WWEMA 44TH WASHINGTON FORUM
MARCH 22, 2017
Objectives

➢ Provide background on Isle and the TAG process
➢ A year in review, a snapshot from the past fiscal year
➢ Key technologies going through the current TAG circuit
➢ Share a couple case studies that illustrate the challenges of scaling up in respect to the role of investment
Bringing new technologies to life
Connecting expertise, investment and inspired ideas across the globe
The Technology Maturity Sweet Spot
What is TAG?

The Technology Approval Group (TAG) accelerates the market uptake of qualified step change technologies by engaging water utilities with early-stage, innovative solutions. TAG serves as a collaborative forum that connects regional organizations and keeps participants informed about innovative technologies emerging in the marketplace.

- TAG is a global innovation forum for the world’s leading water utilities. The TAG model was first launched in the UK in 2005.
- Isle hosts TAG meetings across Europe, US, Canada, Brazil, Singapore, UAE, Africa, Philippines and Australia.
- The US Isle TAG forum was launched in 2011 and currently includes water utilities across 7 regions.
The US TAG Network

US NorCal TAG (Est. 2014)

US Water TAG (Est. 2013)

US Wastewater TAG (Est. 2011)

US Texas TAG (Est. 2015)

US Ohio Valley TAG (Est. 2014)

US Northeast TAG (Est. 2014)

US Southeast TAG (Est. 2013)
Subscribing TAG Members
Technology Approval Group Process

Isle Utilities conducts a 1-1 Technology Needs Assessment

In our global search for technologies, we bring forth the qualified solutions that meet top priorities

We conduct technology due diligence to objectively assess a solution’s commercial and technical readiness

Prior to each TAG, we present the best available solutions to members who vote on what they want to see

Members attend 3 meetings per year to review solutions with agencies that share similar operational challenges

If interest continues after the meeting, Isle will support next steps between vendor and utility

Utility Track

Technology Track

Technology goes through Isle’s DD process

Receives an evaluation to illustrate its commercial readiness

Aligned with regional needs and priorities, then invited to TAG if voted on by TAG members

If selected, receives support from Isle before the meeting

Attends and presents at TAG

If interest continues after the meeting, Isle will support next steps between vendor and utility
Isle Resources

Technology Evaluation

Company: Name — Description

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
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Similar technologies:

- APEM
- Aerial Survey

Technology Platform

Categories:
- Energy
- Environment
- Water
- Transport
- Maintenance

TAG Member Pilot Tracker

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Technology</th>
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<tbody>
<tr>
<td>ABS Materials, Inc.</td>
<td>Osorb VOC Capture Media</td>
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<td>ABS Materials, Inc.</td>
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<td>Dynamic Micro Sectors</td>
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<td>Wavelet</td>
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<td>Satelytics</td>
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<td>BlueInGreen, LLC</td>
<td>CDOX and HYDOZ</td>
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<td>Castagra</td>
<td>Castagra</td>
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<td>Clearas</td>
<td>Advanced Biological Nutrient Recovery System</td>
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<td>Colfast AS</td>
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<td>Comnix Inc.</td>
<td>ComnixApps</td>
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<td>Desalitech</td>
<td>Reflex RO Solution</td>
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<td>Diagnostic Technology</td>
<td>Phytoxigene CyanobDtec</td>
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<td>Dropcountr</td>
<td>Dropcountr CLEAR</td>
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<td>Dynamic Flow Tech Ltd</td>
<td>Waste Water Meter</td>
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<tr>
<td>Echologics</td>
<td>LeakFinder ST</td>
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<td>Echologics</td>
<td>EchoShoreTx and EchoShoreT</td>
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TAG Summary Report May and June 2015

The TAG Technology Report

Competitor | Offering | Components | Control Type | PMV Compatibility | Unit Price | US Market |
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The TAG Technology Report summarizes technologies for monitoring, tracking, and managing various aspects of environmental and water management. The report includes a table comparing different competitors based on their offering, components, control type, PMV compatibility, unit price, and US market status. The report also highlights the use of aerial survey techniques for monitoring large areas, which is particularly useful for environmental and water management projects.
US TAG Headline Summary

Subscribing Members
10/1/15 – 9/30/16

Meetings Held
10/1/15 – 9/30/16

- US Water TAG: 3 meetings
- US Wastewater TAG: 3 meetings
- US NorCal TAG: 3 meetings
- US North East TAG: 3 meetings
- US South East TAG: 3 meetings
- US Ohio Valley TAG: 3 meetings
- US Texas TAG: 2 meetings
US TAG Headline Summary

