



BlueTech Water Almanac 2014 - 2015



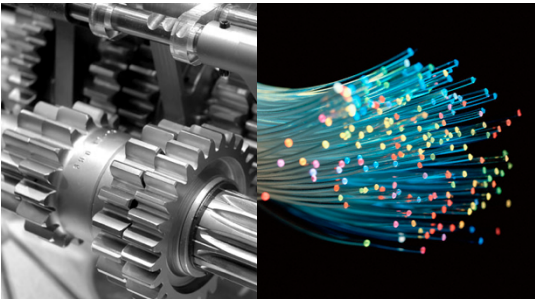
AN O₂ ENVIRONMENTAL COMPANY

Chairman's Opening

Paul O'Callaghan
CEO



Key Trends



1. **Fusing of machinery, sensors and big data in water**

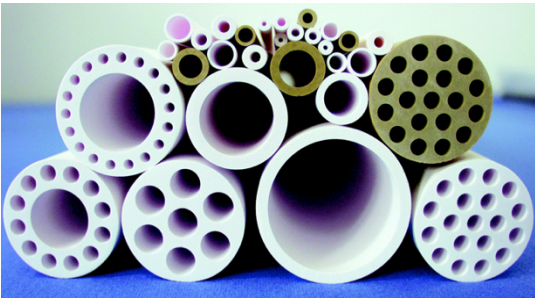
An innovation renaissance for pump manufacturers -
Opportunity for: suppliers of pumps and control systems with analytics divisions: e.g. Grundfos, Xylem



2. **Lines being blurred between world of Wastewater and Organic Waste**

Customers are looking for integrated solutions to both wastewater and organic wastes.

Opportunity for companies such as: Suez, Veolia, Nijhuis, Anaergia



3. **Ceramic Membranes – continues to be a hot bed of activity**

NanoStone Water(formerly 3C), **PWN** – opens Andijk plant,
Metal Membranes – closed round with ICOS Capital, **Cerahelix**
– participates in Innovation Pavilion

Key Trends

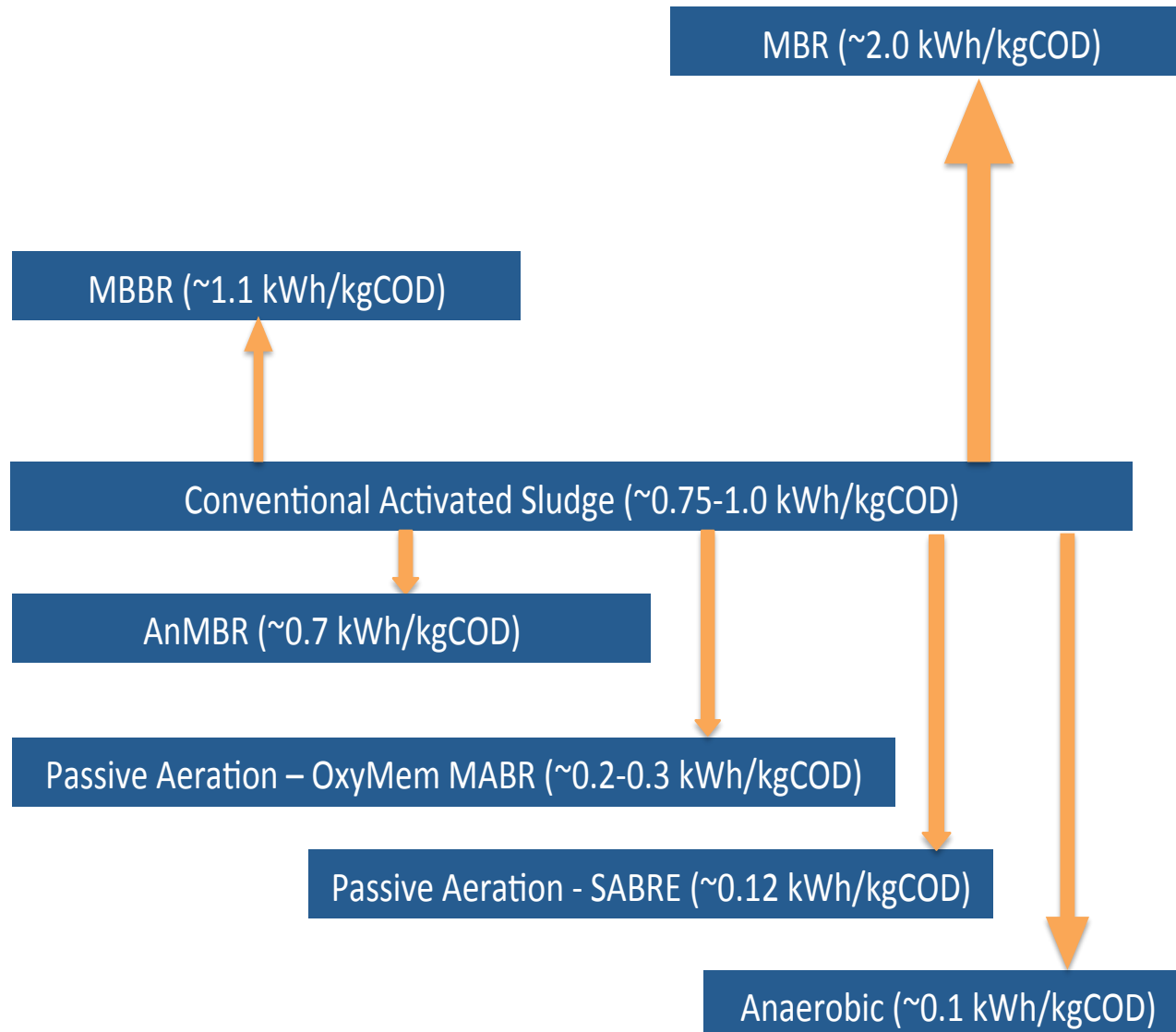
- ***The Year of the BlueTech Crash?***
 - Examples of companies that failed in 2014
 - **Ultura (APT Water, RoChem, Sepro)** – Files for Chapter 11
 - **MaxWest** – goes into liquidation
 - **Paradigm** – goes into liquidation
 - Total invested: estimated: circa \$100M
- **Success stories**
 - NanoH2O – acquired by LG for \$200M
 - CAMBI – going from strength to strength
 - The jury still out on....
 - **Ostara**: Founded 2005: circa \$35M invested
 - **Voltea**: Founded 2006: circa €16M invested

