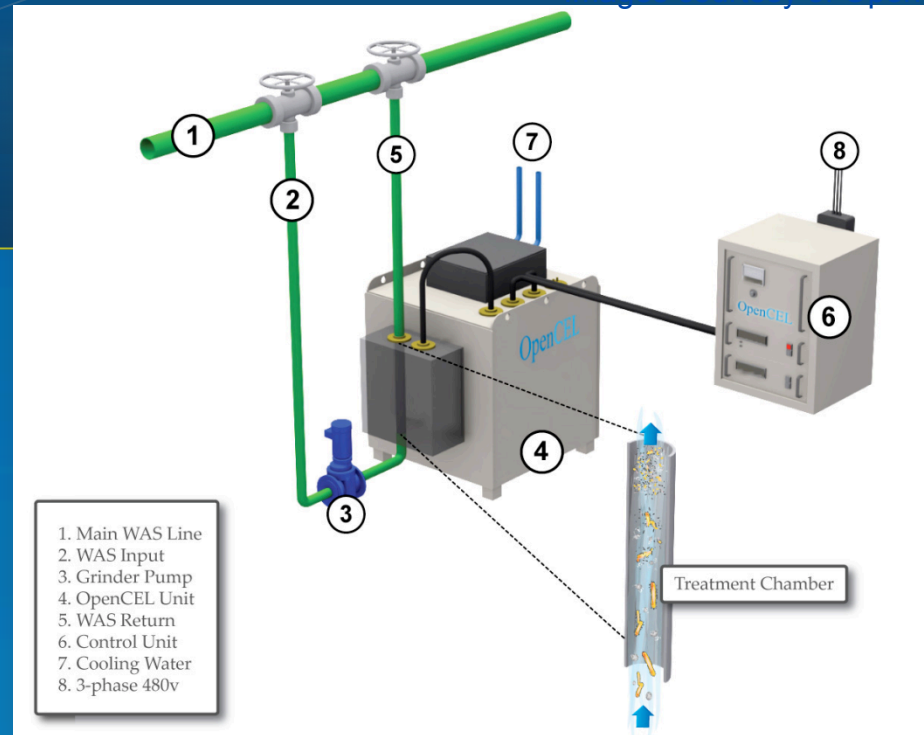


# Blue Plain Facility



# OpenCEL Overview

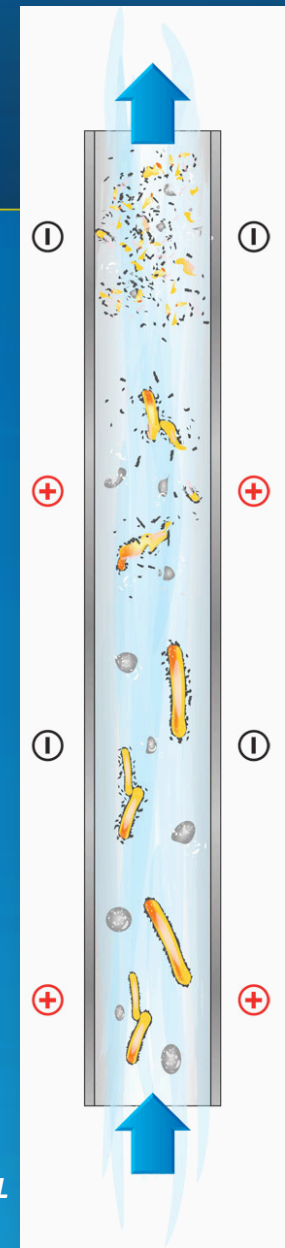
- Pulsed Electric Field
  - “Focused Pulsed” (FP) Technology
  - Requires cooling water, 480V line, grinder pump, access to sludge line
  - Operates at 15 to 100 kV/cm electric field strength; 2 to 15  $\mu$ s pulse width; 2 to 10 kHz pulse frequency
  - Non-arcing
  - Energy draw:  $\sim$ 0.05kWh/gal TWAS treated



# OpenCEL Data

- Only full-scale installation at Mesa, AZ
  - Has been operating continuously since Sept. 2007
- OpenCEL unit has:
  - Reduced the amount of energy required to heat the digester sludge feed (up to 20°F temperature increase in sludge)
  - Demonstrated a greater than 10% increase in VSR and a cumulative reduction in biosolids requiring disposal of over 30% since September
  - Demonstrated a corresponding increase in biogas generation by 55-60% in early 2008 and a cumulative increase of 40% since September

