Micro Breweries, Food Processors, and your WWTP

Mark J. Hurley, M.S., P.E.

Gosling Czubak Engineering Sciences, Inc.

Presentation Overview

- Background
- Typical Challenges
- Potential Solutions
- Specific Case Studies
- Closing
- Contact

Background

- Over the past decade, micro breweries have increased substantially
- Michigan is home to dozens of producers of food & fruit products

Typical Challenges

- **Both processes create a byproduct of high strength wastewater**
  - Often discharged to municipal sewer systems
- **High variability of flow volume**
- **Typically wastewater has high levels of BOD_5, suspended solids, phosphorous and ammonia**
  - Concentration of BOD_5 can be a magnitude or more stronger than domestic wastewater

Typical Challenges

- **Even a small amount of high strength waste can contain a large portion of a plant's organic load**
  - Stresses the treatment system (… and the operator, who tells the DPW director, who tells the Village Manager, who lets "the engineer" know…)
  - Challenges discharge permit compliance

Example

CGI Variable Loading Issue

"Pounds is Pounds"

Cherry Pack 2011 vs Average Day 2010
Side by side comparison

COD = 1,081 mg/L
Dose = 698,000 Gallons
Dosage Weight = 6,293 lb
Mass Loading over ~39 acres = 163 lb/ac/day

COD = 1,520 mg/L
Dose = 166,000 Gallons
Dosage Weight = 2,104 lb
Mass Loading over ~39 acres = 54.5 lb/ac/day

Typical reference loading recognized by the MDEQ is 50 lb/ac/day

Potential Solutions

- Modification of plant cleaning procedures
- Plant use of alternative cleaning compounds
- Plant pretreatment system
- Diversion of high strength waste to holding tanks and transportation to other WWTP facility
- Collaborative improvements to municipal WWTP to accommodate waste

Case Study: Elk Rapids

- **Municipal wastewater treatment plant**
  - Aerated Lagoons (wait for it)
- **Shorts Brewing Company**
  - Existing customer with high strength waste
- **Burnette Foods**
  - Needed a solution for its waste; desired a local solution
- **How do we solve?**

Existing System

- **Constructed in 1978**
- **Hydraulic Capacity**
  - 407,000 gpd
  - Currently 253,000 gpd
- **Organic Capacity**
  - 960 #/day BOD_5
  - Currently 590 #/day

Shorts Brewery

- **Needs at the time**
- **Flow**
  - 4,000 gpd (17 homes)
- **Organic Loading**
  - 6,500 mg/l BOD_5
  - 220 #/day BOD_5
    - 440 homes
  - 13,000 mg/l COD
- **Increased Production?**

Burnette Foods

- **Needs at the time**
- **Flow (Process Only)**
  - 40,000 gpd (170 homes)
- **Organic Loading**
  - 3,000 mg/l BOD_5
  - 1,000 #/day BOD_5
    - 2,000 homes
- **Increased Production?**

Case Study: Elk Rapids

- **Shorts Brewing Company built and now operates a privately-owned pretreatment system**
- **Burnette Foods became a Village customer**
  - Upfront capital contribution
  - Ongoing operational surcharges
- **Village WWTP Improvements**
  - Added activated sludge processes and headworks improvements

Case Study: Elk Rapids

- **Issues Addressed**
- **High Variability of Peak Volumes**
  - Flow equalization at Burnette Foods
  - Segregated high strength waste
  - Implemented proven, robust treatment technology
  - Sized WWTP equipment for max day demand; maintained adjustability

Case Study: Elk Rapids

- **Issues Addressed**
- **How to pay for it?**
  - Built only what was needed
  - Secured State funding
  - Involved Burnette Foods in cost sharing
  - Selected affordable treatment options
  - BTW, on time and on budget (pat pat pat)