2014 - *The year low energy wastewater treatment went mainstream*

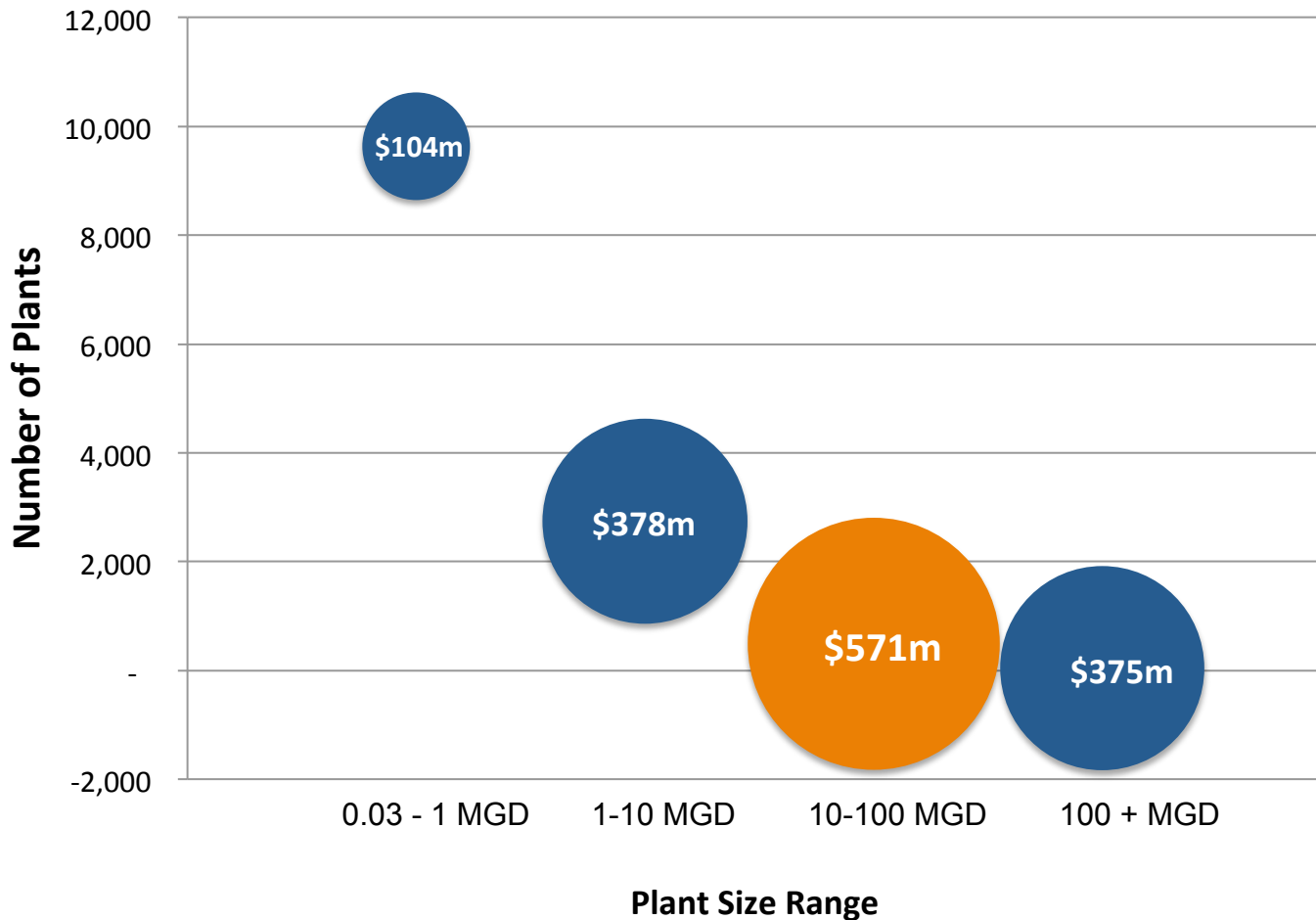
- **Activated Sludge** – *‘reports of its death have been greatly exaggerated’*
 - No near-term “silver bullet” to replace aerobic biological treatment for larger plants
 - Advanced primary and sludge pre-treatment are the likely ‘1-2 combo’
- **MBR** – *its all about the energy stupid*
 - Doosan: LENA, GE Water – LEAP MBR
- **GE Water** – launched RBS and MABR at Singapore Water Week
 - M2 Renewables had pioneered the RBS concept
- **Passive Aeration in vogue**
 - Oxymem, Emefcy SABRE, BioGill
 - Only tackles <10,000 PE (1MGD) plants
- **Anaerobic MBR** – climbs up the S-curve
- **Sludge Pre-treatment** – is taking off

