ADVANCED PROCESS MODELLING FORUM
LONDON
20–21 APRIL 2016

Optimising industrial waste-water systems:

From food production to shale gas

Marc Pau-Roig – Applications Engineer

gPROMS

Process Industries face more and more

Waste-water treatment related constraints

- High discharge quality requirements (→ violation costs)
- Space availability (e.g. Off-shore platforms)
- Water availability (dry areas, big cities)
- Best Available Technology (BAT) compliance

I am presenting:

g|WATER

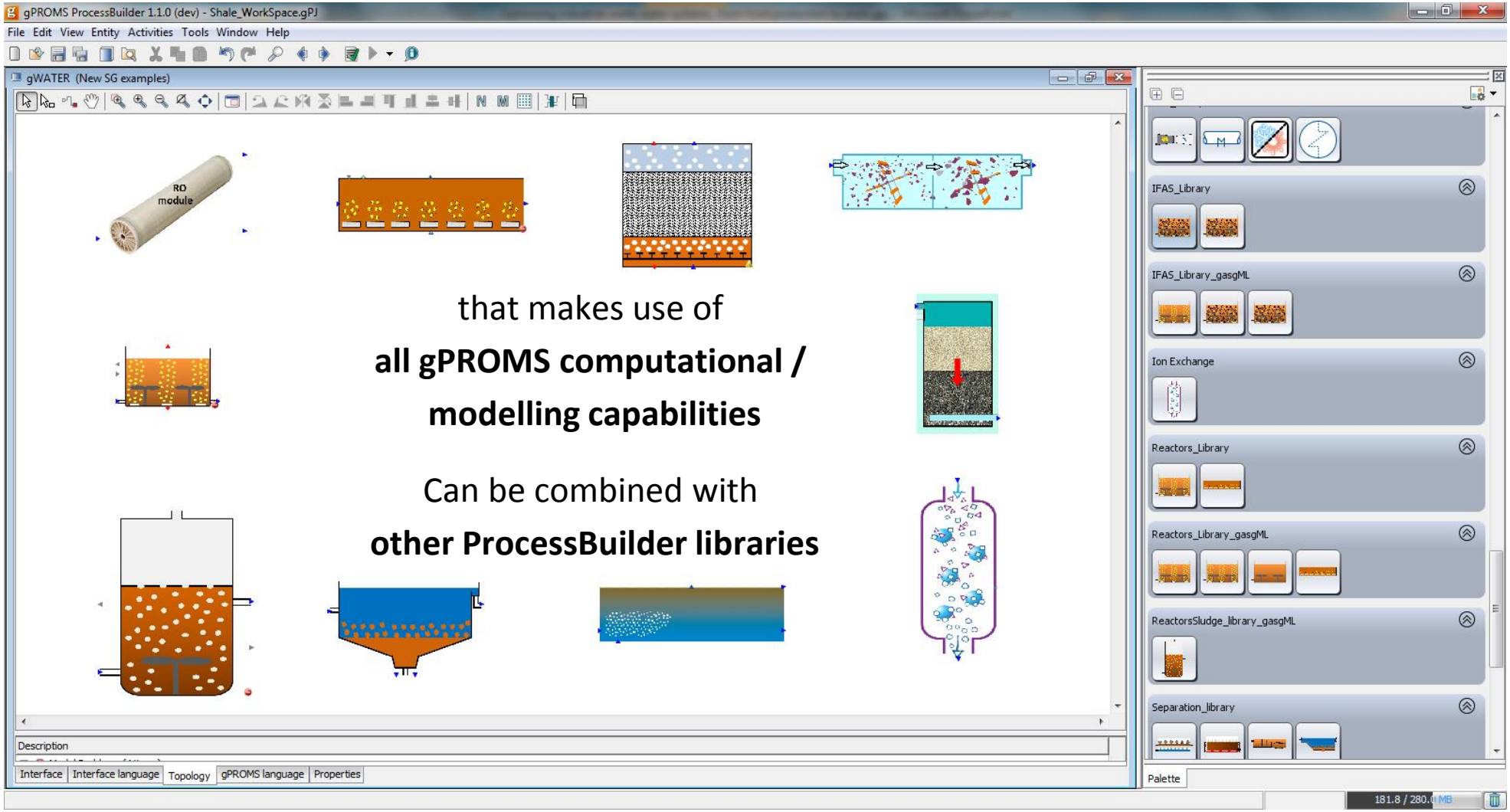
Process units library

for

water and wastewater

treatment chains

gWATER is a library…

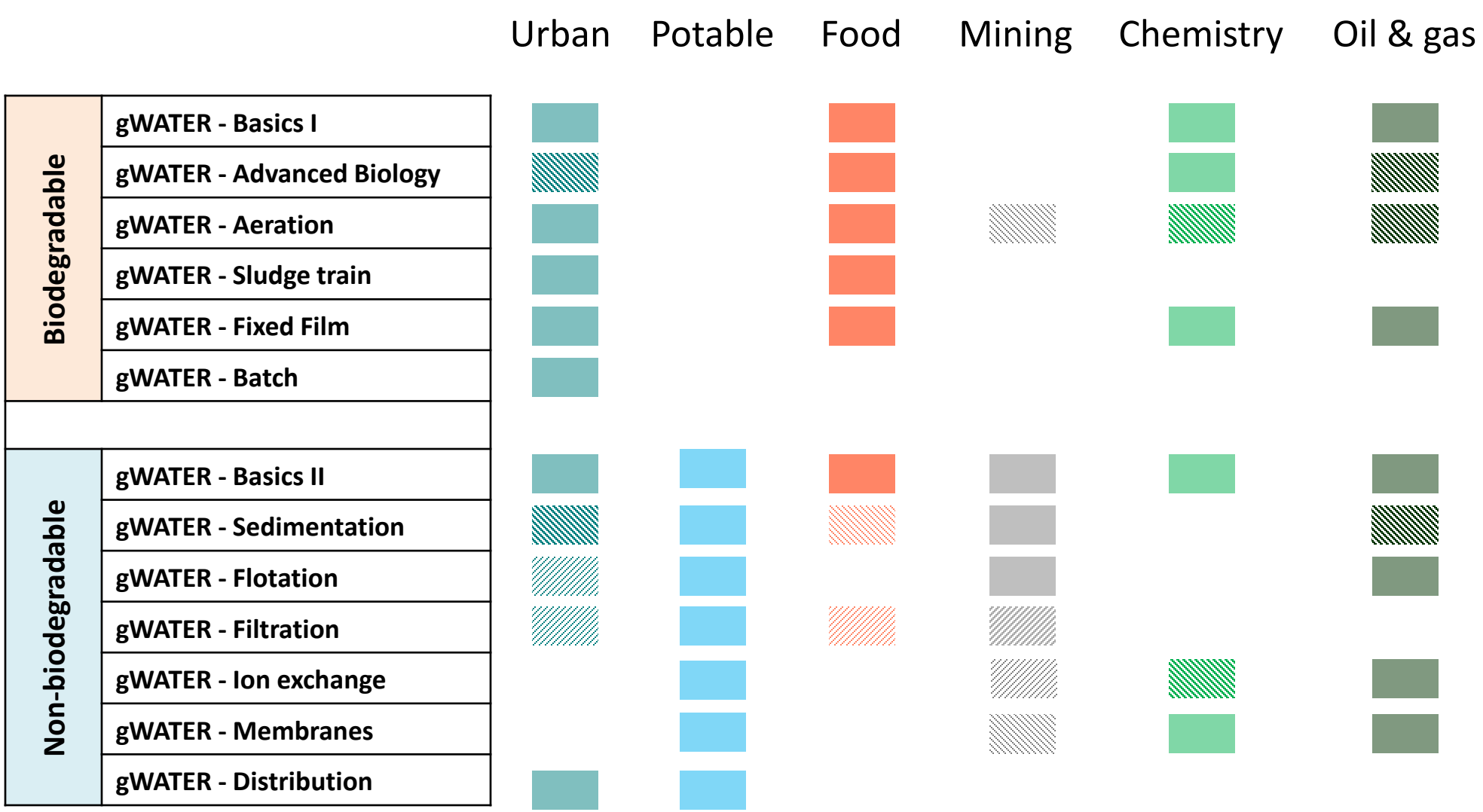


gWATER classification

Biodegradable waters

