



# WHO MOVED MY CARBON?

## New Opportunities with Advanced Primary Treatment



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### Presenter



**SERGIO PINO-JELCIC**

Jammin'4Water – WEFTEC 2017



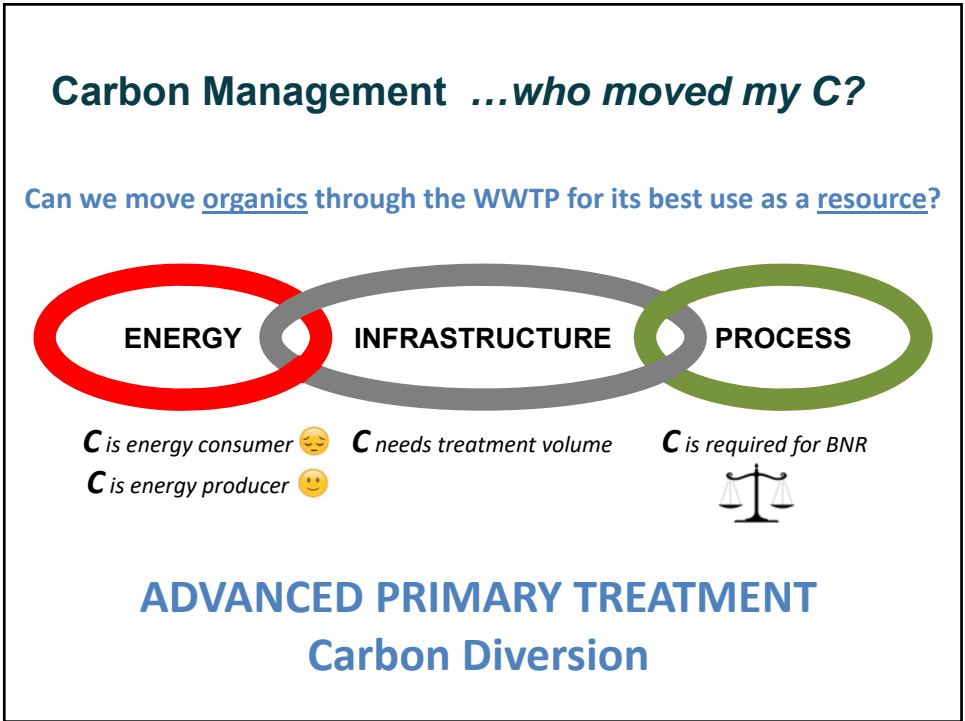
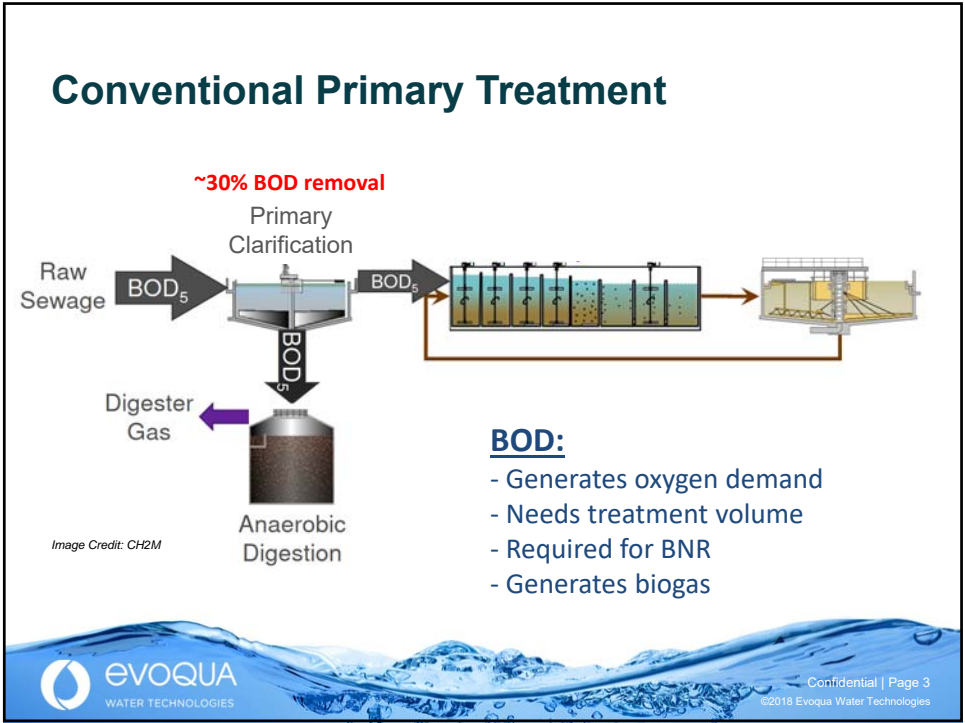
*19 years in the wastewater industry*