Case Study: Cherry Growers

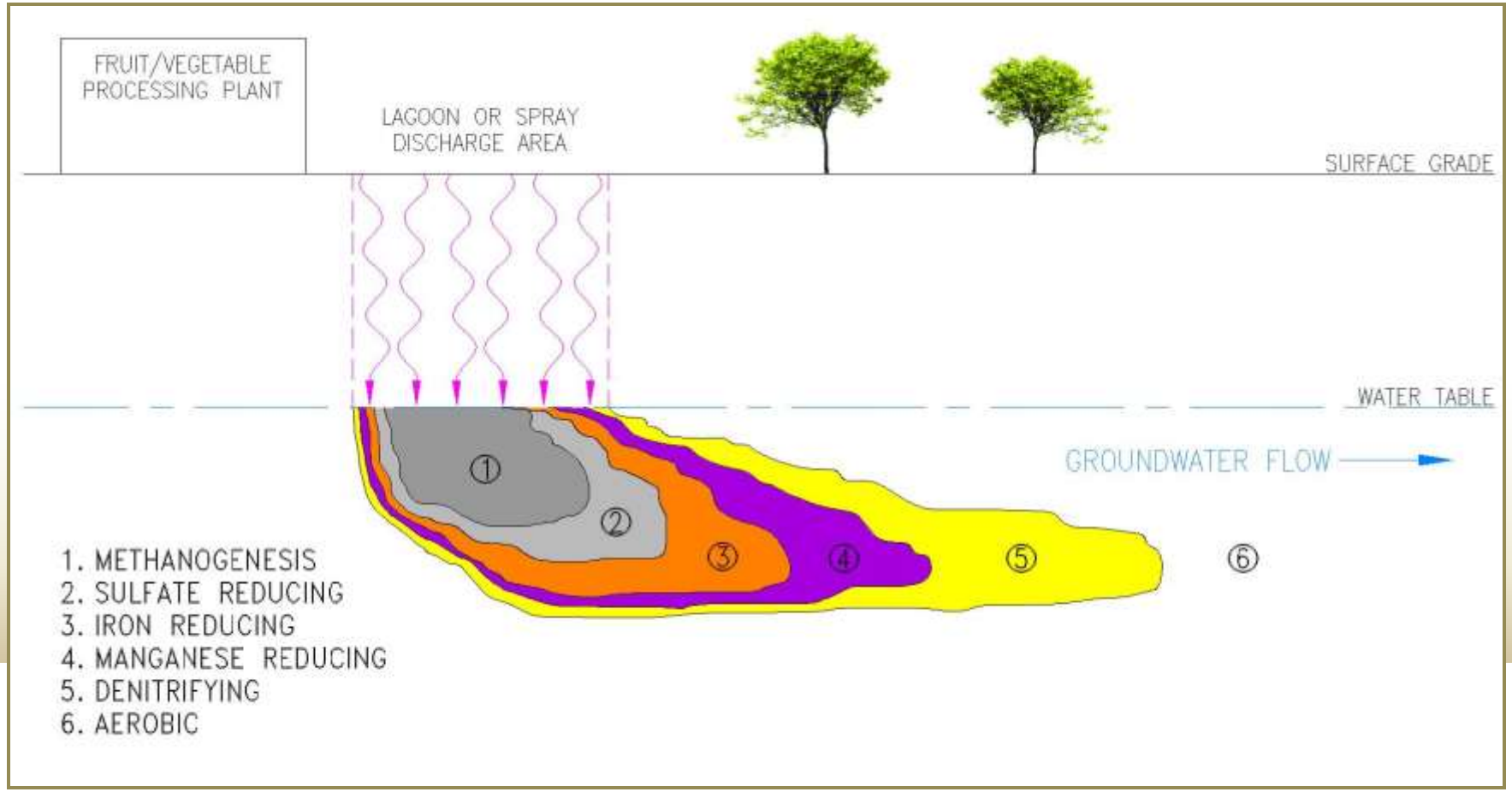
- **Major fruit processing cooperative operation**
- **High strength wastewater** (remember above slide)
- **High variability of flow volume and loading rate**
- **Wastewater Treatment Process:**
  - Hydro sieve for solids removal and spray irrigation fields

Case Study: Cherry Growers

- Variable loading of wastewater onto the irrigation fields created a reduced environment within the subsurface
- High concentrations of inorganic salts had been leached into the groundwater
  - Dissolved Iron
  - Dissolved Manganese

Case Study: Cherry Growers

Probable subsurface degradation that has occurred at CGI due to variable loading of the irrigation zone



Case Study: Cherry Growers

- **The potential solution? Air sparging.**
  - Process of injecting air directly into groundwater
- **Two Goals**
  - Create an aerobic environment within the soil
  - Replenish the oxygen in the groundwater and reverse the anaerobic conditions caused by the high strength, irrigated wastewater

Case Study: Cherry Growers

- **Observations and Conclusions**
  - Anaerobic environment to aerobic environment
  - Adequate air contact time for removal of COD/BOD
  - Degradation essentially eliminated
  - Metals leaching nearly eliminated under variable loading
  - Increased biological activity
  - Full irrigation air sparge system implemented at significant cost savings (vs. traditional mechanical WWTP)

Sparge Zone Pilot Study Results

Before

- Dissolved Iron = >11.0 mg/L
- Dissolved Mn = 0.51 mg/L
- Dissolved Oxygen = <1.0 mg/L
- Alkalinity = >350 mg/L
- ORP = 23 mV to –64 mV

After

- Dissolved Iron = 0.0 mg/L
- Dissolved Mn = 0.0 mg/L
- Dissolved Oxygen = >10.0 mg/L
- Alkalinity = 180 - 260 mg/L
- ORP_{AVE} = 160 mV

Closing

- Many solutions to accommodate high strength waste
- Producers must understand the effect of their discharges on the treatment system
- Operators must understand the nature of processing and barriers faced by producers AND communicate to the elected officials the potential pros and cons of accepting high strength wastewater
- Collaborate to find mutually-beneficial solutions

Contact

Mark J. Hurley, M.S., P.E.

Gosling Czubak Engineering Sciences, Inc.

1280 Business Park Drive

Traverse City, MI 49686

231-946-9191

mjhurley@goslingczubak.com