

SEIT Scholarship: A Journey through the United Kingdom For Biosolids Processing Solutions

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Project Background

- In 2001, MSD commissioned a new solids handling system
- Rotary Drum Dryers
- In 2005, MSD received approval from the Kentucky Division of Waste Management for Land application of the heat-dried biosolids



Project Background (Cont.)

- The Andritz Drum Dryer System is at the end of its useful life
- In **March of 2016** we solicited a Request for Expression of Interest (RFEI) for Potential Biosolids Processing Technologies and Management Methodologies
- We contacted over 48 companies to make them aware that the RFEI was going to be released.
- We requested information regarding technology, Service Approach, Site Requirements, Full scale projects/location, Funding, Management (e.g. own, contract operations, etc..)



What We Learned from the RFEI(s)?

- Multiple entities that were interested in providing biosolids processing and management technologies
- Array of Technologies: Hydrothermal Processing (HTP), Thermal Hydrolysis, Co-Digestion, Expanded Mesophilic Digestion, Struvite Recovery, Belt Dryer Drying, Chemical Fertilizer e.g. Anuvia[®], Fluid Bed Dryer, Enhanced Biological Phosphorus Removal (EBPR), etc..
- Multiple Biosolids Products: Class A, Class B, Class AA, Biocrude oil, Root Activated Fertilizer, etc..

EnglishRFEISummary/050516.xlsx - Microsoft Excel

RFEI Summary: Technology/Product/Service Highlights

REQUEST FOR EXPRESSIONS OF INTEREST (RFEI) FOR BIOSOLIDS PROCESSING and MANAGEMENT TECHNOLOGIES

Company	Technology Summary	Product	Proposed Project Team (If Applicable)	Service Approach: Biosolids and Management Technologies
Khafra (Louisville, KY)	They are proposing (2) options Regional Facilities/MFWQTC Regional Facilities use thickening technologies for the purpose of preparing the Biosolids for further processing Point-Sources Reduction (PSR) further off-site treatment via composting, drying and on/land application. MFWQTC Would complete the design/build of applicable biosolids processing facilities and associated Data Control Systems at MFWQTC at MI as well.	MFWQTC - Class B or LG for further processing and/or local beneficial use	Khafra, MWH, Beneficial Reuse Management Contractor, and Point Source Reduction Technology (Both Confidential)	Would like to determine the merit of producing Class A Biosolids. The options towards meeting this goal range from composting to on-site drying at the regional Plant locations. Design/Build/Operator, or Public/Private Partnership (PPP)
Black & Veatch (Louisville, KY)	There are offering multiple technologies that could be used to either enhance or replace the existing biosolids management systems at MFWQTC: Thermal Hydrolysis, Co-Digestion, Expanded Mesophilic Digestion, Struvite Recovery, Belt Dryer (Thermal Drying), and Production of a Chemical Fertilizer (Anuvia), Digester Gas Conversion to CNG	Class A, Increase Biogas, Struvite (P fertilizer), Chemical Fertilizer	Black & Veatch and IAC (fully owned by B&V long term partnerships	Offered an array of Options However their top (2) Choices Strategic Management Partnership or Concession Model (Design Build and Operate) The Concession agreement is a long term partnership with a concessionaire (fund or developer) that forms a SPV to deliver, operate and maintain the project
NuTerra Management LLC (Jacksonville, FL)	NuTerra partners with other strategic partner firms to optimize performance and minimize costs (i.e., for anaerobic digestion, methane production and energy generation).	Class B and Class A	BCI Environmental Corp. and NuTerra Management NuTerra™	Assist in the Design, Construction and Implementation
Genifuel Corp. (Salt Lake City, UT)		Biocrude Oil, methane gas, and sterile water	Genifuel/Pacific Northwest National Laboratory (PNNL)	Install centrifuge and HTP systems at CC, FF, and HC. Centrifuge dewatered WAS and HTP leaves no solids. All WAS trucking is eliminated. MFWQTC produces less solids because it is no longer receiving WAS from the smaller sites.