Non-biodegradable waters

gWATER sub-libraries & industry scope

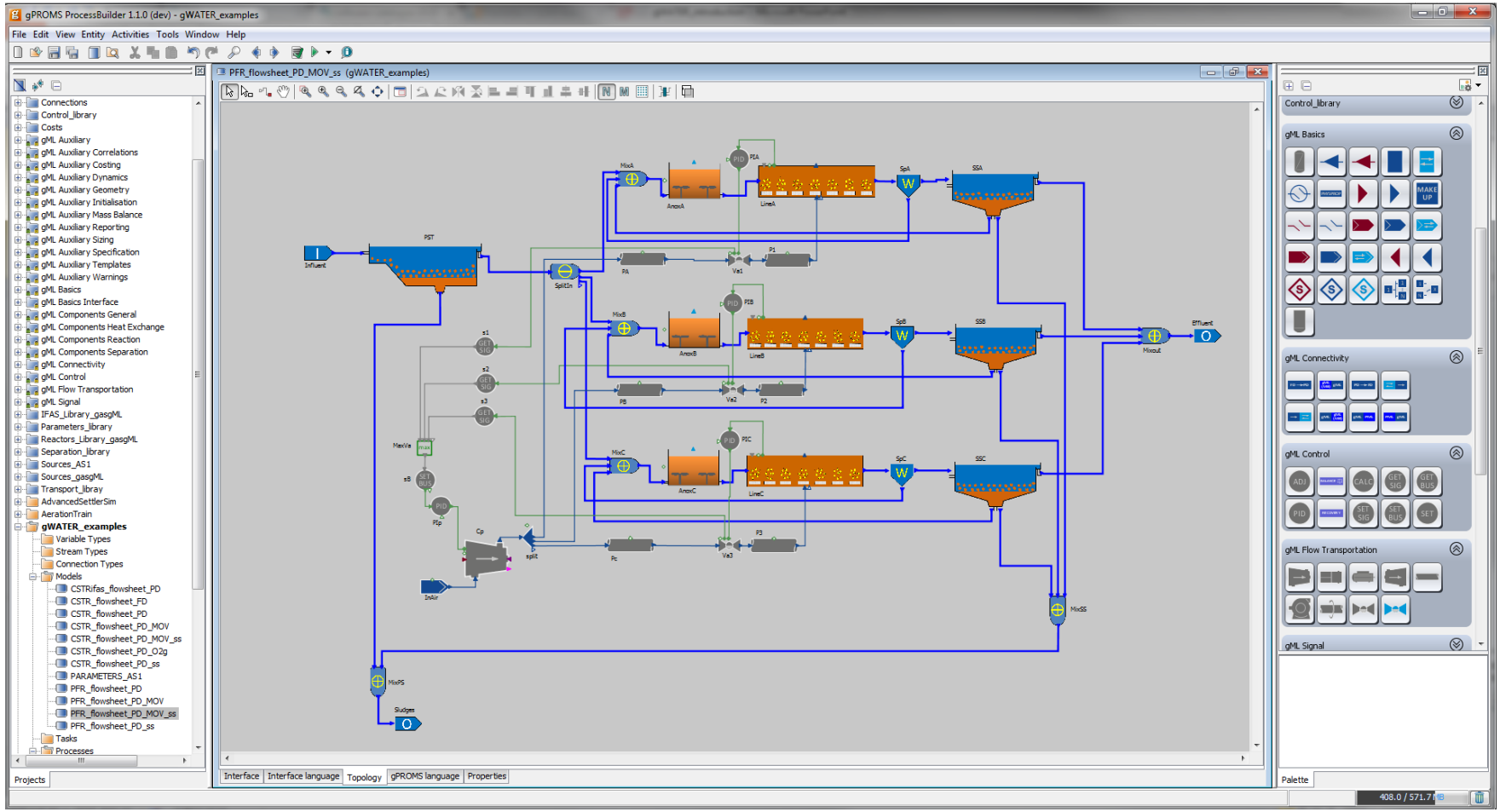


This list is non exhaustive and can evolve depending on specific needs

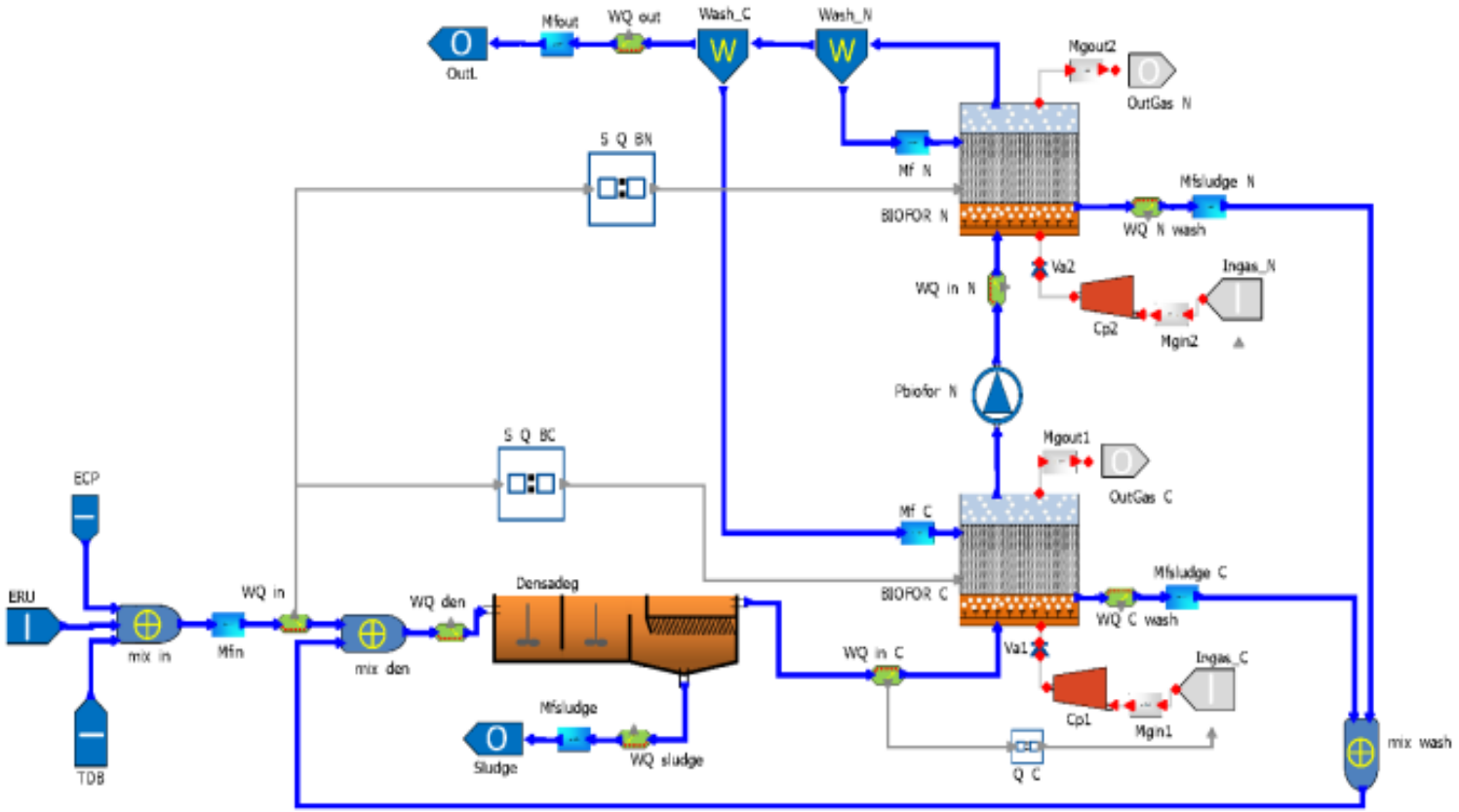
Biodegradable treatment schemes