Biological Wastewater Treatment

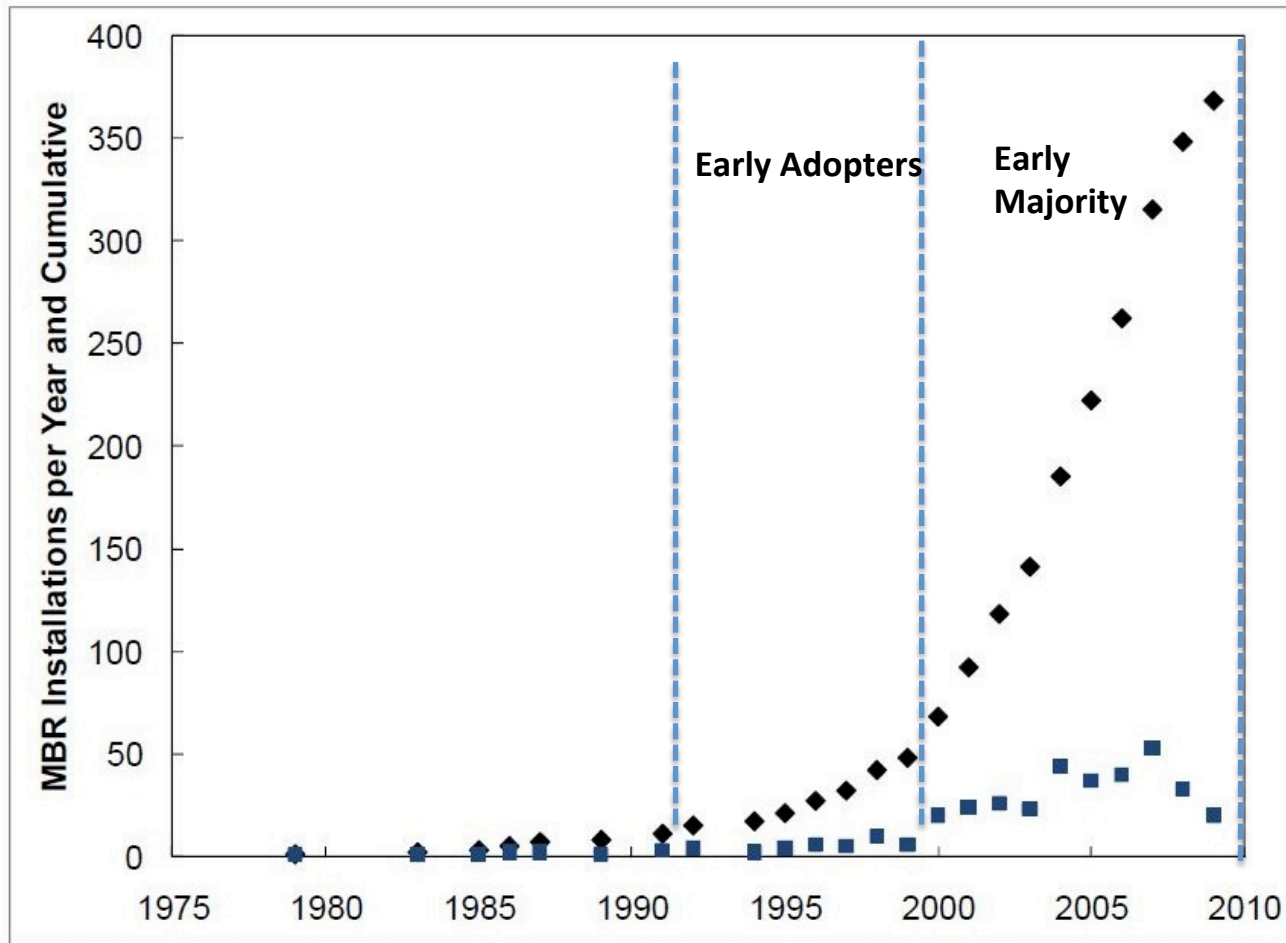
Carbonaceous BOD/COD removal – kWh/kg COD removed



