SEEIT 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..

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NuTerra Management LLC (lacksonville, R) Indees partners with other strategic partner Institute partners with other strategic partner costs (Le, A) anaebic digitission, melane production and energy generation). Class B and Dass A Class B and Dass A Component Logia and NuTerra Assisting the Design, Construction and Implementation Install carbon (C, P), and CL, Install carbon (C, P), and Install	Black & Veatch (Lovisville, Kr)	There are offering multiple technologies that could be used to either enhance or replace the mising biocalids management sparms at MPAOTC. Thermal Hiddinia, Co- Digerstin, Expended Massahllic (Densition, Statute Benner, Beit Dayri (Densition), and Production of A Chemical (Perlicer (Munick), Durate Geschmersion to D16	Class A, Increase Blogas, Smulte (P Techlicer), Chemical Fectilizer	Black & Veatch and IMC (fully owned by BBV long term partectings	Offered an army of Options Indexert Their too (2). Oncices Strategic KAnagement Partnership or Concession Model (Design Build and Operang): The Concession agreement is a long term partnership with a concessionaire (find or developer) that forms a SPC to developer) that forms a SPC to developer) that forms a SPC to developer).
Install centrifuge and HTP systems at CC, H7, and HC	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	BCR Environmental Corp. and NuTerra Management NuTerra ³⁴	Assist in the Design, Construction and Implementation
Genifuel Corp. (Salt Lake City, UT) Biocrude Dil, methane gas, and Genifuel Corp. (Salt Lake City, UT) Storille water Genifuel Corp. (Salt Lake City, UT) Stori	Gaolikal Para Kaletaka Para 1171		Biomude Oil, methane gas, and sterile water	Genifuel/Pacific Northwest National Laboratory (PNNL)	Install centrifuge and HTP systems at CC, HF, and HC. Centrifuge demotered WKS and HTP leaves no solids. All WAS mucking is eliminated. MFWQTC



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-Mesophillic (2014)	Oxford	Oxford, UK	63 dtpd
GE Monsal Biological Hydrolysis by Mesophillic 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)	Avonmounth	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 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
- VK 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.







