Sustainable Water Reuse: Design Build Delivery of Water Recovery and Reuse Facility at Frito-Lay
Casa Grande, AZ

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Agenda

• Site
• Project Overview and Objectives
• Process Water Treatment and Recycling Plant (PWTRP)
• Renewable Energy
Pre-2008 Casa Grande Plant & Land Application Fields

Past Land Application Fields (~120 acres)

Plant
Project Overview & Objectives: Sustainability

- Water
  - Process Wastewater Recovery for Reuse
- Energy
  - Solar Panels
  - Biomass Boiler for Natural Gas Production
- Facilities
  - LEED Certified Main Facilities
- Economics
  - Cost Effective Design
  - Reliable Performance
Project Overview & Objectives

• Flagship Project for Frito-Lay, Pepsico & CDM Smith
• High profile/example project for other food industries
• Achieves sustainable goal for “Near Net Zero” facility
• Integrates production procedures with treatment & reuse
• Aesthetically pleasing to showcase for visitors
• Produce Sun Chips and other products at Casa Grande facility using solar power
• Area used for waste process water land application converted to solar fields
• A treatment plant to recycle process waste water
Project Overview & Objectives: Process Wastewater

• To align with their sustainability goals, Frito Lay selected to treat waste process water to be reused.
  – Washing
  – Cleaning
  – Move Food Products
  – Sanitize Equipment

• Finished Water Quality: Meets EPA Primary & Secondary Drinking Water Standards
Process Water Treatment and Recycling Plant

Basis of Design

- Design Flow: 645,000 GPD (450 GPM)
  + Future Expansion

- Water Recovery & Reuse: 75 - 80%

- City Water: 20 – 25%
Process Water Treatment and Recycling Plant Site Layout
Process Water Treatment and Recycling Plant
Solids Handling Building

- Rotary Drum Screens
- Solids Blending Tank
- Centrifuges
- Centrate Recovery Tank
Process Water Treatment and Recycling Plant
Process Wastewater
Process Water Treatment & Recycling Plant
15 Steps!

Step 1. Plant Process Sump:

Start Point
Step 2. Primary Screens:

Dry Cake 26%

Blend Tank

Centrifuge
Process Water Treatment & Recycling Plant

Step 3. Equalization Tank

Step 4. pH Control System

CO2 System
Step 5. Primary Clarifier

Influent:
BOD = 2,200 mg/L
TSS = 420 mg/L
TKN = 78 mg/L
Process Water Treatment & Recycling Plant

Step 6. Anoxic Tank

MLSS = 8,000 – 10,000 mg/L

Step 7. Aeration Tanks

Unique Design Houses Bioreactors in 1 Concentric Tank
Step 8. MBR Tanks

Step 9. Back Pulse Tank

(Direct Discharge)

BOD & TSS = ND-10 mg/L
TN = 2 – 9 mg/L
NO3 = ND- 2mg/L
Step 10. Activated Carbon

Step 11. UV Disinfection
Step 12. LPRO System

Permeate Meets EPA Drinking Water Quality

Permeate

Reject Water
Step 13. Water Stabilization

Step 14. Chlorination

Step 15. Water Storage Tank
Performance of MBR During the Month of January 2011

- **Influent COD (mg/l)**
- **MBR Permeate COD (mg/l)**

**Influent and MBR Permeate COD (mg/l)**

- **Time (Days)**
Performance of MBR and LPRO Units in TDS Removal
(January, 2011)

- Influent TDS (mg/l)
- MBR Permeate TDS (mg/L)
- LPRO Permeate TDS (mg/l)

<table>
<thead>
<tr>
<th>Time (Days)</th>
<th>TDS (mg/l)</th>
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<tbody>
<tr>
<td>1-31</td>
<td>0-3000</td>
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Influent TDS remains relatively constant throughout the month, while MBR and LPRO permeate TDS show some fluctuations.
Process Water Treatment & Recycling Plant

- Fouling of LRPO Membranes
- Membrane Autopsy Performed
- Organic Foulant Constituents
  - Proteins
  - Carbohydrates
  - Polysaccharides
Fouled LPRO Membrane Due to High pH
New LPRO Membranes
(DOW/FilmTech)
MBR Permeate Before & After GAC Tanks
Comparison of New Filter Cartridge With Dirty Filter Cartridges
Primary Clarifier Effluent pH and MBR Permeate pH
COD Removal Efficiency by Primary Clarifier and MBR (January 2012)

- EQ Tank COD (mg/l)
- Primary Clarifier Effluent COD (mg/l)
- MBR Permeate COD (mg/l)

COD = 96–98.5% Removal
BOD = ND (98% of Times)

55-67% COD Reduction
TDS Removal Efficiency by MBR & LPRO

(Raw Process Water TDS 2,200 mg/l - 2,800 mg/l)

February 2012

60 - 65% Reduction

97% - 98.5% Reduction
Process Water Treatment & Recycling Plant
Finished Water Quality

- BOD = ND
- TSS = ND
- TN = ND
- NO3 = ND
- Color = 0 CU
- NO Microbes
- NO Sugar
- NO Protein
- Low TDS

- Meets EPA Drinking Water Standards!
Renewable Energy

- 4 Locations on Site
- 3 Types of Solar Panels
- Produce ~5MWt ~50% of Site’s Annual Load

Sterling Engine
Dual Axis Tracking

Single Axis Tracking

Dual Axis Tracking
Renewable Energy

- Single Axis Tracking Photovoltaic:
  - Proven Technology
  - 18,000 Solar Panels
  - 36 Acres
  - Covered Parking & Field

- Dual Axis Tracking Photovoltaic:
  - SolFocus PV Panels
  - 10 Stirling Engines
Project Achievements

• 75 - 80% Water Reuse Achieved
• <1% of Waste to Landfill
• 67% of Energy Generated from Renewable Sources
• Collective Actions Reduced Greenhouse Gas Production by 50%
Questions?