From Sludge Disposal to Resource Recovery: Drivers in Biosolids Management over the Years

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Associate Vice President

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BLACK & VEATCH

14 March 2018
When we continue to
Think • Plan • Act
we will achieve Zero Injuries Today

Safety Moment

Dave,
City has asked us not to share these photos. They are a bit sensitive about this. Sorry, Jeff

From: Koch, David S.
Sent: Friday, January 12, 2018 11:36 AM
To: Henson, Jeffrey (Jeff)
Subject: Explosion Photo

Jeff: Any chance you can send me one of those photos of the explosion at the WWTP you had showed me when I was in your office on Tuesday?
Gas Buildup Causes Wastewater Plant Explosion

By Sara Jerome
@sarmje

A wastewater treatment plant in Missouri suffered an explosion last week as a result of methane gas buildup in the plant.

The explosion occurred around 10:30 pm and part of the building collapsed as a result, KSHB reported. Still, after the city fire department responded, the plant was able to avoid closing.

“No one was injured in the explosion, which damaged a hallway and stairwell. On Thursday morning, Kansas City Water was assessing the damage, which was categorized as being more than minor, closer to substantial,” The Kansas City Star reported.

“Workers also were cleaning up debris and making repairs. Methane gas is a byproduct of the wastewater treatment process. It was unknown what sparked the explosion,” the report said, citing a water department official.
Agenda

- Regulations History
- Case Study Examples
  - Monroe
  - Wyoming
  - Grand Rapids
  - MWRDGC – Stickney WRP
- Going Forward
  - Where are we headed?
  - Takeaways and acknowledgements
Regulations History

- First significant updates since the CWA (replaced 40 CFR Part 257)
  - Enviro group challenged USEPA – indirect goal: IPP
- Introduced Class A and PFRP
- Clarified/modified prior regs for land application (Class B and PSRP) – monitoring, etc.
- Positive impact: Beneficial reuse programs more defensible
Regulatory Impact on Beneficial Use

- 2004
- 1998
- 1984
- 1979

Derived from: Metcalf and Eddy, 1978; EPA, 1984; Rios, 1992; EPA, 1999; Beecher et al., 2007
Case Study Example - Monroe
Planning re: 503 regs

• 1991 study evaluating alternatives
• Drivers: concern over long-term viability of landfilling and 503 reg impacts
• Recommended heat drying to Class A standards
• Conceptual design prepared
And then...

- Did not move the plan forward (cost?)
- Continued to landfill and doing so today
- Equipment upgrades over the years:
  - BFPs at time of study
  - Upgraded to centrifuges in 1998-2000
  - Replaced with screw presses in 2015 (power use reduction)
- No current major drivers for change
  - Some economic pressured with hauling costs (but not landfill)
Case Study Example - Wyoming
Early 1990’s Planning

- Existing program – LA and LF
- Odor issues
- Voiced concerns on long-term viability of LA and LF
- Initial plan: Enhancement to LA and LF programs
- Long term: Keep other technologies and end uses on the shelf and re-evaluate in 5 years
Initial Improvements

- Additional biosolids storage tank
- Replace domes with flat covers on existing tanks
- Pumping/loading improvements
- Odor control improvements

Focus on land application program
Case Study Example – Grand Rapids
History

- Anaerobic digestion and sludge drying beds
  - Metals/toxics forced a change
- Incineration and Zimpro (land app and landfill)
  - 503 air regs (incineration) and equipment condition (Zimpro) forced a change
- Contract dewatering (land app and landfill)
- Planning in 2001: D&M of Class A product most viable long-term, through composting and/or heat drying
  - Stated concern of long-term viability of Class B land application
Aligned Goals and Synergies

- Common issues facing both communities (aging infrastructure, land application public perception)
- Both planning for long-term options
- Sustainability focus
- Relatively close proximity
- Officially formed on Earth Day 2004
Current Initiatives

- Digestion/HSW digestion
- Nutrient recovery/algae production
- Other resource recovery (energy, ammonia)

Driver: WRFF/Utility of the Future - Today
Case Study Example – MWRDGC Stickney WRP
Drivers at MWRDGC

- Resource recovery
- Biosolids: diversity of outlets
- Nutrient management (Gulf hypoxia; Illinois NLRS)
- Competition from the various uses (nutrients – composting vs. Ostara; energy – MBM vs. others)
Solids Handling at Stickney WRP

- O’Brien WRP Sludge (PS & WAS)
- WAS (Batteries A,B,C,D)
- Preliminary Settling Tanks
- Sludge Screens
- Sludge Concentration Tanks
- Pre Digestion Centrifuges
- Sludge Holding
- Sludge Holding Tanks
- Post Digestion Centrifuges
- Dryers (MBM)
- Centrate
- WASSTRIP
- Ostara Nutrient Recovery
- Dewatered Biosolids
- LASMA
  - Land application
  - Composting
- To Salt Creek Interceptor
- To Southwest Interceptor
- To Argo Interceptor
- Railcars (to LASMA)
- Supernatant

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Other Examples
Other utilities/initiatives

- Ann Arbor – continued investment to LA
- GLWA/DWSD – diversity of outlets
- East Lansing – digestion project
- Holland BPW – co-burning interest (since abandoned), current landfill issues
- NBP – voluntary, industry-driven program (focused on public acceptance, etc.)
Going Forward
Regulations – where to from here?