- Conventional Activated Sludge (CAS)
- Membrane Bio-Reactors (MBR)
- Biofilters

gWATER: Biological Process – Activated Sludge



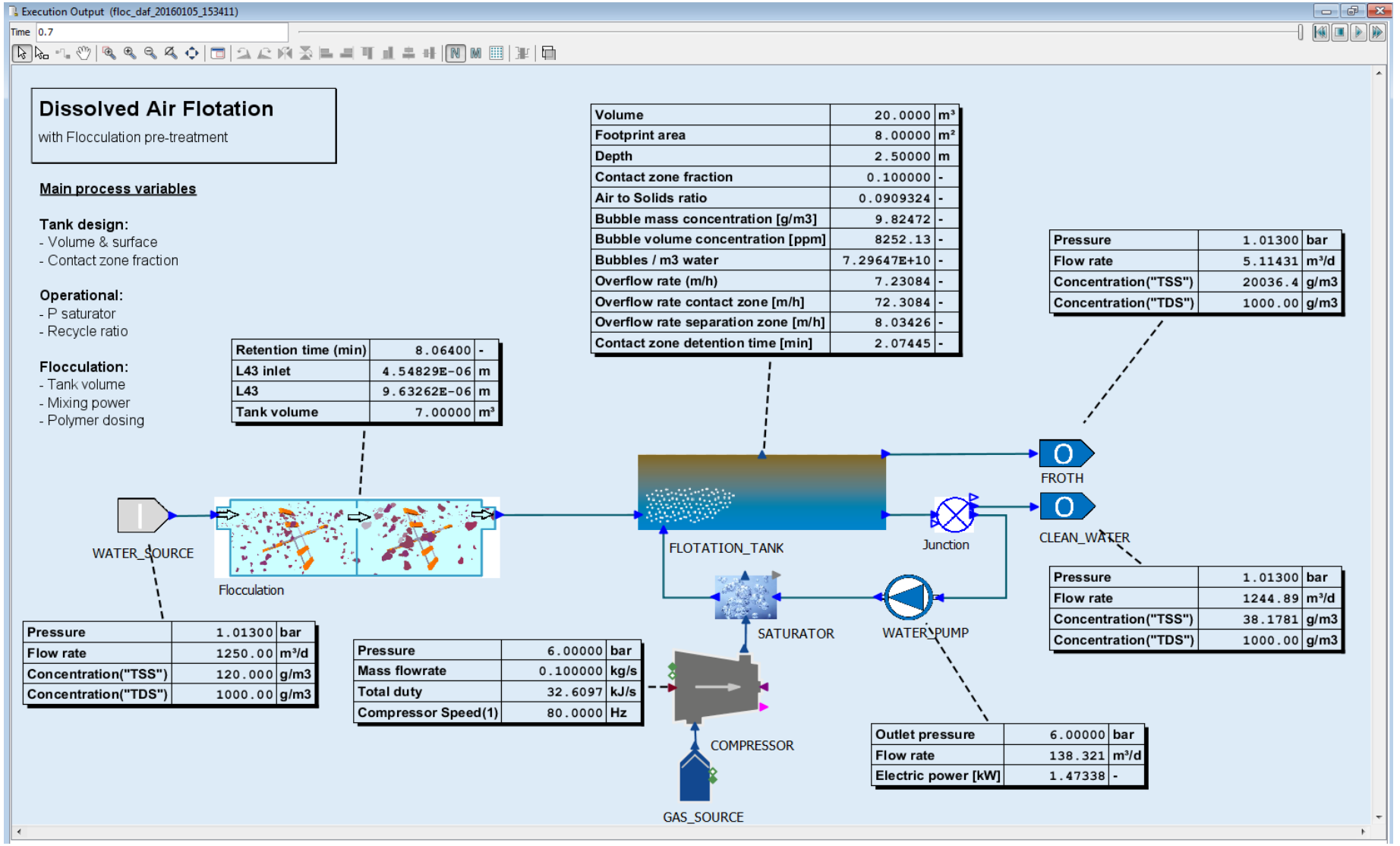
gWATER: Biological Process – Biofilm reactors