Aeration Energy Costs for USA Biological Wastewater Treatment



MBR Adoption



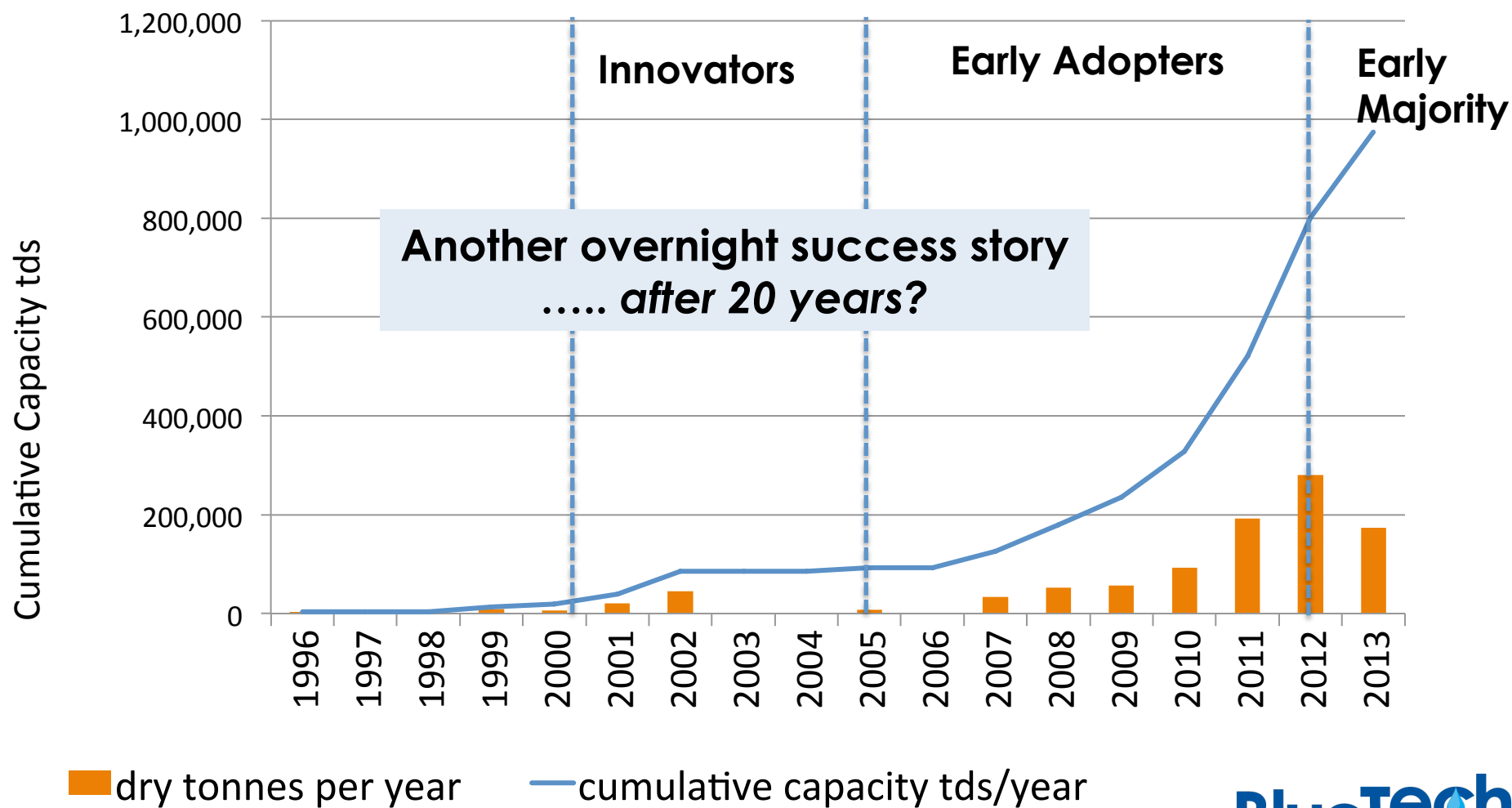
**Overnight
success story...**

after 20 years?

Figure 13. S curve for numbers of North American MBR plants put into service by Zenon. Blue squares show installations per year, while black diamonds show cumulative installations.

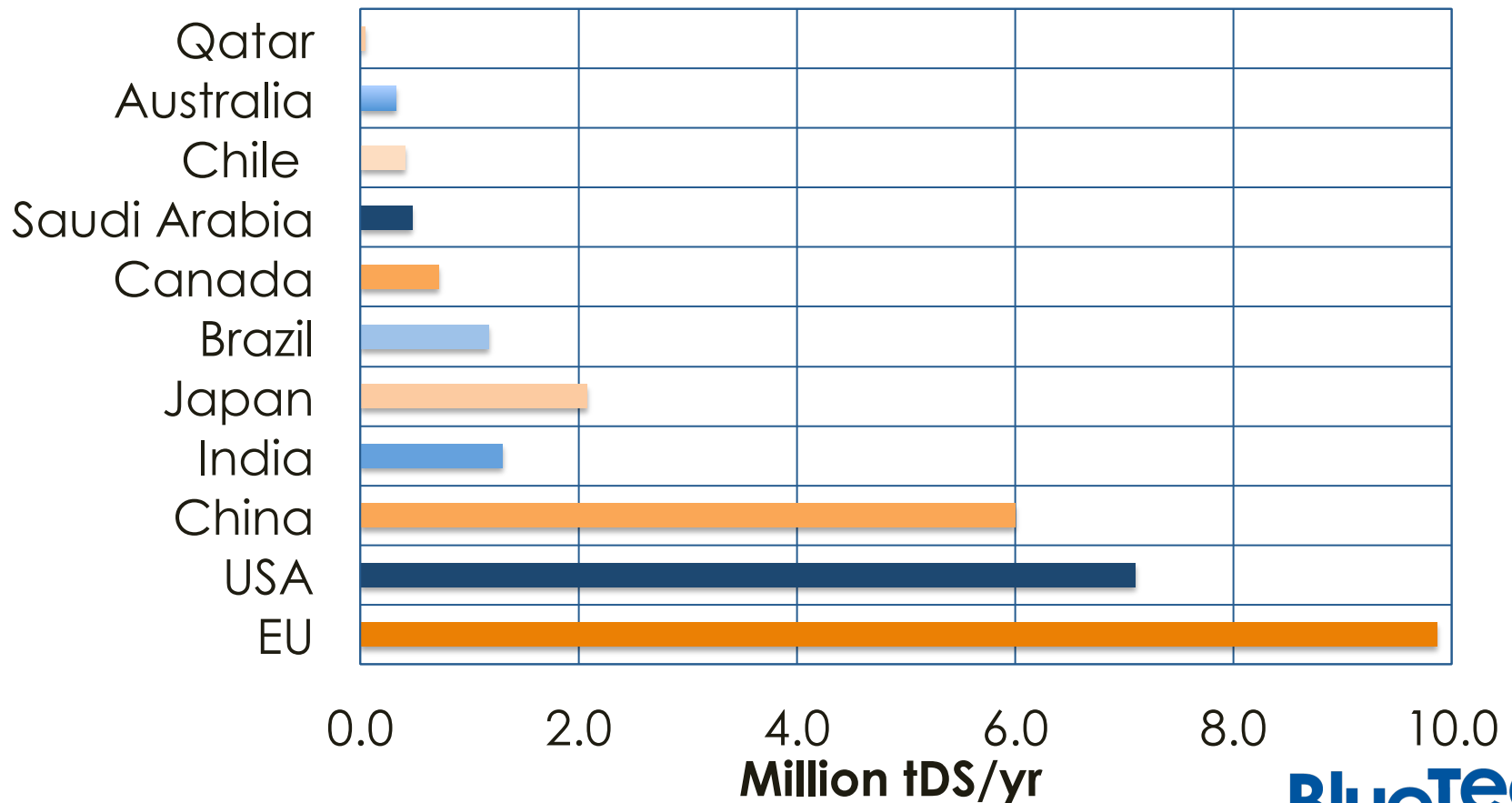
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Sludge Thermal Hydrolysis

