BIOSTYR Duo: Smaller but mightier for efficient wastewater management

H1 - Wastewater Management

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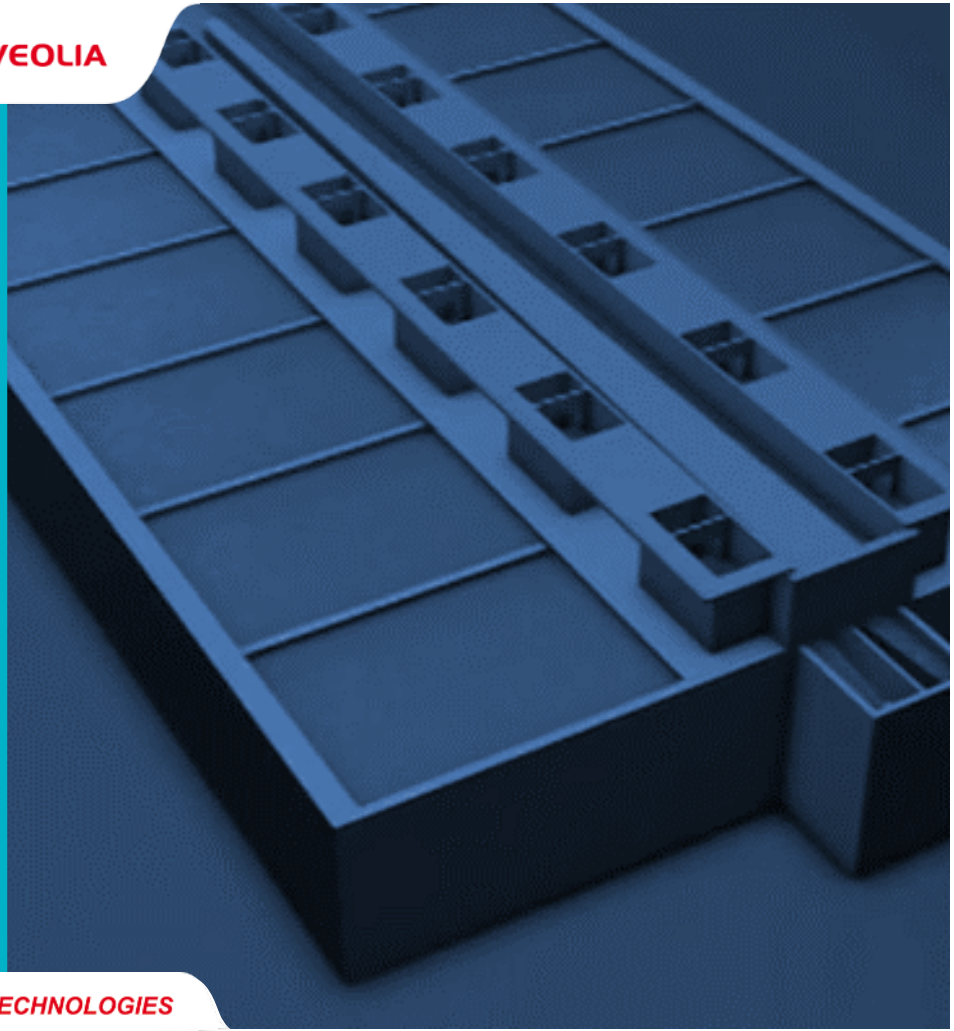
WATER TECHNOLOGIES

AGENDA

- Presentation of the BIOSTYR technology
- Developing BIOSTYR Duo
- BIOSTYR Duo Case-Studies