*Sales Manager for Biological Process Equipment at Evoqua*

*Conga and Bongo player for Jammin'4Water at WEFTEC*



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## Primary Treatment Technologies

### PRIMARY TREATMENT

**Conventional**

- Primary Clarification

**Chemically Enhanced**

- Primary Clarification

**Mechanically Enhanced**

- Microscreens & Filters

**Biologically Enhanced**

- "A" Stage of A/B Process
- Captivator® System

## Performance Comparison

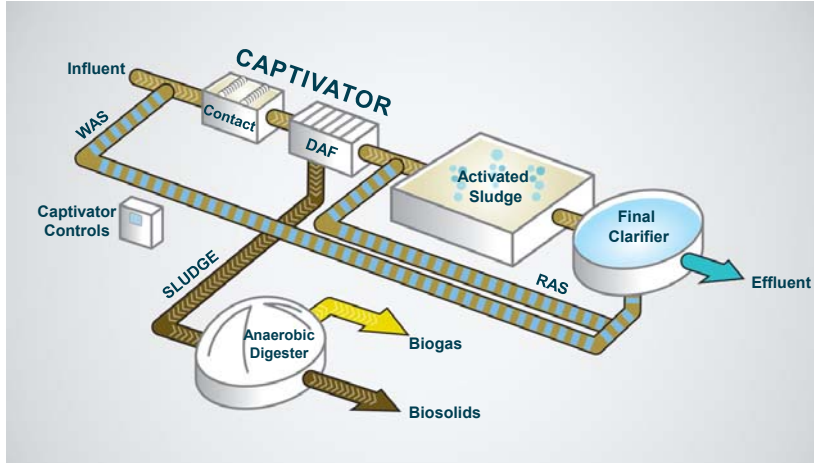


	Primary Clarification	Captivator
BOD removal	25-30%	45-60%
TSS removal	45-55%	65-80%

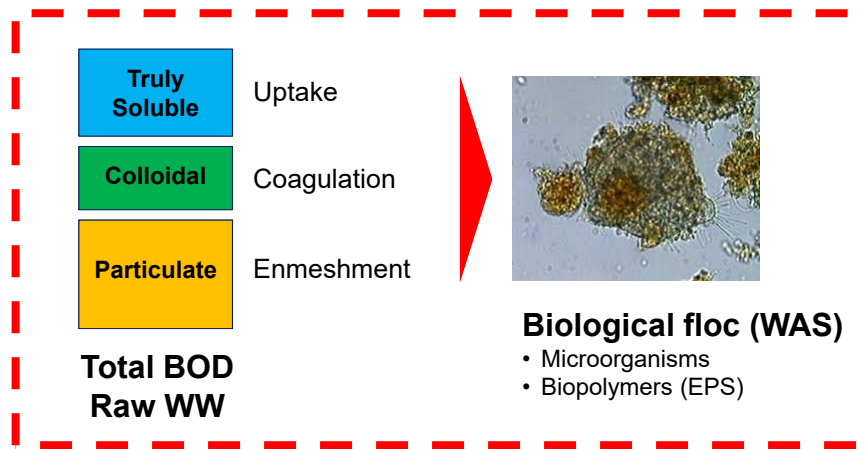
**Biologically Enhanced Primary Treatment**

- ✓ **Biosorption**
- ✓ **Bioflocculation**

## Captivator – Advanced Primary Treatment



## Contact Tank – Biosorption Mechanism



**Short HRT and Mild Aeration**

## Why DAF for Solids-Liquid Separation?

### Hydraulically efficient

- Up to **5X** smaller footprint than primary clarifiers
- Rapid transport of solids to digester

### Thickener (coflotation)

- UP to **4-6%** solids without chemicals
- **NO** need for additional thickeners



### Additional benefits

- Grit separation (settleable)
- FOG removal (floatable)



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## CAPTIVATOR

### *Impacts on Downstream Processes*



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## Impact on Aeration Basins

### Less BOD/TSS to Activated Sludge

- Less aeration energy
- Smaller aeration basin
- Free up bioreactor volume
- Less MLSS – less load to clarifiers
- Design considerations for denitrification and bio-P