Task Management - Products - RFEI Matrix - Sheet5

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msd
Safe, clean waterways

The Leaders Innovation Forum for Technology sponsored by WERF and WEF

- Released invitation for SEEIT Scholarship on Nov. 1, 2016
- An initiative for utility personnel to visit other Utilities with innovations of interest and to share experiences with their peers
- The LIFT SEEIT is a tool and resource supporting transformation of water resource recovery facilities into **Utilities of the Future**



The Leaders Innovation Forum for Technology sponsored by WERF and WEF

- Thorough application process including resumes of team members
- Based on references in the RFEI, we located places where technologies were already in place
- Initial Review: Spain, Belgium, UK
- Requested to visit Seven (7) facilities in the UK
- Deliverables: Video, travel Report, and agree to support other Utilities with technology information



LIFT SEE IT 2017

- In January 2017, 32 Staff members from 11 Utilities were awarded scholarships:
- Notables: City of Boulder, City of Jackson, City of Raleigh (UK, Netherlands, Sweden), San Francisco Public Utilities Commission



SEE IT Itinerary

Technology	Facility	Location	Design Criteria
Thermal Hydrolysis/Exelys (2013)	Esholt	Bradford, UK	30, 0000 dry tons/year
Cambi Batch Flow(2013)	Seafield	Edinburgh, Scotland, UK	100 dry tons/day (dptd)
Thermal Hydrolysis-Mesophilic (2014)	Oxford	Oxford, UK	63 dtpd
GE Monsal Biological Hydrolysis by Mesophilic AD (2001)	Aberdeen Nigg	Aberdeen , Scotland, UK	16,000 tonnes of dry solids/year
GE Monsal sequential gas mixing technology (2013)	Davyhulme	Manchester, UK	91,000 dry tonnes/year
Advanced Anaerobic Digestion and Biowaste (2012)	Avonmouth	Bristol, UK	40,000 dry tonnes/year

Seafield WwTw

- Scottish Water (POTW)
- Veolia, 30 year O&M Contract
- Stopped drying in 2008
- Cambi™, March 2015
- (4) Employees for Biosolids Processing: Odour Technician, Unit Controller, Electrical/Mechanical Engineer
- Produce 90% of electricity for the site. 5.5 MW can run the entire plant



Lessons Learned-Seafield



- Think about Steam Management Access
- Be able to have Scaffolding available
- Must Clean Digesters prior to converting to Thermal Hydrolysis

Aberdeen Nigg WwTW

- Scottish Water –Authority
- Kelda Water Services (Operating Company)
- Service 280,000-300,000 people
- First Cambi™ Thermal Hydrolysis in the United Kingdom
- Does have trade unions
- Small Footprint
- Concerned about Odours-Fish Processing Nearby
- Struvite is an Issue
- Entire Plant process is under containment



Lessons Learned-Aberdeen WwTw

- Developed Performance Metrics: Odour Contacts, CHP% Utilization, Asset Replacement Spend Profile
- Improvement in Maintenance was critical
- On-hand Stock and Consumables
- Plans to upgrade their Cambi™ TH and boiler system to increase gas production.



Davyhulme WwTw

- Upstream, Advanced Digestion Plants
- 7 Dewatering Transfer Stations
- In pipe: 3% Digested Sludge
- 25% Dewatered sludge trucked to Facility
- Third Largest THP in the world
- 4 TH Units (20 reactors)
- Incentive: Gas To Grid



Davyhulme WwTw

Sludge Cake Storage



Cambi™ System



Lessons Learned-Davyhulme

- Prescreening is critical
- Must have an excellent conveyance system
- Gas to Grid management is dependent on demand
- Must include Redundancy

“Box of Shame”



Oxford WwTw

- Veolia Bio Thyles™ Thermal Hydrolysis Process
- Site-31 acres
- Capacity to treat 56,000 tonnes/day
- Performance Based Contract
- Side Stream NH₃-N concern



Oxford WwTw Post Digestion Dewatering

Post Hydrolysis- Bucher Press

Filtering Cloth



Oxford WwTw Lessons Learned

- Must define Side stream acceptability requirements
- Plant Layout is critical
- Availability of small parts is critical
- 2 Stages of Dewatering is critical



Esholt WwTw

- Veolia Built the Plant
- Yorkshire Water
- Serves pop. 750,000
- Prior to THP Incineration
- System required Special Access
- **Had Plant Flooding**

