Why Worry – Water is Cheap

NAMI Environmental Conference

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Water is Cheap, and That is a Problem

• Cost of 1,000 gallons of water in Atlanta, GA = $8.25
• Average cost of 1,000 gallons of water in the U.S. = $1.50

• Water stress is the ratio of water withdrawal to total available renewable supply
• Water cost does not currently reflect water stress
Tyson Foods, Inc.

• 122,000 team members
• 113 production plants
• Each week we process:
  – 130,000 cattle
  – 424,000 hogs
  – 35,000,000 chickens
  – 75,000,000 pounds of prepared foods
• Each week we use 596 million gallons of water
  – It takes about 1 gallon of water to produce 1 pound of product
Tyson Sustainability

• Tyson takes a multidimensional, system-level sustainability approach which addresses the food produced, animal well-being, environmental, workforce and community issues

• Our latest sustainability report is found at tysonsustainability.com
Water Sustainability

• Within our plants, we have a 12% reduction goal by 2020 for water intensity

• We have 36 full treatment wastewater plants and 55 pretreatment wastewater systems

• Tyson is partnering with World Resources Institute (WRI) to:
  – Assess water-related business risks across the value chain
  – Measuring water associated with purchased electricity
  – Set context based water targets
Why Does Tyson Care About Water?

• Water is an essential component to safe food production
• Water is an essential part of the beef, pork and chicken value chain
• Water is critical to the communities our team members live in
  – 596,000,000 gallons is the amount of water used by 851,000 people in one week
• Water stress is a real issue, especially in the western states

Bottom line: responsible, forward-looking management of water resources is the right thing to do
100th Meridian
Projected change in water stress (Change from baseline to 2020 business as usual)

Legend:

- **Light blue**: 2.8x or greater decrease
- **Dark blue**: 2x decrease
- **Medium blue**: Near normal
- **Pink**: 1.4x increase
- **Red**: 2x increase
- **Orange**: 2.8x or greater increase
- **Gray**: No data
Projected change in water stress (Change from baseline to 2040 business as usual)

Legend:
- ws4020cl
- 2.8x or greater decrease
- Near normal
- 2x increase
- 1.4x decrease
- 1.4x increase
- No data
Projected change in water stress (Value in year 2020 business as usual)

Legend:

- Low (<10%)
- Low-medium (10-20%
- High (40-80%)
- Medium-high (20-40%)
- Extremely high (>80%)
- No data
- Arid and low water use

Source: USGS/NOAA; Data: USGS, NPS
Projected change in water stress (Value in year 2030 business as usual)

Legend:
- Low (<10%)
- Low-medium (10-20%)
- Medium-high (20-40%)
- High (40-80%)
- Extremely high (>80%)
- Arid and low water use
- No data
High Plains Aquifer Example
Water is an Issue – Now What?

• Water conservation options
  – Reduce
  – Recycle
  – Reuse

• Reuse is a needed solution

• Reuse is going on today at the municipal level
Current Wastewater Reuse Projects

Figure 2-1. Planned and constructed IPR and DPR projects in the United States as of 2017
Terminology

• Indirect potable reuse (IPR): “Deliberative augmentation of a drinking water source (surface water or groundwater aquifer) with treated reclaimed water, which provides an environmental buffer prior to subsequent use”

• Direct potable reuse (DPR): “The introduction of reclaimed water (with or without retention in an engineered storage buffer) directly into a drinking water plant … includes the treatment of reclaimed water at an Advanced Wastewater Treatment Facility for direct distribution”
Indirect Potable Reuse
Table 1-3. Comparison of IPR and DPR practices