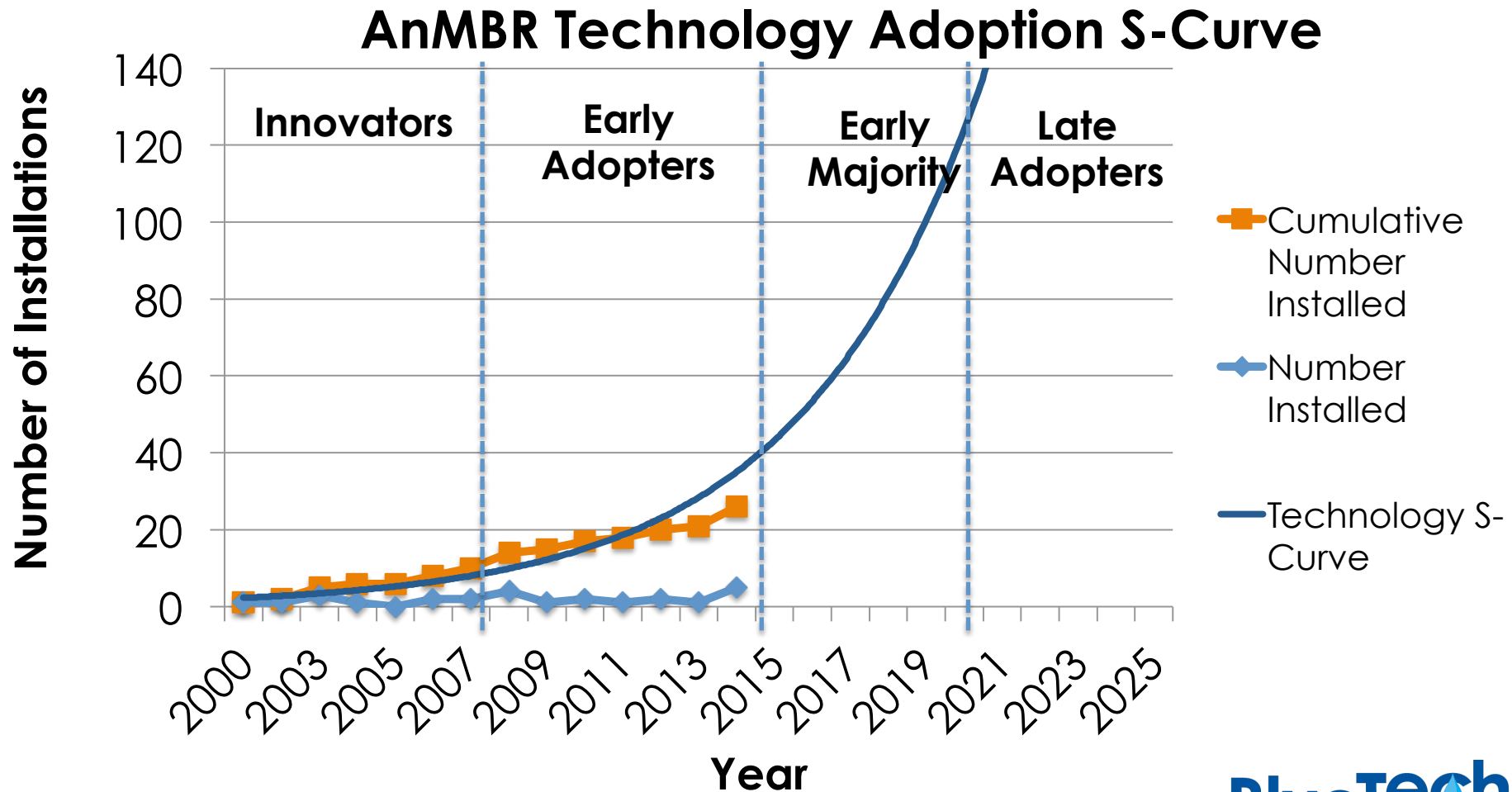


'There's sludge in dem-dar hills'