## Impact on Anaerobic Digesters

### More raw BOD to digestion

- More biogas
- Less WAS to digester
- Enhanced VS destruction



### Less grit to digestion

- More “useable” volume
- Fewer cleanings

## Impact on Sludge Thickening

### **No separate sludge thickeners required**

- Captivator delivers up to 4-6% thickened solids



### **No polymers needed**

- Substantial O&M savings



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## Applications

- ✓ *Plants with primary clarifiers – existing or future*
- ✓ *Biosolids upgrades (digestion, thickeners, etc.)*
- ✓ *Beneficial use of biogas. Energy recovery systems*
- ✓ *Construction cost savings – plant expansion in existing tanks*
- ✓ *Conversion of RBC, TF, HPO plants to activated sludge*
- ✓ *Grit and FOG issues*
- ✓ *High energy costs. ESCO projects*
- ✓ *High BOD load*



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# CAPTIVATOR

## *Development Case Study*



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### Technology Development

Bethlehem, PA pilot



Singapore R&D study

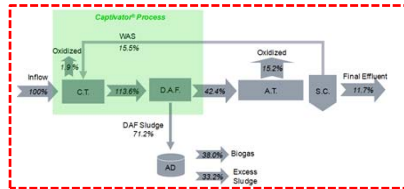
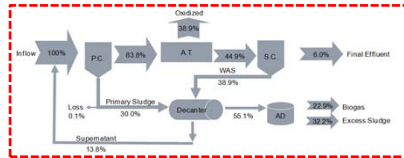


Oconomowoc, WI pilot





## Singapore COD Balance



COD	Baseline System	Captivator System
Oxidized	39%	17%
Biogas	23%	38%



## Agua Nueva WRF (Pima County, AZ)

- 32 MGD. Green-field DBO project. 2013
- **Captivator** design combined grit removal, primary DAF clarification, and sludge thickening in a single unit process
- Saved ~\$75M over previous estimates

Captivator System



Image Credit: CH2M

## Agua Nueva WRF – Performance

	Captivator
Soluble BOD removal	29%
Total BOD removal	50%
TSS removal	66%



Image Credit: CH2M

- ✓ 65% footprint reduction compared to primary clarifiers.
- ✓ 35% reduction in aeration volume.
- ✓ 30% less diffusers. 30% smaller blowers.
- ✓ No separate sludge thickeners



## CAPTIVATOR

### *Demonstration Pilot Program*



## 0.3-MGD Captivator Pilot Unit



## Bench Tests



**Contact Tank  
Simulation**

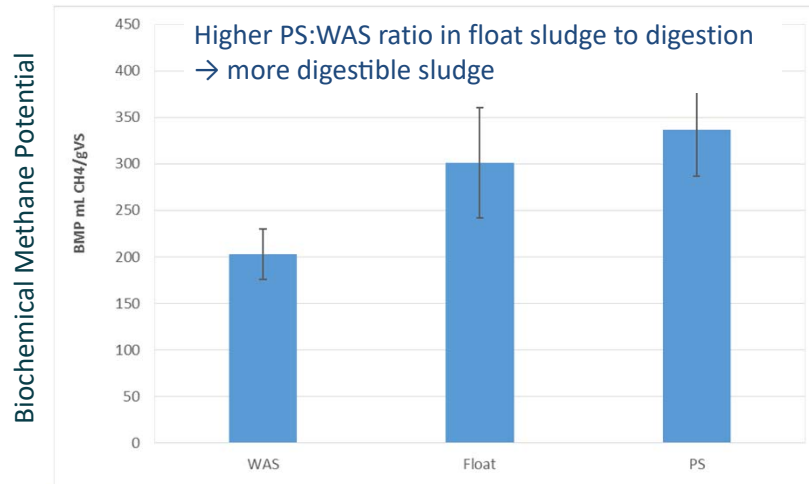


**Pressurized  
System**



**DAF  
Simulation**

## Captivator Pilot – BMP test



## Takeaways ...*who moved my carbon?*

Advanced primary treatment is part of Carbon Management which serves utilities to connect energy, infrastructure, and process.

**Captivator** is a biologically enhanced primary treatment combined with sludge thickening, and with the ability to remove grit and FOG. It is up to 5X smaller than primary clarifiers.

**Opportunities:** Less aeration energy & more biogas production. Construction cost savings for plant expansions. Delivers thickened sludge without chemicals. Grit and FOG issues. Pilot unit available.



**Thank You!**



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