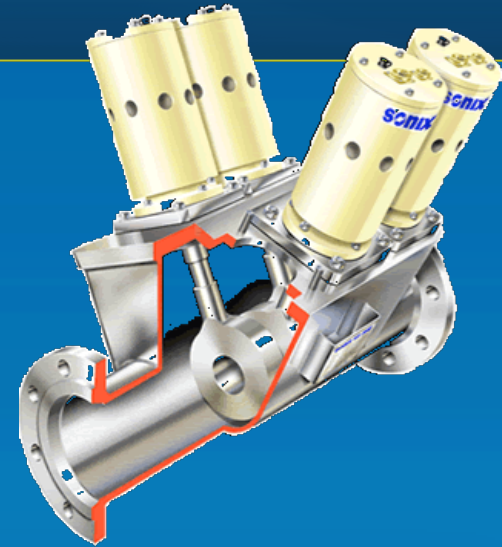
*\*Image courtesy of OpenCEL*





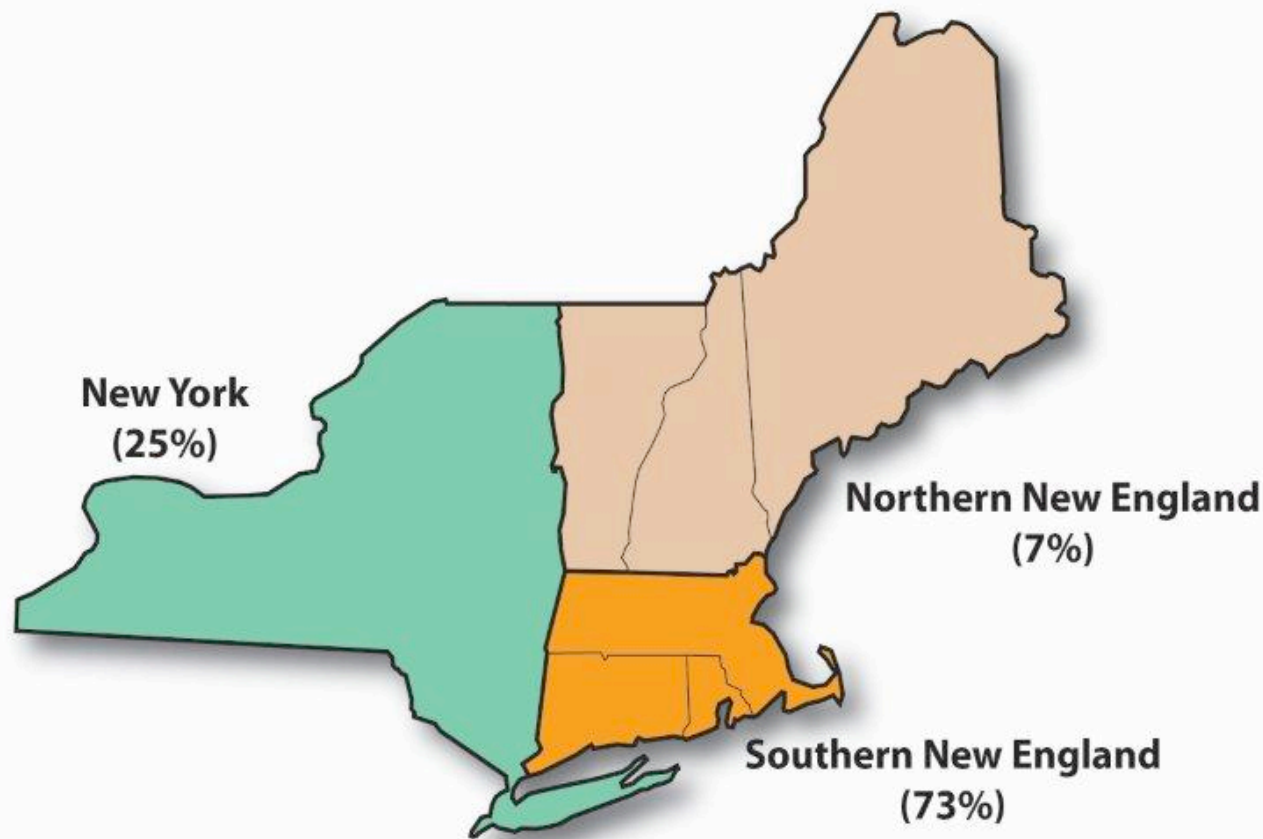
# Other Technologies

- Ultrasonic – Sonico
- Microwave – nothing on market yet
- Milling Centrifuges - Lysatec



# Reliance on Incineration for Biosolids Management

(Percent of Total by Weight)



Source: NEBRA National Survey, 2007