>100 presentations from 54 Technology Companies

10/1/2015 – 9/30/2016

Segmented by operational category:
- Water & Wastewater Treatment
- Water Quality & Monitoring
- Operations (MES)
- Asset Renewals, Assessment & Management
- Sludge Management
- Water Resources Management
- Condition Assessment & Leakage
- Intelligent Networks
- Energy Generation & Efficiency
- Customer Management
US TAG Headline Summary

TAG Technology Assessment: evaluation of a new technology by a TAG participant

1,135 Technology Assessments by Individual
10/1/2015 – 9/30/2016

Graph showing:
- Group Member Technology Assessments: 1135
- Requests for Additional Information: 240 (21%)
- Requests for Technology Follow up: 91 (8%)
- Interest in Pilot / Trial / Sale: 86 (7%)
US TAG Headline Summary

TAG Technology Assessment: evaluation of a new technology by a TAG participant

505 Technology Assessments by Agency
10/1/2015 – 9/30/2016

- Group Member Technology Assessments: 505
- Requests for Additional Information: 190 (38%)
- Requests for Technology Follow up: 81 (16%)
- Interest in Pilot/Trial/Sale: 80 (16%)

US TAG Headline Summary

TAG Technology Assessment: evaluation of a new technology by a TAG participant
Mentionable TAG Outcomes

Los Angeles County Sanitation District
Current pilot with New Sky’s SulfurCycle R process for H₂S
Wastewater TAG 12 February 2015

Orange County Sanitation District
Pending Board Proposal for ScFi Super Critical Oxidation pilot
Wastewater TAG 1 May 2011

East Bay MUD
2-phase pilot with Utilis leak detection tech completed, current contract
NorCal TAG 9 February 2016
Isle USA 2015/16 Hot Technologies
These technologies got the highest amount of invitations to present at US TAGs in 2015/16

**UTILIS**

**AREA**: Distribution & Leak Detection

**DESCRIPTION**: Utilizing the same technology that is used to detect water on other planets, Utilis offers a unique solution for leak detection in urban distribution networks. A satellite mounted sensor, similar to ground penetrating radar, is used to identify the characteristic spectral signature associated with drinking water. Leaks can be pinpointed within a 3-6 meter radius.

**2015/16 TAG PRESENTATIONS:**
- Northeast TAG 9
- Ohio Valley TAG 10
- Southeast TAG 12
- Texas TAG 3

**NO-DES**

**AREA**: Distribution & O&M

**DESCRIPTION**: NO-DES has developed and commercialized a new, effective mains flushing solution that virtually eliminates water wastage during operation. The unit filters and recirculates water flushed from a hydrant back into the distribution system, minimizing waste to a tiny fraction of the current process.

**2015/16 TAG PRESENTATIONS:**
- Northeast TAG 8
- Texas TAG 3
- Southeast TAG 11

**SAFE H2O**

**AREA**: Disinfection

**DESCRIPTION**: The Rapid Pathogen Detection System is a lab-based tool that provides quantitative analysis of pathogens in a water sample in under 4 hours. The unit has been demonstrated to meet detection sensitivity and accuracy requirements for Cryptosporidium and Giardia.

**2015/16 TAG PRESENTATIONS:**
- Northeast TAG 8
- Ohio Valley TAG 9
- Southeast TAG 11
- US Water TAG 11
Isle USA 2015/16 Hot Technologies
These technologies received the highest amount of invitations to present at US TAGs in 2015/16, and the highest amount of follow up interest.

<table>
<thead>
<tr>
<th>OPTIMATICS</th>
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<tr>
<td>AREA: Intelligent Networks &amp; Planning</td>
<td>AREA: Monitoring and Control, O&amp;M</td>
<td>AREA: O&amp;M</td>
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<tr>
<td>DESCRIPTION: The Optimizer™ is a cloud-enabled software package able of considering thousands of inputs across multiple asset management parameters and deriving an optimized solution to help reduce energy expenditure, capital costs, O&amp;M costs, and improve overall performance.</td>
<td>DESCRIPTION: SAMS Water and SAMS Wastewater are software product that complete automate compliance management including scheduling, data collection, and reporting. This ensures the integrity of the compliance management process, reduces cost, and prevents violations.</td>
<td>DESCRIPTION: iMARQ is an intuitive build-your-own-database app that enable field workers, contractors, and temporary works to instantly connect with existing utility system from the field using their own mobile devices. iMARQ automates real-time updates and status reports from the field.</td>
</tr>
</tbody>
</table>