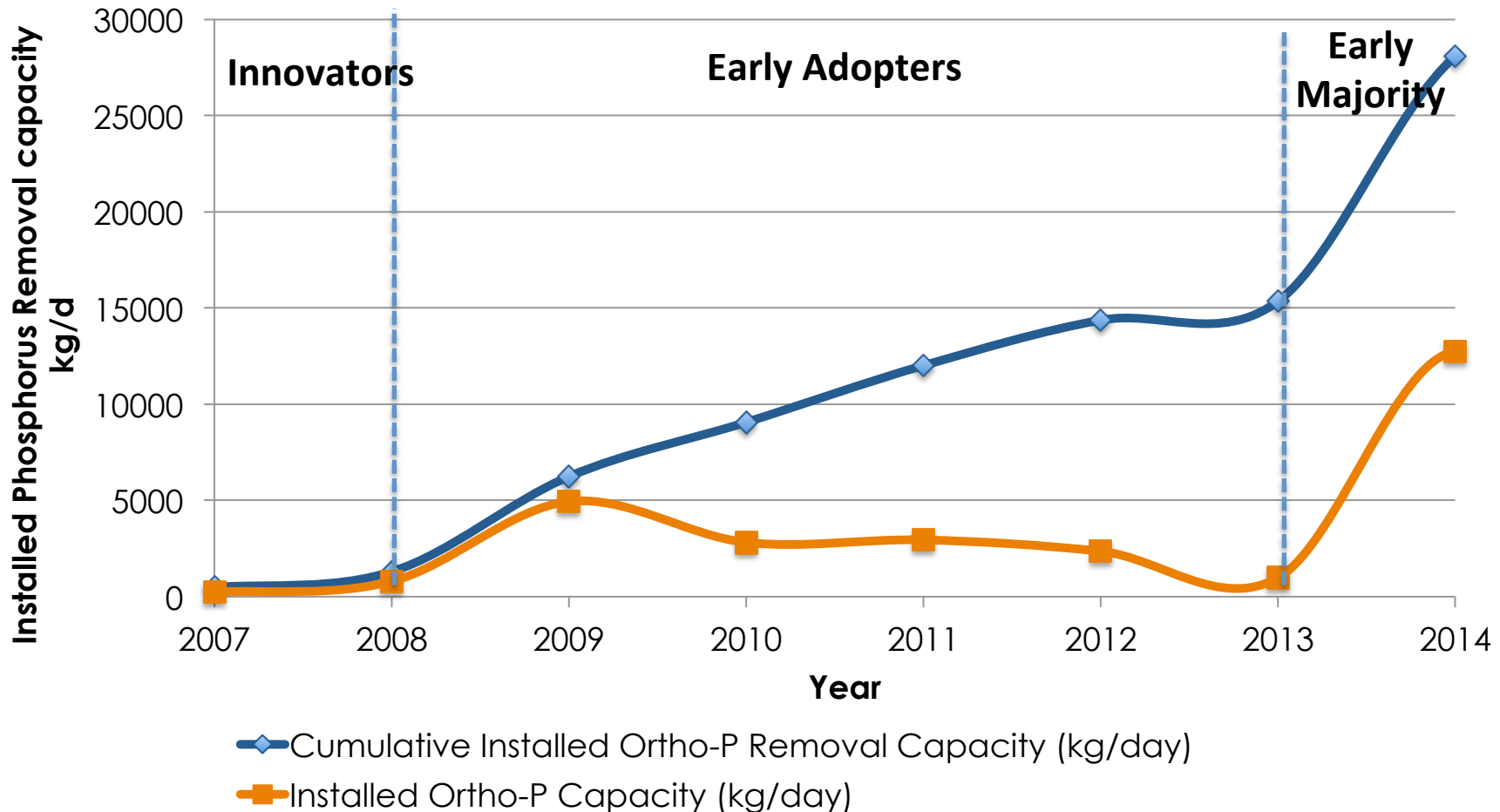
Global Sludge Production



Anaerobic MBR is entering the early adopter stage



Phosphorus Recovery – mainstream, and getting crowded



NB: Includes Ostara, AirPrex, Phospaq, NuReSys

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"Let China sleep, for when she wakes, she will shake the world." - Napoleon

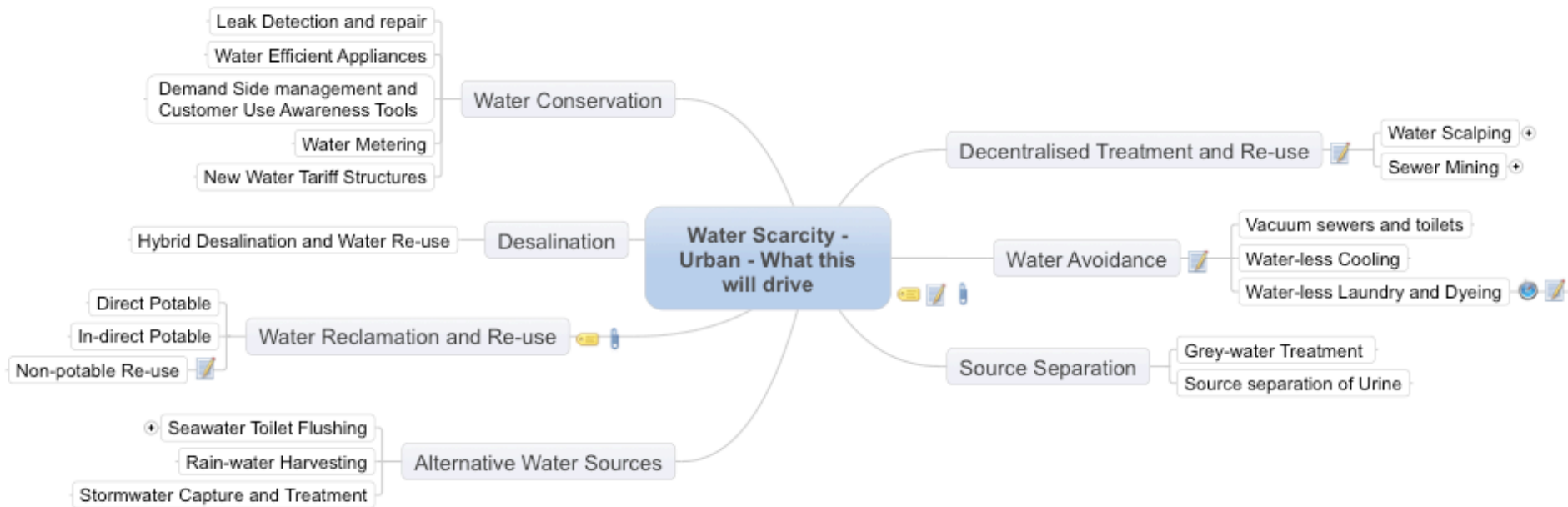
- Regulations will drive continued growth in the Chinese industrial wastewater market in 2015
- CITIC and KKR to buy United Envirotech for \$930M
- Industrial wastewater facilities we visited were world class facilities
- Chinese market is embracing membranes
 - Players include: Zenon, Memstar, Beijing Origin, Asahi, SCINOR
- Biosolids market is like a sleeping giant
- There is still an opportunity for international companies to bring technologies to the market, particularly by partnering with local EPC's
 - E.g. SCINOR, United Envirotech, Beijing Origin Water