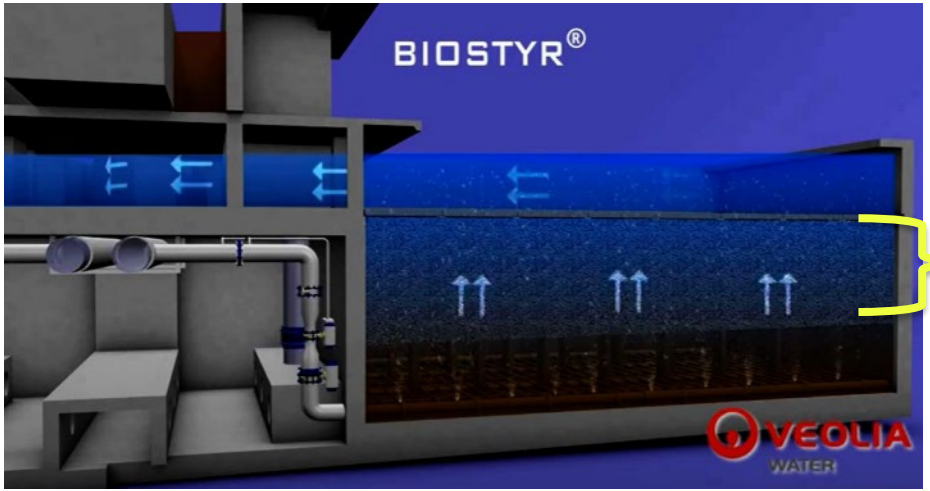
Presentation of the BIOSTYR technology

WATER TECHNOLOGIES

Principle of Biological Aerated Filters (BAF) - BIOSTYR

BAF technology is based on two water treatment principles:

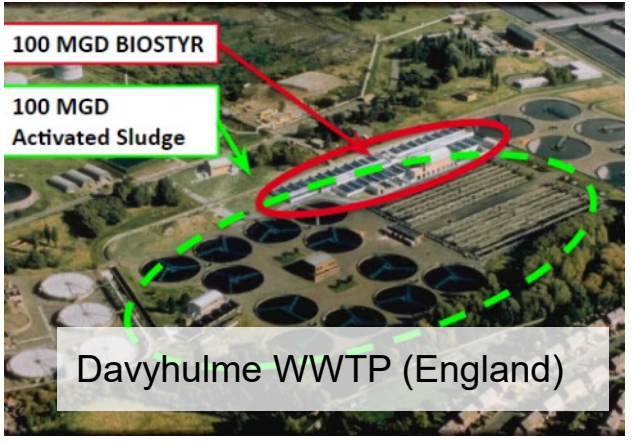
- Biological treatment (aerobic/anoxic) using biofilm
- Physical treatment by granular filtration



Filtration media + biomass support

BIOSTYR - Facts

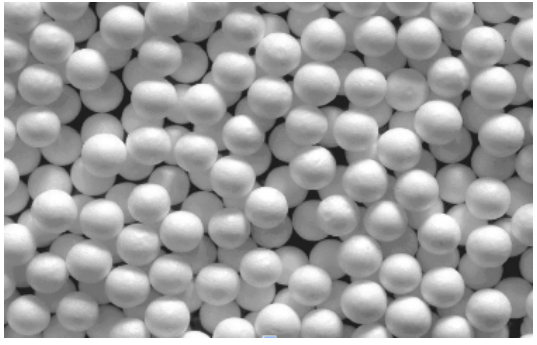
- Compact Footprint
- Can be installed and operated in cold weathers
- Fully automated technology:
  - Cells in filtration when required
  - Rotation of idle cells
  - Backwashes based on time or headlosses
  - Aeration varies with DO



Davyhulme WWTP (England)

BIOSTYR - Facts

- Biomass support: Biostyrene beads
  - Inert
  - Resistant to abrasion
    - **No need for replacement**



- Beads retention: Nozzle deck
  - Prefab slabs
  - Nozzles are located at the effluent
    - **No clogging or fouling**
    - **Aesthetic and low odors**