2015/16 TAG PRESENTATIONS:
- Nor Cal TAG 6
- US Water TAG 9
- Northeast TAG 7
- US Water TAG 11
- US Wastewater TAG 15
- Nor Cal TAG 9
- Ohio Valley TAG 8
- US Water TAG 12
Isle USA 2015/16 Hot Technologies
These technologies got the highest amount of invitations to present at US TAGs in 2015/16

**OXYMEM**

**AREA:** Wastewater Treatment

**DESCRIPTION:** The Membrane Aerate Biofilm Reactor (MABR) is a process in which a gas permeable membrane provides the support for the biofilm which simultaneously providing oxygen to the microorganisms by diffusion, or simply, bubble-less aeration.

2015/16 TAG PRESENTATIONS:
- Northeast TAG 7
- Southeast TAG 10
- US Wastewater TAG 15

**CLEARAS**

**AREA:** Resource Management, Wastewater Treatment

**DESCRIPTION:** Clearas Advanced Biological Nutrient Recovery blends contaminated wastewater and CO2 with the existing microbiology in a wastewater effluent to initiate the recovery of harmful nutrients. The system uses a vertical photobioreactor which optimizes biological to stimulate nutrient recover and produce clean water and oxygen.

2015/16 TAG PRESENTATIONS:
- Northeast TAG 6
- South East TAG 9

**SENSOREX**

**AREA:** Disinfection & Wastewater Treatment

**DESCRIPTION:** Sensorex has developed the first UV Transmittance analyzer on the market to use a UV-LED light source, offering several important advantages of conventional, mercury lamp-based systems.

2015/16 TAG PRESENTATIONS:
- Ohio Valley TAG 9
- Southeast TAG 11
- US Wastewater TAG 17
Isle USA 2015/16 Hot Technologies
These technologies got the highest amount of invitations to present at US TAGs in 2015/16

**DIAGNOSTIC TECHNOLOGY**

**AREA:** Water Quality & Monitoring

**DESCRIPTION:** Phytoxigene CyanoDTec is a molecular-based technology that detects cyanobacteria in freshwater and discriminates between toxin producing and non-toxin producing species. The test measures the presence of specific toxin producing genes responsible for the production of either microcystin, modularin, clyindrosporospin, and saxitoxin.

**2015/16 TAG PRESENTATIONS:**
- Northeast TAG 8
- Ohio Valley TAG 9
- NorCal TAG 9

**EVOQUA**

**AREA:** Wastewater Treatment

**DESCRIPTION:** Evoqua Water Technology’s BioMag/CoMag is a process which uses fine particulate magnetite as a densification agent into biological floc to increase settling velocities resulting in faster and more reliable clarification, thus enabling smaller treatment volume than alternate technologies. Suitable for any suspended biological growth process, existing or new systems.

**2015/16 TAG PRESENTATIONS:**
- Northeast TAG 6
- Southeast TAG 10

**SATELYTICS**

**AREA:** Monitoring and Control

**DESCRIPTION:** The Deragger II technology detects very small changes in a pump’s power consumption in real time, which can determine when a blockage is beginning to form. The pump is stopped and put into reverse to break the rags, ensuring they do not tangle and block the pump.

**2015/16 TAG PRESENTATIONS:**
- Ohio Valley TAG 10
- Southeast TAG 12
- Texas TAG 3

These technologies got the highest amount of invitations to present at US TAGs in 2015/16.
**Company:** Genifuel  | **Technology:** Hydrothermal Processing

Hydrothermal Processing for resource recovery and elimination of biosolids (USA)

### Technology Category
Sludge Management

### Unique Selling Point
Hydrothermal Processing addresses two of the most critical problems in wastewater treatment: resource recovery and solids management. In addition to oil and gas production, phosphorus is recovered from the system and can be converted to phosphate fertilizer. All large molecules, such as biological organisms, pharmaceuticals, chemicals, etc. are destroyed. COD (Chemical Oxygen Demand) in the effluent water is reduced to approximately 100.