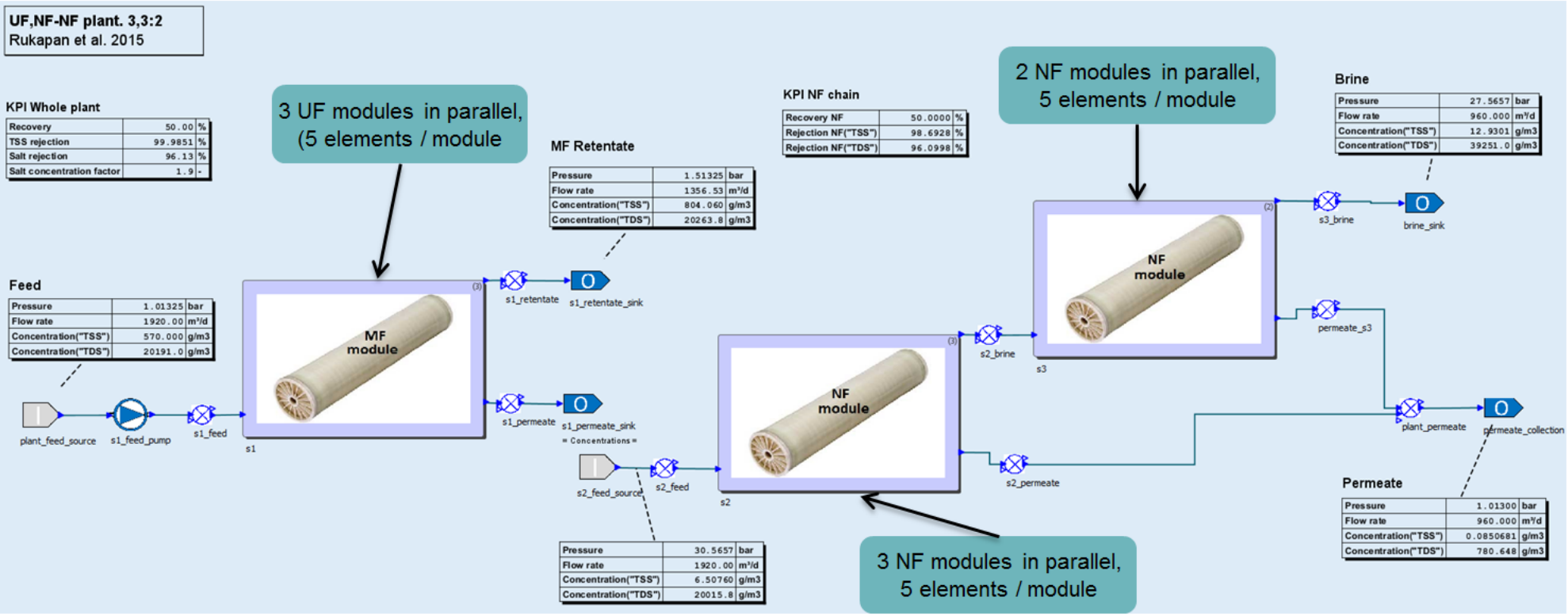
Non-biodegradable waters

- Mining and Mineral Processing Industries
- Desalination
- Water purification
- Oil & Gas produced water