BIOSTYR: Meets stringent effluent requirements

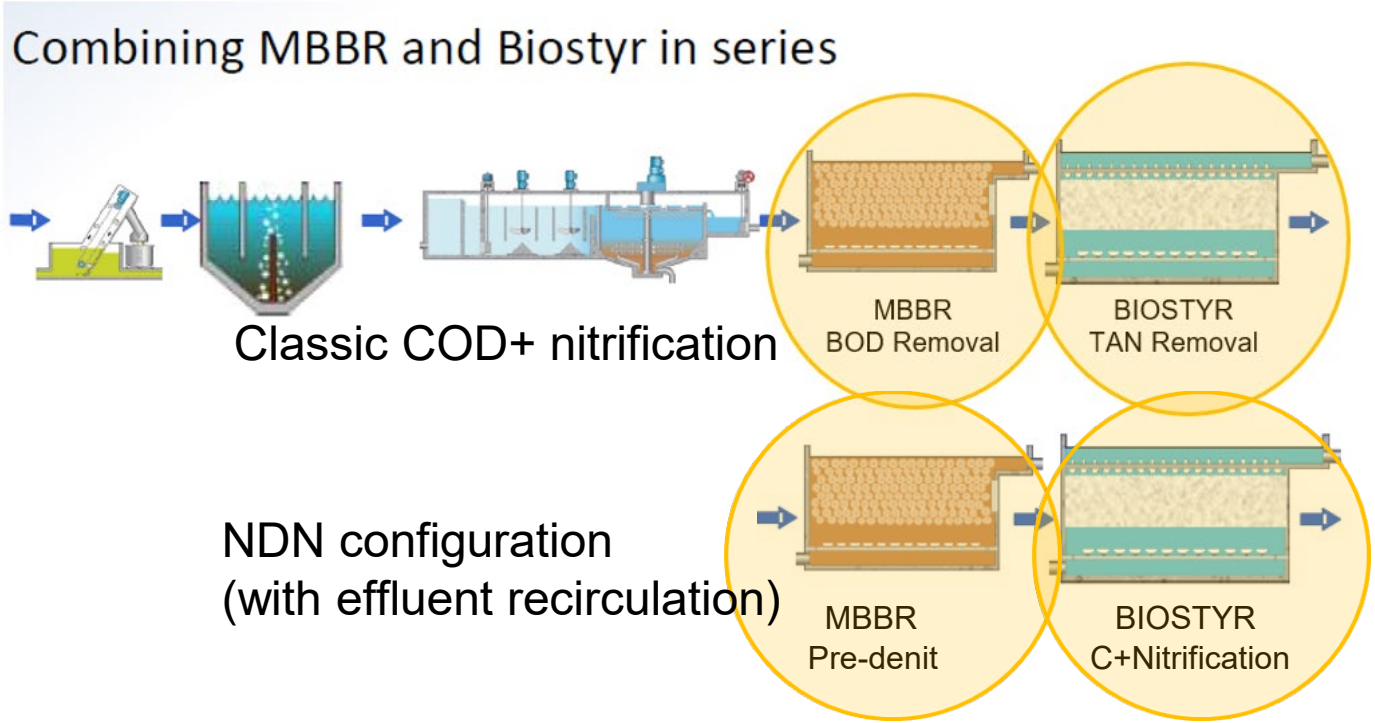
How low can it go in a single stage?

Application	Carbon removal	Secondary nitrification	Secondary NDN (effluent recirculation)	Tertiary nitrification	Post denitrification *with COD dosage
Requirement	Primary Treatment	Primary Treatment	Primary Treatment	**Carbon removal step**	**Nitrification step**
BOD (mg/L)	10	10	10	5	-
TSS (mg/L)	10	10	10	5	-
N-NH_4 (mg/L)	-	**< 1**	< 1	< 1	< 1
N-NO_3 (mg/L)	-	-	**< 10**	-	**< 2**
TN (mg/L)	-	-	**< 15**	-	**< 5**