### Previous TAGs
- Ontario TAG 3
- US Wastewater TAG 19

### Similar Technologies
- TerraNova Energy
- KORE
- Algae Enterprises

### Preferred Outcome from TAG
- Feedback
- Pilot / Trial
Company: BlueInGreen | Technology: SDOX
Oxygenation as aeration alternative

Technology Category
Process Optimization

Unique Selling Point
Rapid gas transfer combined with a smaller side-stream results in a small footprint and low Opex compared to competing technologies. Solutions are not dependent on liquid depth, solids concentrations, or residence time for gas transfer. Similarly, oxygen is placed in-pipe to eliminate odor and corrosion at the source. Energy is saved through the use of variable frequency drives which typically provides at least 20:1 turn down capability; drive speed can vary in relation to specific process parameters, monitored in real-time.

Previous TAGs
➢ NorCal Water TAG 10
➢ Wastewater TAG 6
➢ Texas TAG 4
➢ Australia TAG 8
➢ UK TAG 32

Similar Technologies
➢ Eco2Tech

Preferred Outcome from TAG
Feedback | Pilot / Trial | Sales
Company: CNP | Technology: AirPrex
Recovery of high-phosphate mineral struvite after AD (Germany)

Technology Category
Water & Wastewater Treatment

Unique Selling Point
Installed between anaerobic digestion and dewatering, boundary conditions for struvite precipitation are set by air stripping in the AirPrex reactor, and the addition of a magnesium salt product (MgCl2). Can be configured to sequester but not harvest the magnesium ammonium phosphate (MAP), which would be discharged with the biosolids and would not be allowed to crystallize in pipes or process equipment. More cost effective than the harvesting option for small to midsize facilities. Can be upgraded to MAP harvesting systems at a later date if required.

Preferred Outcome from TAG
Feedback | Pilot / Trial | Sales

Previous TAGs
➢ US Wastewater TAG 14
➢ US Ohio Valley TAG 11
➢ US NorthEast TAG 10

Similar Technologies (Evaluated via TAG)
➢ Ostara, Renewable Nutrients Quickwash, Ekobalans eco:P, NuReSys-P-plant, Sustec NutriTec, Paques Phospaq

Technology Readiness Level
9
Company: CNP | Technology: AirPrex
Recovery of high-phosphate mineral struvite after AD (Germany)

Technology Category
Water & Wastewater Treatment

Unique Selling Point
Installed between anaerobic digestion and dewatering, boundary conditions for struvite precipitation are set by air stripping in the AirPrex reactor, and the addition of a magnesium salt product (MgCl2). Can be configured to sequester but not harvest the magnesium ammonium phosphate (MAP), which would be discharged with the biosolids and would not be allowed to crystallize in pipes or process equipment. More cost effective than the harvesting option for small to midsize facilities. Can be upgraded to MAP harvesting systems at a later date if required.

Preferred Outcome from TAG
Feedback | Pilot / Trial | Sales

Previous TAGs
➢ US Wastewater TAG 14
➢ US Ohio Valley TAG 11
➢ US NorthEast TAG 10

Similar Technologies (Evaluated via TAG)
➢ Ostara, Renewable Nutrients Quickwash, Ekobalans eco:P, NuReSys-P-plant, Sustec NutriTec, Paques Phospaq

Technology Readiness Level
9
Company: RedEye | Technology: RedEye DMS
Cloud-based solution for engineering drawing management (Australia)

Technology Category
Operations and Data Management

Unique Selling Point
Software currently used for engineering drawing management are not fit for purpose and don’t allow changes to be recorded, shared, reviewed, and approved in an easy, efficient, auditable manner. Incumbent systems still require printed copies to be used in the field where the work is done. RedEyeDMS is the solution to this problem; improving safety, productivity, and efficiency, making accurate, updated information available at all times.

Preferred Outcome from TAG
Feedback  Pilot / Trial  Sales

Previous TAGs
➢ NorCal TAG 11
➢ Water TAG 15

Similar Technologies (Evaluated via TAG)
➢ No recent TAG solutions
Company: Evoqua | Technology: Hydraclam® and Chloroclam®
Remote monitoring solution for enhanced distribution management (USA)

Technology Category
Water Quality & Monitoring

Unique Selling Point
The solution is unique in that the goal is not just to sell a hardware (sensor) or software (data) component to utilities, but to combine both with Evoqua’s organizational expertise in water quality management to help the utility understand, and, ultimately control, their distribution management strategy. This solution brings the unique expertise of Evoqua’s disinfection professionals into partnership with the utility’s water quality team.