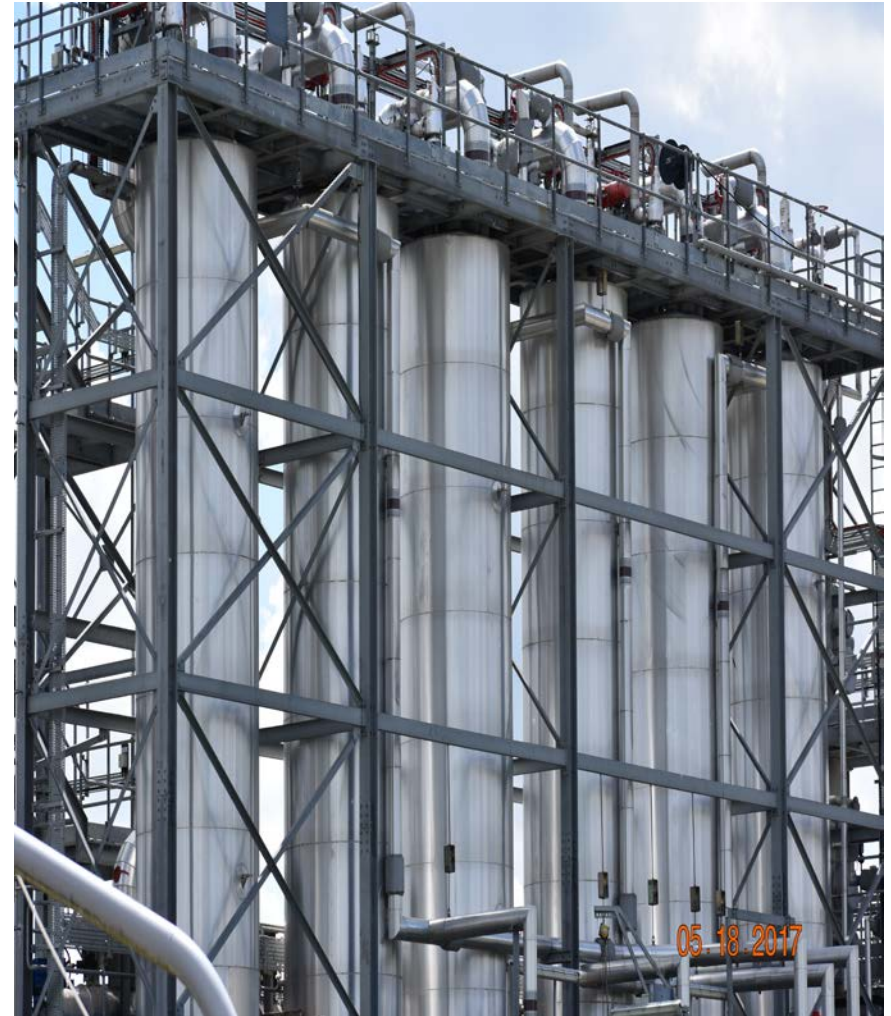


Esholt WwTw



Esholt WwTw Lessons Learned

- Profitability totally centered around maximizing energy recovery and generate electrical power to export to local grid
- Digester Feeding Protocol-Codigestion
- How to resolve Digester foaming due to THP



Avonmouth

- SWT/STC/FWTP/G+G
- Pop. Equivalent to 1M
- Anaerobic Digestion/Lime
- 100% Self-Sufficient in its electricity needs
- Has a food waste digestion facility- 240,000 tonnes/year
- Grey Water sold as cooling water



Avonmouth

Leased Land –Wind Turbines



Odour Control System



Lessons Learned-Avonmouth

- Mechanics of becoming a zero energy facility
- Extensive community outreach program
- Optimization of Digester Gas Production
- Renewable Obligation Certificates Program



What Did We Learn?

- Much more emphasis on safety and plant security
- Improvement needed in having spare parts on hand
- Maximization of Digester Gas Production
- Less Digesters are typically needed than with more conventional wastewater treatment processes
- Combined Heat and Power (CHP) is their profit center
- Must have staff dedicated solely for Biosolids Processing
- Renewable Energy possibilities
- Must be concerned about side stream(recycled)
- Struvite (Mg, NH₃, P) is an issue
- Mums the word on Maintenance Costs



Fun Facts

- Drove over 2000 miles
- UK still uses miles, lbs, and MGD
- Krispy Kreme Doughnuts is the American Sugar of Choice
- 6 months spent setting up visits via email, LinkedIn and FB
- Facilities were difficult to locate!



Summary

- SEE IT Scholarship, an excellent opportunity to see technology that you would consider for your Biosolids Processing Solution
- Invaluable lessons learned that can save you a lot of resources and capital dollars
- We have the same similar issues with POTWs in the UK: Energy costs concerns, maintenance challenges, odours, biogas production, etc.



Questions