BIOSTYR Duo

WATER TECHNOLOGIES

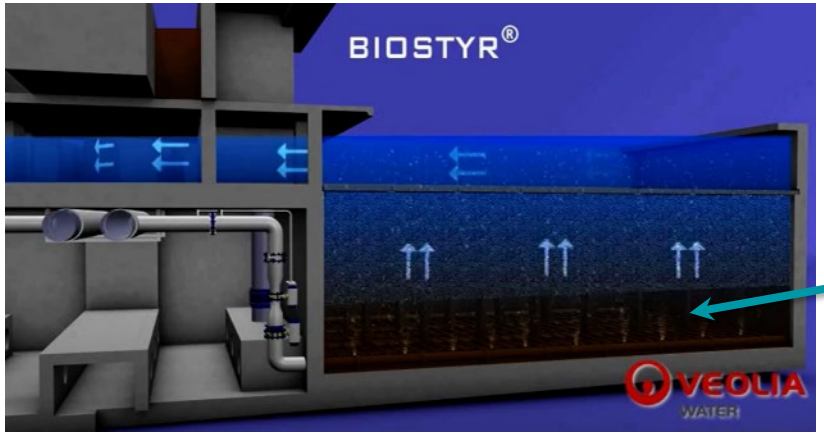
BIOSTYR Duo - BAF version of process intensification



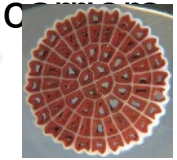
BIOSTYR Duo - BAF version of process intensification

Objective: do more in existing volume

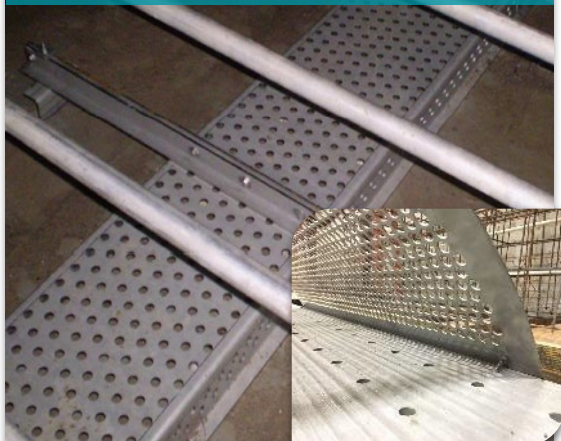
- Use «dead space»
- Increase biomass inventory
- Classic BIOSTYR can be retrofitted to Duo



Empty space for media expansion filled using heavier MBBR c



MBBR Media retention screens over trench covers



Developing BIOSTYR Duo

WATER TECHNOLOGIES

BIOSTYR Duo Development- Technology development

- **2011**: Pilot-scale trials in France (St-Thibault-des-Vignes)
- **2011-2015**: Pilot-scale trials in Canada (Kingston, ON and Terrebonne, QC)
- **2014-2015**: Pilot-scale trials in USA (Binghamton, NY)
- **2014-2016**: Industrialization tests in Canada (Cornwall, ON)
- **2016**: Industrialization tests in France (Seine Aval)
- **2019**: First full-scale application (Binghamton, USA)
- **2019**: First reference in Canada (Cataraqui Bay, ON)

Main results from industrialization test, Cornwall

- Possibility to increase the biofiltration process capacity

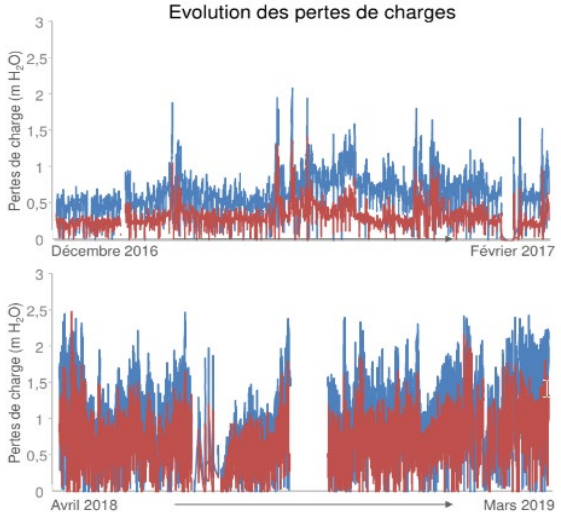
Parameter	Maximum tested value	% increasing compared to classic BIOSTYR design
Filtration velocity	9.9 m/h (stable operation) 11.4 m/h (peak)	+ 66%
TSS influent loading	1.21 kg/m^3/d	No gain in tested conditions
COD total influent loading	3.03 kg/m^3/d	+ 41%
NH_4 influent loading	0.39 kg N/m^3/d	+ 31%