gWATER : Dissolved Air Flotation

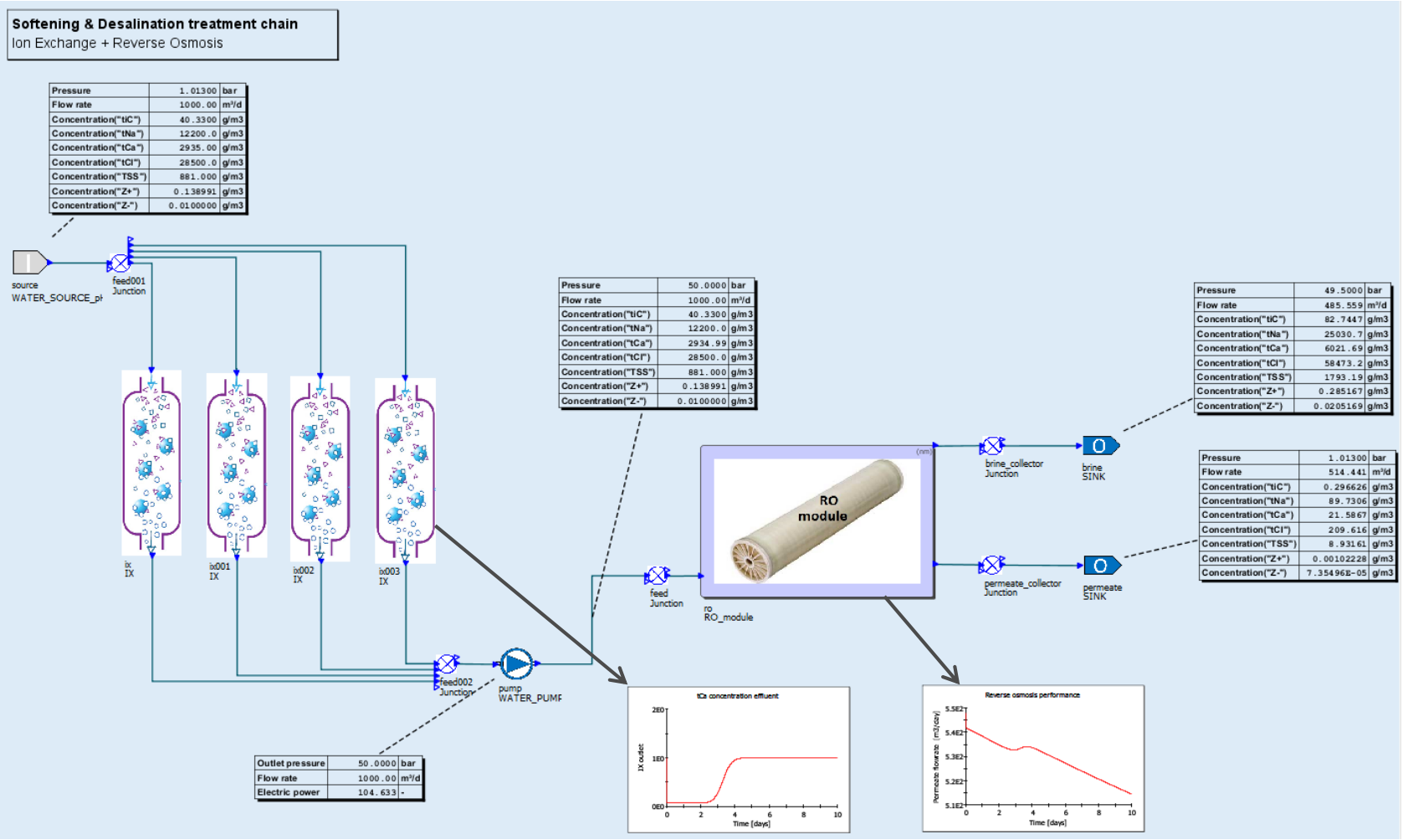


gWATER : Membrane network (MF/UF/NF/RO)



- Water purification
- Waste water desalination
- Complex ions removal
- Ultrapure water production