- Federal regulatory outlook
- State regulatory focus areas
- Holistic approaches toward sustainability and resource recovery
Federal Regulations/Activities Generally Supportive of Biosolids Resource Recovery

• Food Safety Rule
• Antimicrobial Soap Ban

• Renewable Fuel Standard
• OIG 40 CFR 503 Audit
FDA Food Safety Modernization Act (FSMA): Produce Safety Rule (Nov 2015)

- Focus: food-born illness prevention during food production, handling

- Biosolids a concern in proposed rule comments
  - FDA response: that “adherence to 40 CFR part 503 remains an appropriate approach to the use of biosolids for the growing of covered produce. We continue to believe that these requirements are appropriately protective of public health.”

- Final rule explicitly addresses biosolids use
  - Growers “may not use human waste for growing covered produce, except sewage sludge biosolids used in accordance with the requirements of 40 CFR part 503, subpart D, or equivalent regulatory requirements.”
Antimicrobial Hand Soap Ban

- FDA target: 19 ingredients antibacterial in hand soaps (not sanitizers)
- Proposed in 2013, finalized in Sept 2016
- Effects in biosolids noted well before rule finalization
  - 25-50% reduction in triclosan (TCS), triclocarban (TCC) at MWRDGC plants

Research supports negative health risk from biosolids, but reductions in TCS/TCC critical from public acceptance perspective

Safety and Effectiveness of Consumer Antiseptics; Topical Antimicrobial Drug Products for Over-the-Counter Human Use; Final Rule” Federal Register. Vol. 81, No. 172/ Tuesday, September 6, 2016
Renewable Fuel Standard (RFS) Program

- Part of Clean Air Act
- Developed in response to 2005 Energy Policy Act
  - Ensure transportation fuels contain a min. volume of renewable fuel
- Biosolids-derived fuel classification
  - “Other advanced” initially
  - “Cellulosic advanced” as of 2014
  - CNG, LNG and power for electric vehicles
RFS Credits: Classification Matters

- **RFS credits** = Renewable Identification Numbers (RINs)
  - 1 gallon renewable fuel = 1 RIN

- **Current value:**
  - D3 (Cellulosic): $2.50/RIN
  - D5 (Advanced): $0.90/RIN

- **Co-digestion impacts value**
  - Biogas from food waste = D5

Reprinted with permission from BioCycle, February 2017, S. Olson (Genscape)
Potential Approaches to Address RIN Co-digestion Concerns

**Composite Calculation**
- Determine “baseline” sludge-based biogas (D3)
- Any biogas above baseline credited as D5

**Separate Digestion**
- Digest sludge and food waste in separate facilities
- Simplifies credit calculation

**Combined Plant Influent**
- Add foodwaste to wastewater before headworks
- Produced biogas would be D3
EPA Office of Inspector General (OIG) Audit of 503s

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Evaluation of EPA’s Controls Over Land Application of Sewage Sludge (Project OPE-FY17-00019)

OIG Question: “Does the EPA have and implement controls over the land application of sewage sludge that protects human health and the environment?”
State Level Regulations

Human waste as fertilizer defended

Fort Worth’s ‘sewage sludge’ raises a stink in the country

Concerns:
- Odor-based Regulations
- Phosphorus Bans
- Polyfluorinated Alkyl Substances (PFAS)

Opportunities:
- Co-digestion (CA/MA initiatives)
Phosphorus Turfgrass Bans

• 15 states regulate P applications to turf
  • 11 ban P for lawn maintenance

• P-sensitive regions (Northeast, mid-Atlantic, Great Lakes, Florida)

• Regulations can range from management practices to bans

• Can include biosolids composts and fertilizers, but language is often ambiguous

For more information: http://www.wrrfdata.org/PhosphorusFS/WEF-PhosphorusFactSheet2014.html
**PFAS Concerns**

**Drinking Water Limits**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>PFOA limit (ppt)</th>
<th>PFOS limit (ppt)</th>
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<tbody>
<tr>
<td>EPA (advisory)</td>
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<tr>
<td>New Hampshire (std)</td>
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<td>Vermont (std)</td>
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<tr>
<td>Michigan (aquifer std for cleanup – 1/10/18)</td>
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**Concerns in NY, NH and VT from old factories, etc.**

**Focus expanded to other industries (including composting)**

**Several businesses close, including a composter**

**EPA Health Advisory for drinking water = 70 ppt**

**New standards set in NH, VT**

**Context**

<table>
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<th>Source</th>
<th>PFOA (ppb)</th>
<th>PFOS (ppb)</th>
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<tbody>
<tr>
<td>Biosolids</td>
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<tr>
<td>US Daycare center dust</td>
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<tr>
<td>US Human blood, 1999</td>
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<td>US Human blood, 2012</td>
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**Summarized from Beecher, 2017**
Takeaways – what is really driving how we manage biosolids?

- Aged infrastructure
- Sustainability goals
- Energy efficiency goals
- Resource recovery focus
- Wildcard: Public perception (odors, etc.)

Regulations will continue to provide guardrails and guidelines
Acknowledgements

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