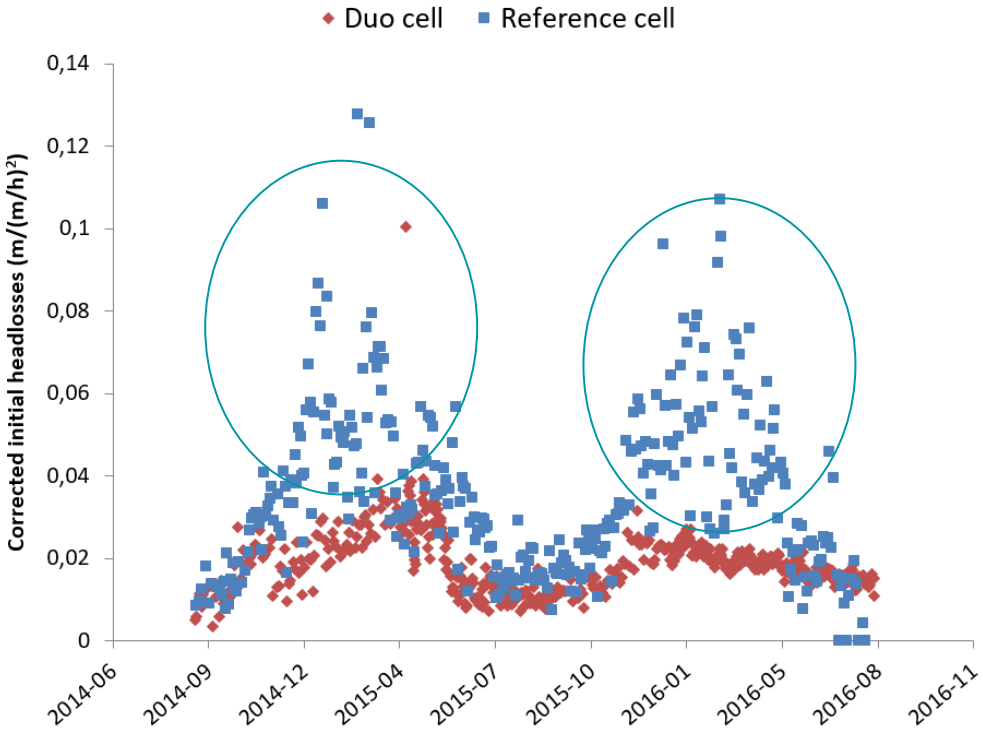
Main results from industrialization test, Cornwall

More stability in initial headloss progression over 2 years

Validated in Seine-Aval;

- **30% headlosses** reduction

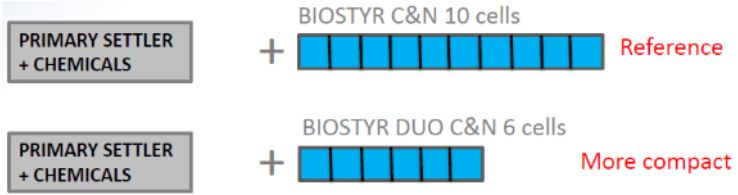




BIOSTYR DUO Development- Main Conclusions

More compact

- Higher volumetric pollutant loads
- Higher hydraulic capacity



Longer filtration cycles

- MBBR carriers grow heterotrophic organisms
- Less biomass on beads = ↓ headloss (↓ BW frequency, more production)

BIOSTYR Duo Case Studies

WATER TECHNOLOGIES

Case Study- Cagnes-sur-Mer (France)

Project Context:

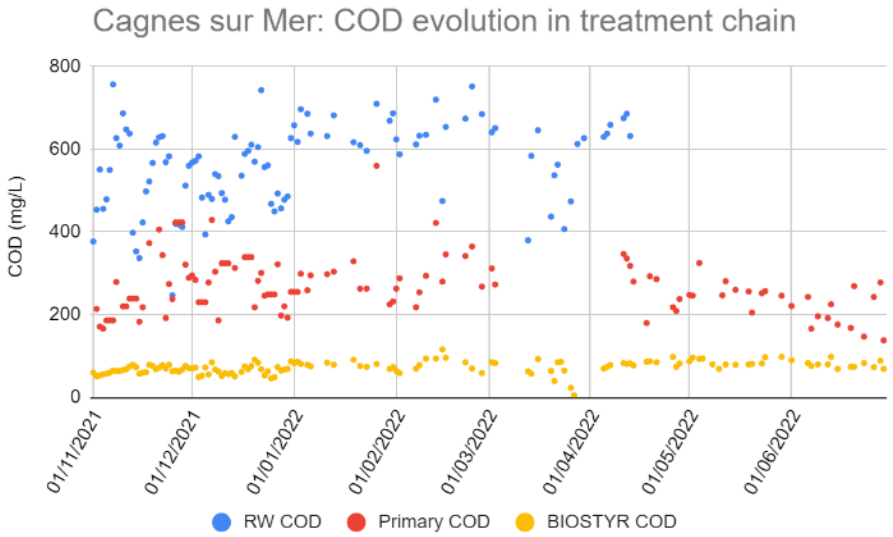
- Tight footprint available
- Close to existing infrastructures

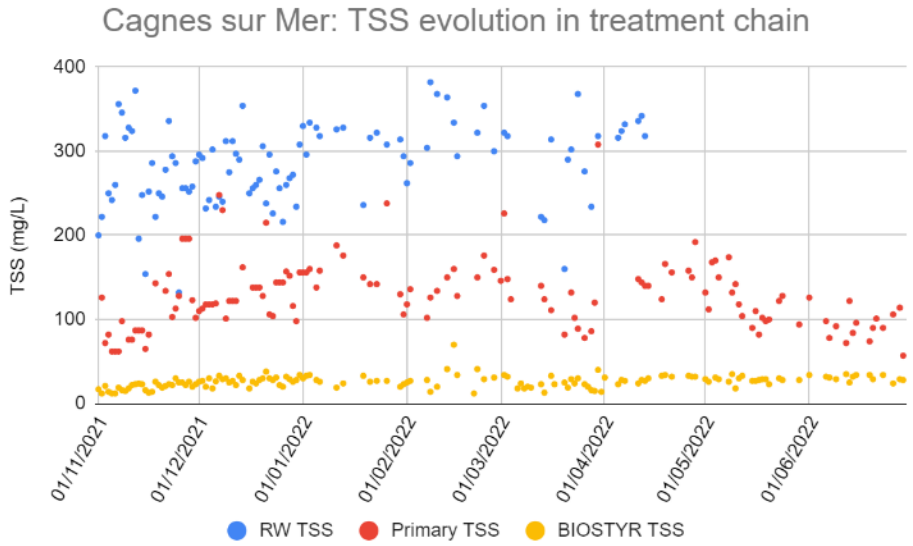
Main Characteristics:

- 6 X BOD BIOSTYR Duo cells

Case Study- Cagnes-sur-Mer (France)

Water quality through the treatment chain

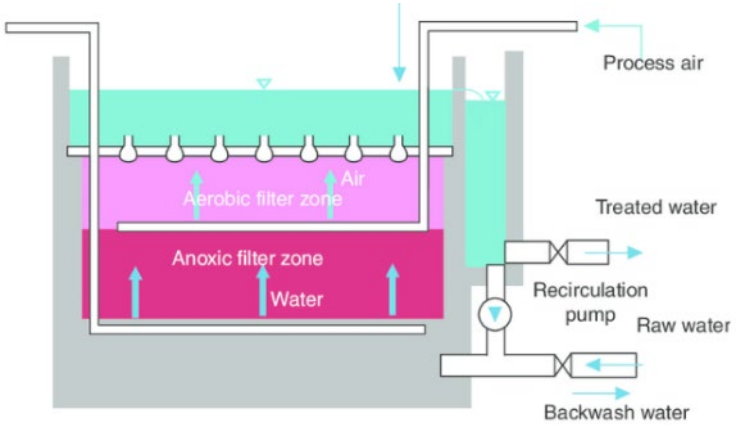




Case Study- Marne Aval (France)

