Water Purification
E Beam Opportunities

May 10, 2018

Wisconsin Based Cheese and Dairy Ingredient Company

Water Purification vs Waste Treatment

- Our main ingredient is milk
- The solids that go to our water purification plant are from milk, and should be captured prior to treatment for animal feed
- WPDES permit requirements now require more investment to meet tighter limits
- The water from our cheese and whey plant are purified before being discharged to the environment. They should be reused

Cheese Making 101

- 100 pounds of milk (3.5% fat, 3.2% protein, 5.4% carbohydrates, 0.8 minerals, 88% water)
  - 10 pounds of cheese (50% moisture or 5 pounds of water)
  - 90 pounds of whey (0.05% fat, 0.8% protein, 4.5% carbohydrates, 0.5% minerals, 95% water)
- Most of the whey solids are dried and 50% of the water can be captured as COW water (Condensate Of Whey)

Cheese and Whey Plant

- A large cheese plant utilizes 3 million pounds of milk per day (360,000 gallons or 65 trucks)
- Produces 300,000 of pounds of cheese per day
- Produces 75,000 pounds of dry whey products
- Uses 700,000 gallons of water per day (generally once through)
- Generates 800,000 gallons of waste water per day (most for cleaning equipment)

Cleaning Compounds

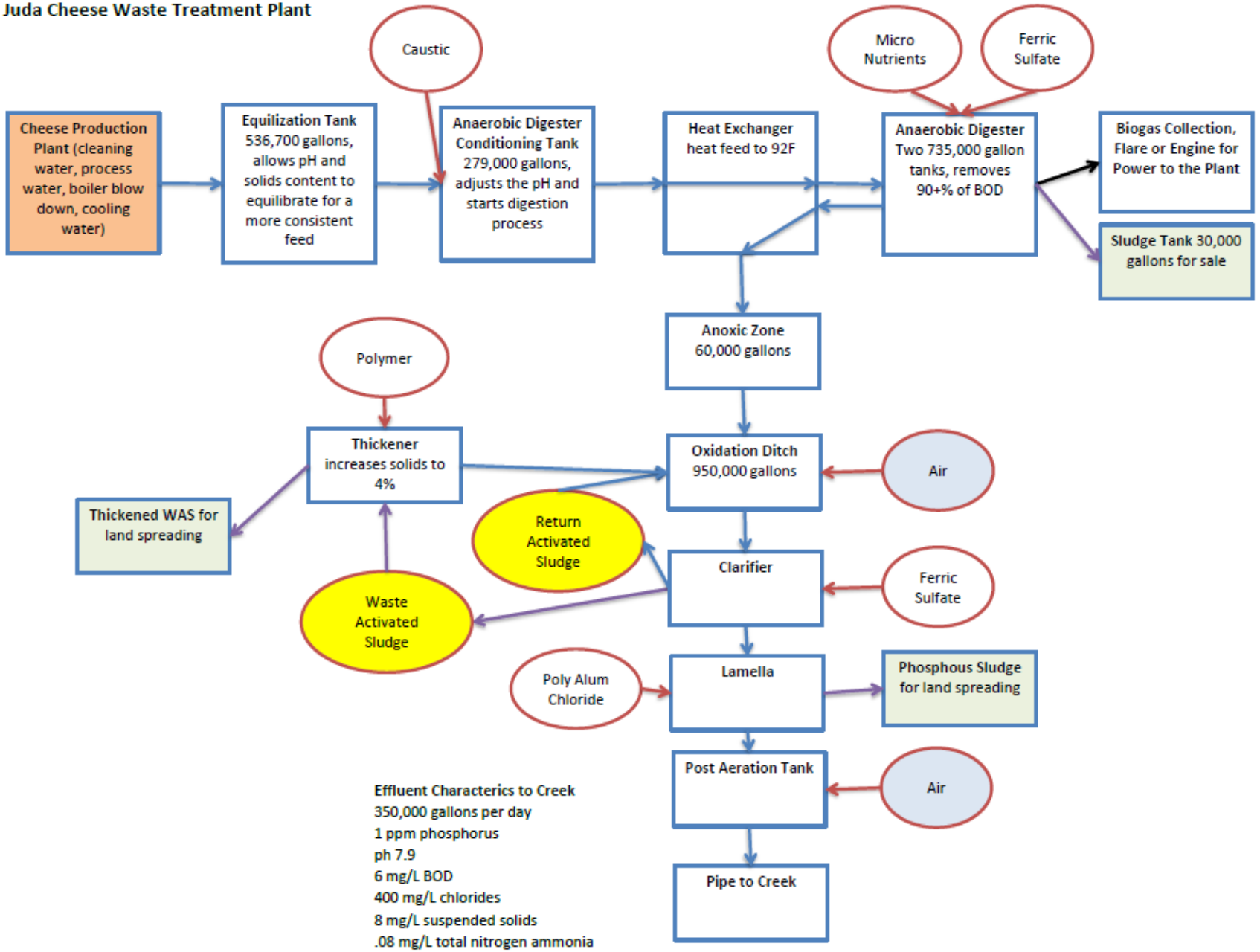
- What can e-beam do to these compounds

PROJECTED DAILY USE gal	LBS/day								
Period 1	Nitrogen	Sulfur	Silicon	Phosphorus	Calcium	Sodium	Potassium	Chloride	
850.2	133.55	223.76	16.28	17.58	0.04	1183.38	0.34	113.36	
	26.7	44.7	3.3	3.5	0.0	236.5	0.1	22.7	ppm
								600,000	gpd

Pasteurized Milk Ordinance
Water Reuse

- Category 1-Potable Water Reuse
  - Needs to be pasteurized equivalent
  - Requires cleaning of tanks and distribution lines
- Category 2-Limited Use
  - Pre-rinses, cleaning water makeup, culinary steam
- Category 3-Not meeting requirements of ½
  - Non culinary boilers
  - Outside of truck washes

Juda Cheese Waste Treatment Plant



Effluent Characterics to Creek
350,000 gallons per day
1 ppm phosphorus
ph 7.9
6 mg/L BOD
400 mg/L chlorides
8 mg/L suspended solids
.08 mg/L total nitrogen ammonia
24 mg/L variable nitrogen ammonia
9 mg/L dissolved oxygen

Purified Water from Cheese

Effluent Characterics to Creek

350,000 gallons per day

1 ppm phosphorus

ph 7.9

6 mg/L BOD

400 mg/L chlorides

8 mg/L suspended solids

.08 mg/L total nitrogen ammonia

24 mg/L variable nitrogen ammonia

9 mg/L dissolved oxygen

E Beam Opportunities

- Reuse of secondary streams
  - RO retentate with 3% CHO and 3% minerals
  - COW water with low levels of BOD
  - Polished cleaning water
- Reuse of purified water for towers, boilers, etc