Preferred Outcome from TAG
Feedback  Pilot / Trial  Sales

Previous TAGs
➢ First TAG for Hydraclam/Chloroclam (Evoqua has previously presented)

Similar Technologies (Evaluated via TAG)
➢ Optiqua
➢ Ayyeka

Technology Readiness Level
9
Company: RealiteQ | Technology: RealiteQ
Web SCADA for low-cost extension, upgrade or replacement of existing telemetry infrastructure (Israel)

Technology Category
Operations and Data Management

Unique Selling Point
Extremely fast setup, no software installation, build in managerial and operational dashboards, storage and backup of historical data using AWS (Amazon Web Services), no need to employ dedicated skilled IT personnel, top to bottom highly secure system. In contrast to conventional SCADA systems, RealiteQ can make use of all public communications networks (cellular, satellite, DSL) for unparalleled performance, scalability and ease of use.

Preferred Outcome from TAG
Feedback | Pilot / Trial | Sales

Previous TAGs
➢ NorCal TAG 12

Similar Technologies (Evaluated via TAG)
➢ No recent TAG solutions
Company: Atlantium | Technology: Hydro-Optic UV
Advanced, high-performance, low energy UV disinfection/treatment (Israel)

Technology Category
Water & Wastewater Treatment

Unique Selling Point
Atlantium Hydro-Optic UV is the only UV system validated to USEPA 4-log-virus credit using a live Adenovirus challenge and accepted by 7 state regulators (thus far) as a replacement for chlorine. A high-grade quartz water disinfection chamber surrounded by an air block harnesses a fiber-optic phenomenon known as Total Internal Reflection (TIR) to recycle UV photons, lengthening the light paths to provide greater disinfection performance with less energy. This, combined with optimally engineered hydraulics, maximizes UV efficacy to ensure all microorganisms are inactivated.

Preferred Outcome from TAG
Feedback  |  Sales

Previous TAGs
➢ First TAG

Similar Technologies (Evaluated via TAG)
➢ Enaqua
➢ UV Pure
➢ NeoTech Aqua

UV Water Treatment
Atlantium Hydro-Optic™ Solutions
Company: Saint-GobainByggevarer AS | Technology: Filtralite
High performance filter media for replacement of sand or anthracite (Norway)

Technology Category
Water & Wastewater Treatment

Unique Selling Point
Filtralite’s high porosity is due to the unique properties of a particular clay found only in Norway and the production method used to transform the material into filter media. Using the same method with different types of clay does not produce media with the same porosity.

Preferred Outcome from TAG
Feedback | Pilot / Trial | Sales

Previous TAGs
➢ US Water TAG 14

Similar Technologies (Evaluated via TAG)
➢ Nothing at this time
Company: Rädlinger | Technology: Primus Line
Trenchless pipe lining system for trunk mains and sewer force mains (Germany)

Technology Category
Asset Renewals, Assessment & Management

Unique Selling Point
Long length single runs; high-pressure tolerance (over 1305 psi in some cases); ability to navigate bends; fast, efficient, trenchless installation; only 0.04 inch in diameter (dramatically reducing hydraulic losses compared to other methods); PE inner provides an extremely low K factor; does not need resin, UV or steam to set (once pulled through and connected it is ready to be commissioned).

Preferred Outcome from TAG
Feedback   Pilot / Trial   Sales

Previous TAGs
➢ NorCal TAG 12

Similar Technologies (Evaluated via TAG)
➢ Aqualiner
➢ Curapipe Systems
➢ Calix
Case Study: Investment and Commercialization

What should the ideal investment story look like?
Lessons Learnt

Know your sector
Find a ‘Champion Client’
One failure is bad luck. Two suggests incompetence.

Small exit £1m

Investment (Cumulative m)

Annual Turnover (m) €

Catastrophe 1

Catastrophe 2
Lessons Learnt

Learn from your mistakes and quickly move on
Find an investor who understands water
Family offices tend to have more patience, more appetite and more reasonable expectations
Summary of Key Takeaways

➢ Isle is a global technical consultancy specialized in early commercial technologies with a specific focus in the water sector
➢ Isle served primarily end users, but has partnerships with stakeholders in the innovation ecosystem to research organizations, associations, clusters, academics, technology companies, sales representatives, etc.
➢ TAG is a global innovation forum for the world’s leading water utilities and provides the opportunity for qualified early commercial technologies to engage with key decision makers
➢ Current emerging technologies continue to lean towards operational optimization in treatment (in kind with short payback), online water quality for treatment and distribution, CIP and asset management, trenchless condition assessment, rehab, replacement of pipe infrastructure, storm water management and resiliency, etc.
➢ Road to commercialization, finding first adopters, establishing credibility then scaling up with investment is an extremely difficult process to navigate.
QUESTIONS?

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