Project Context:

- Existing Pre-denitrification and nitrification in single BIOSTYR cells (NDN)
- Retrofit from “classic” BIOSTYR to BIOSTYR Duo

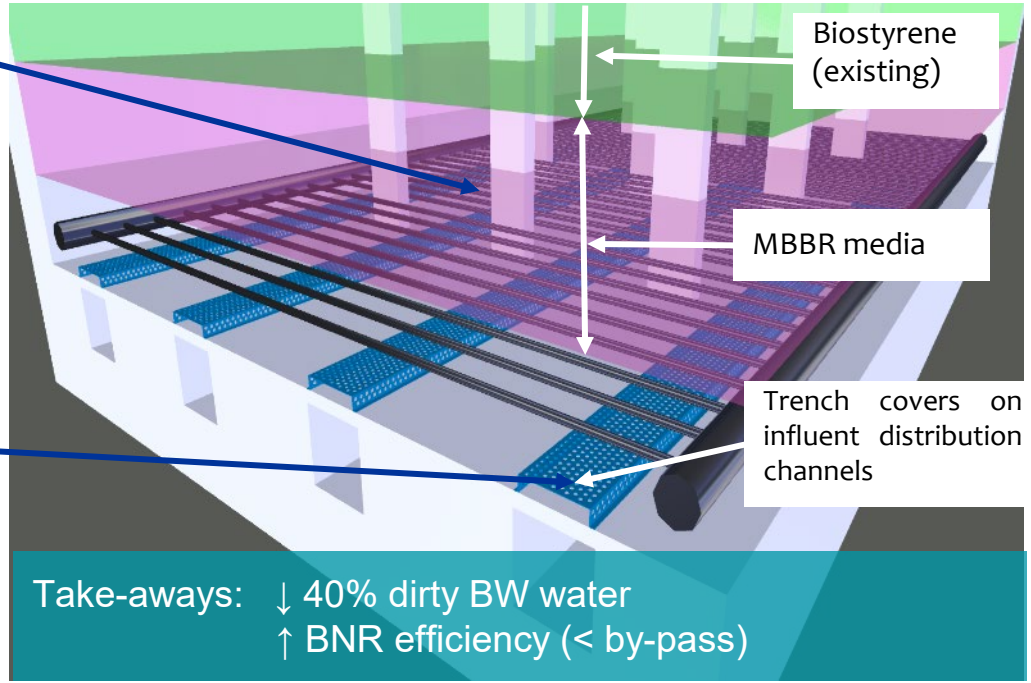


Main Characteristics:

- 14 X NDN BIOSTYR cells
- 4 X post-DN BIOSTYR cells

Case Study- Marne Aval (France)

Retrofit of BIOSTYR to BIOSTYR Duo for capacity increase



Take-aways: ↓ 40% dirty BW water
↑ BNR efficiency (< by-pass)

Case Study- Cataraqui Bay (Canada)

Project Context:

- BOD and nitrification in a single BIOSTYR Duo cell

Main Characteristics:

- 6 X BIOSTYR Duo cells
- No bead loss observed through BW in 2 years of operation

Key Takeaways

Key Takeaways

Highlights of the BIOSTYR Duo technology:

- Process & operation simplicity
- Higher treatment capacity than conventional BIOSTYR
    - *Hydraulic*
    - *Loads*
    - *More compact system*
- Protection against media loss
- Can be retrofitted in existing BIOSTYR filters

Thank You