<table>
<thead>
<tr>
<th>Factor</th>
<th>IPR</th>
<th>DPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public perception</td>
<td>Public perception may favor IPR over DPR, but conditions are site-specific. Public outreach and involvement are important components of any form of potable reuse.</td>
<td>While DPR was previously referred to as “toilet-to-tap” and “flush-to-faucet,” more recent surveys indicate that the public understands that the treated reclaimed water potentially has higher quality than current sources; this is reflected in the San Diego project where some public responses have called for the highly-purified water not to be released to the environment where its quality could be degraded.</td>
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<tr>
<td>Practicality</td>
<td>The lack of a suitable environmental buffer may make IPR impractical.</td>
<td>While the elimination of an environmental buffer provides a higher level of control over the water, there may be a higher level of monitoring and/or treatment complexity required to offset the loss of response time and other potential benefits provided by the buffer.</td>
</tr>
<tr>
<td>Costs</td>
<td>Environmental buffers can incur significant costs to protect, maintain, operate, and monitor. Conveyance to the environmental buffer may be costly.</td>
<td>DPR may require a higher level of operator training and may involve additional treatment steps beyond IPR.</td>
</tr>
<tr>
<td>Water quality</td>
<td>Environmental buffers have the potential to either enhance or degrade water quality, depending on site-specific conditions.</td>
<td>DPR provides a high level of control; but, the process monitoring and control may be more complicated than IPR because response times are shorter.</td>
</tr>
<tr>
<td>Water rights</td>
<td>Water rights issues can complicate IPR potential.</td>
<td>Water rights issues can complicate DPR potential.</td>
</tr>
<tr>
<td>Regulations</td>
<td>Several states have regulations or guidelines governing IPR.</td>
<td>While the state of North Carolina recently lifted the regulatory ban on DPR, to date, no states have formal regulations or guidelines governing DPR. DPR facilities are currently considered on a case-by-case basis in the United States.</td>
</tr>
<tr>
<td>Treatment Requirements</td>
<td>Several states have regulations or guidelines for IPR treatment requirements.</td>
<td>There may be no difference in the treatment objectives between IPR and DPR; but, the level of process monitoring and control and, in some cases, the total level of treatment may be more complex for DPR, due to the absence of an environmental buffer.</td>
</tr>
</tbody>
</table>
Food Industry IPR/DPR

- Potable reuse is an area that has not been addressed for the food industry.
- Science-based regulatory guidance for water reuse would be of great benefit to both the food industry and consumers.
- This is a leadership opportunity to promote sustainable water quantity and quality, and sustainable consumer food production.
Food Industry Wastewater Challenges

• Nutrients, e.g. nitrogen and phosphorus
• Chemicals from sanitation, microbial interventions, and product formulations
• Sanitary wastewater
• Pathogenic microorganisms
Nutrients and Chemicals

• Achieve compliance with National Primary and Secondary Drinking Water Standards
  – https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations
Tyson 2015 Trial

• Used dissolved air flotation cell effluent

• Equipment
  – Oil and grease coalescing tank
  – Membrane bioreactor
  – Reverse osmosis
  – Manual chlorination

• Results
  – Of 102 primary and secondary drinking water standards, did not meet for NO3-N and total coliforms (no positive fecal coliform or e coli)
Tyson 2015 Trial

Before Treatment

After Treatment
Pathogenic Microorganisms

• This is the area that presents the biggest challenge and opportunity

• Needs
  – Identification of expected pathogens and loads
  – Risk analysis method(s)
  – Potential treatment options and log removal
  – Surrogate parameters and other indicators for validation monitoring
Goals

• Create an opportunity to make IPR and DPR an integral part of the food industry

• Guidance on how to evaluate, design and validate a water treatment process that ensures food safety and have the confidence of sound scientific work to back it up

• This may likely be an incremental process to allow for the opportunity to “learn as you go”, but existing work is available to draw upon
  - On-going municipal work
  - USEPA “2017 Potable Reuse Compendium”
Summary

• Water is a critical need for the food industry, and its long term sustainable use is at risk

• Action is needed

• Integrating IDR and DPR into the food industry is an opportunity to lead on this significant issue

• There are various guidance materials available, but not overarching regulatory guidance and direction

• USDA and USEPA are critical partners to make this a reality