Insight Reports

2015 Editorial Calendar

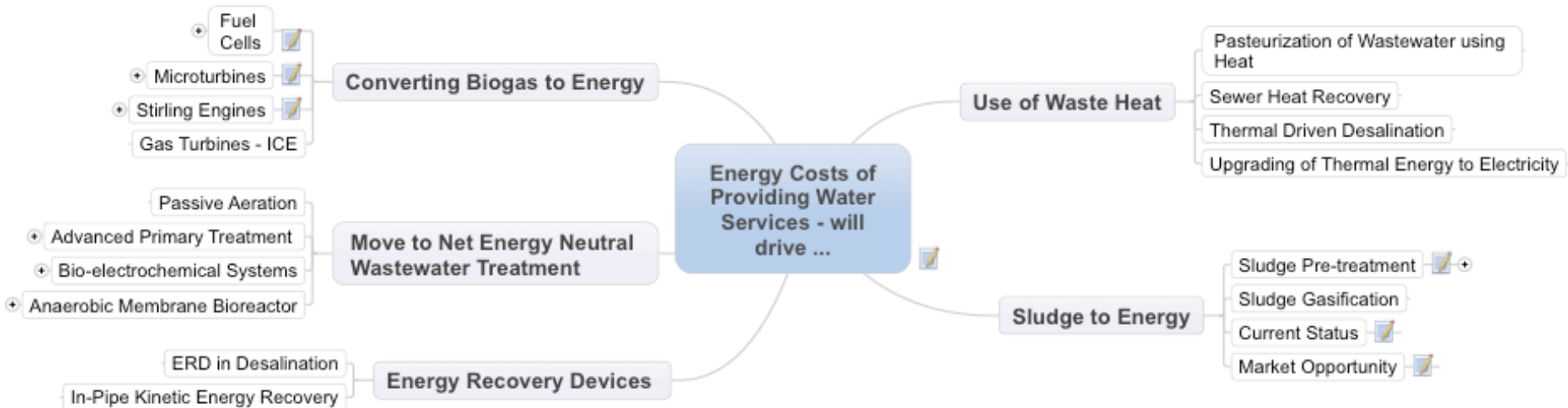
- **Water Reuse and Alternative Water**
 - Forward Osmosis Technology Trends and Market Opportunities
 - Brine Management
 - Municipal Water Reuse
- **Unconventional Fossil Fuels and Water**
 - Enhanced Oil Recovery Water Treatment
 - Shale Gas and Oil Produced Water Treatment
 - Ceramic Membranes for Water and Wastewater Treatment
- **Energy and Resource Recovery**
 - The Nitrogen Recovery and Removal Market
 - Phosphorus Recovery and Removal
 - Biotechnology Opportunities in the Water Sector
- **Smart Water**
 - Smart Agriculture Technology Innovation and Market Opportunities

Mapping Drivers in the Water Sector - Water Scarcity



Mapping Drivers in the Water Sector

- Energy



Rising Stars: BlueTruffle Picks for 2015

The BlueTruffle companies are selected based on a combination of key criteria for success including, strength of management team, attractiveness and size of addressable market, technology port-folio and go to market strategy.



- **ADI Systems, Canada**

- Well placed to take advantage of the AnMBR technology market expansion stage
- Reference facilities and access to markets in emerging economies
- Experienced management team



- **Nijhuis Water Technologies, The Netherlands**

- Strong channels to market in emerging economies (e.g. Russia, APAC, South America)
- Process expertise in industrial wastewater and proprietary technologies
- Experienced management team and strong track record (ex-Norit X-flow)
- Financially well backed by Dutch private equity fund.



- **SCINOR Water, China**

- Management team includes serial water entrepreneur as CEO
- Smart Investors on board- CLSA
- Chinese Industrial wastewater market poised for expansion

aquarion



- **Aquarion, Germany**

- Experienced management team with strong track record (ex Christ Water and H+E)
- Financially well backed by a sovereign fund
- Focusing on niche geographical markets including Libya, Iran, Iraq, Russia.
- Focused on adding differentiated technologies to compete in main-stream markets

New Kids on the Block

- New Entrants to Watch in 2015

Outotec

- **Outotec** - Group Revenues €1.9Bn
 - Coming from a strong background in the mining sector, Outotec has been making aggressive in-roads into water treatment as evidenced by patents filed and acquisition strategy.
 - Management team includes former CTO of Xylem



Johnson Matthey

- **Johnson Matthey** – Group Revenues £11Bn.
 - Johnson Matthey entered the water sector in 2013 with establishment of a Water Business Unit.
 - Strong technical expertise in advanced materials, catalysis, adsorbents and ion exchange.
 - Focusing on industrial water treatment markets and difficult to treat applications and contaminant removal and recovery.
 - Established R&D center in Singapore, acquired Purity Systems Inc. in 2013.



- **Mann + Hummel** - Group Revenues €2.6Bn
 - Major German car parts manufacturing company
 - Acquired Microdyn Nadir in 2014, following two previous acquisitions.

Most Likely to Exit by acquisition in 2015



- The company was founded in 2005 and will have been venture backed for 10 years in 2015. The investors will likely be keen to see an exit and the company has achieved much of what it set out to do in terms of opening up the market for phosphorus recovery
- The company while revenue positive, needs to transition to profitable. The first mover advantage is beginning to be eroded, with new entrants following, time will tell if Ostara has moved far enough quick enough.



- The sludge pre-treatment market is poised for growth, as evidenced by the BlueTech Sludge Pre-treatment S-curve.
- CAMBI is the undisputed leader in this field and with average annual revenues of between \$30-\$50M is in the sweet spot for acquisition.
- There is strong interest from the major players, including GE Water (with the acquisition of Monsal), Doosan (through EnPure) and others such as WABAG, BASF in entering the sludge treatment area which is a key area of market opportunity.

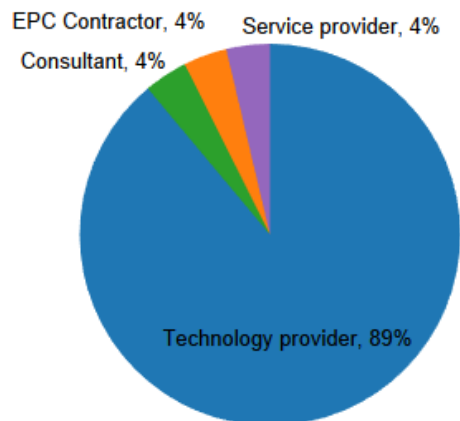
Make or Break Year for:



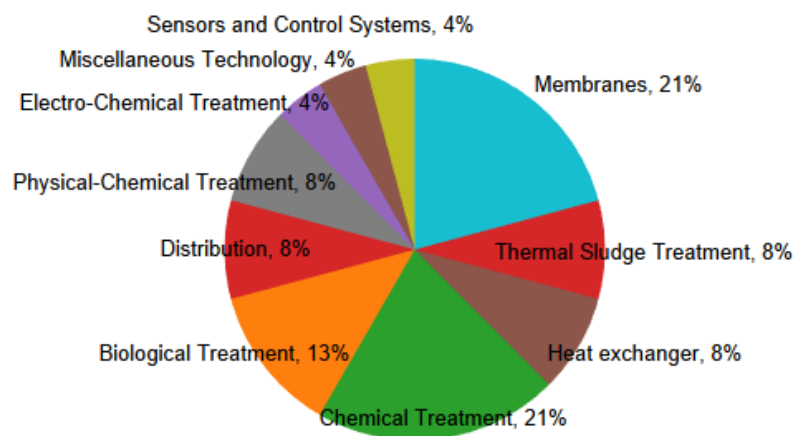
- Voltea has taken in circa €16M in venture backed funding and has revenues estimated to be €1-€2M currently based on reported system sales.
- The company has reduced the cost of the CapDI technology and identified some beach-head markets including cooling towers, commercial laundry and white-goods.
- There have been two changes in CEO in the past two years and the management team will come under increasing pressure to achieve projected sales targets and scale revenues.

Analysis of Key areas of water technology investment (2013 & 2014)

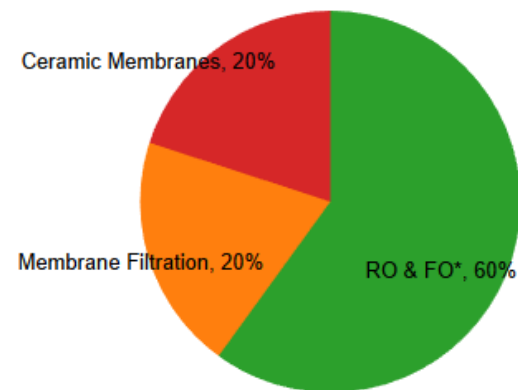
Investments analysis by place in the value chain of company invested in



Technologies providers technological breakdown (investments)



Membranes technology breakdown (investments)

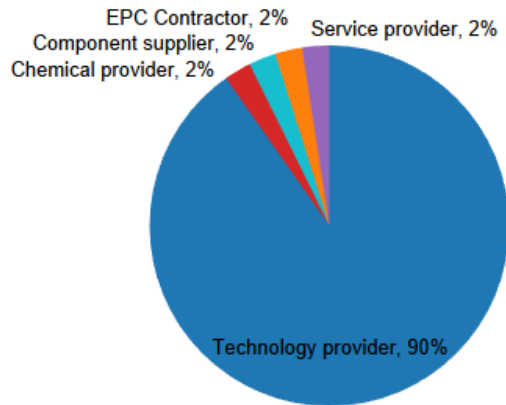


* Reverse osmosis and Forward osmosis

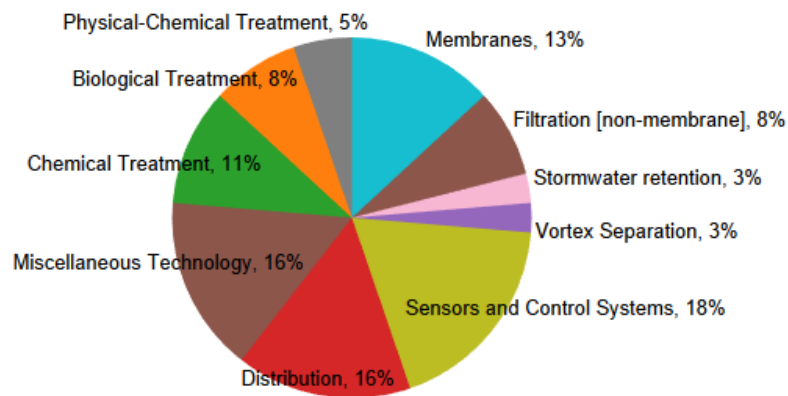
Physical treatment stands out as the area with the greatest activity in terms of both investment and acquisitions. The main area of focus within physical treatment is membranes, which continues to be a hotbed of activity both in terms of investments and acquisitions.

Analysis of key areas for acquisitions (2013 & 2014)

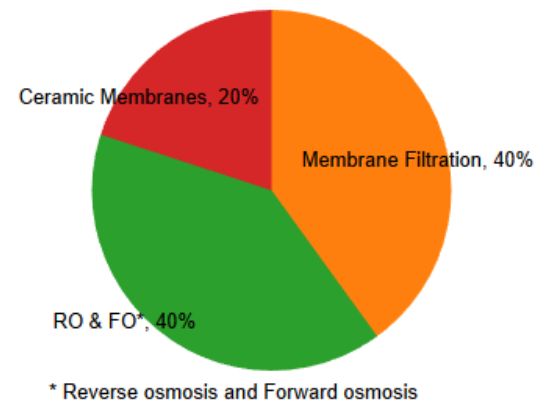
Acquisitions analysis by place in the value chain of company acquired



Technologies providers technological breakdown (acquisitions)



Membranes technology breakdown (acquisitions)



The Membrane technology area represents 21% of all investments tracked and 13% of acquisition transactions. Allowing for a certain rate of attrition in companies that receive investment, there seems to be a good match between the investment and appetite for acquisition in this technology area.



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