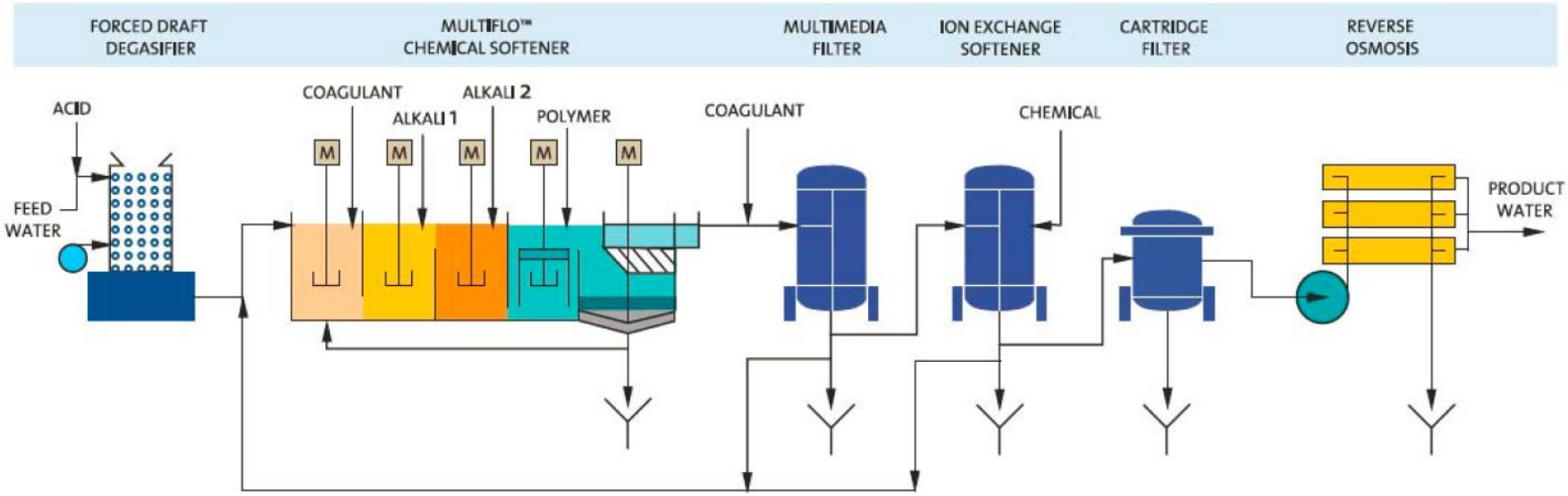
gWATER : Ion exchange + Reverse Osmosis



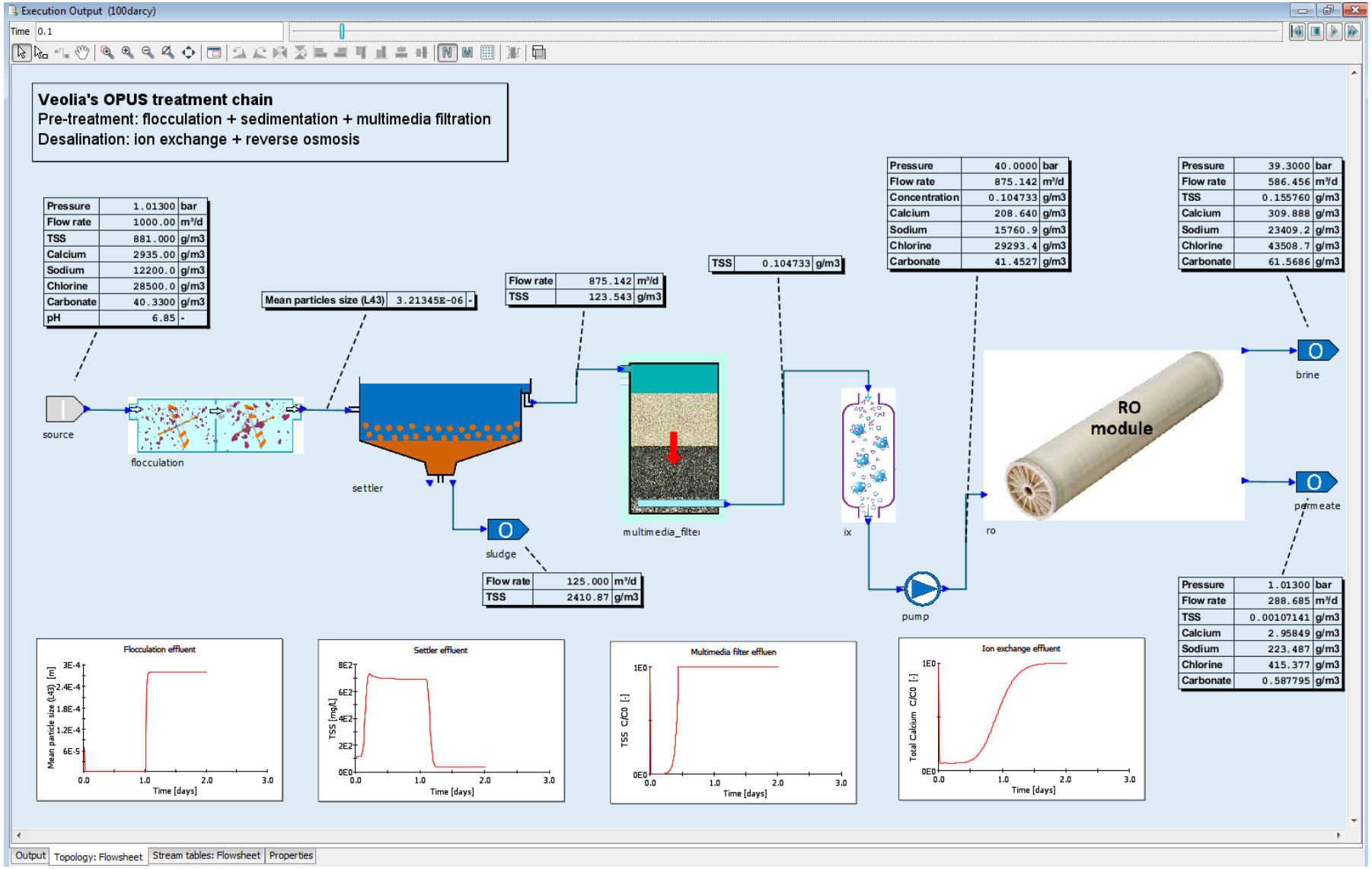
- Water softening & desalination

Veolia's OPUS system

Desalination of water with high concentrations of sparingly soluble solutes (e.g., SiO2, CaSO4, and Mg(OH)2), organics, and boron.



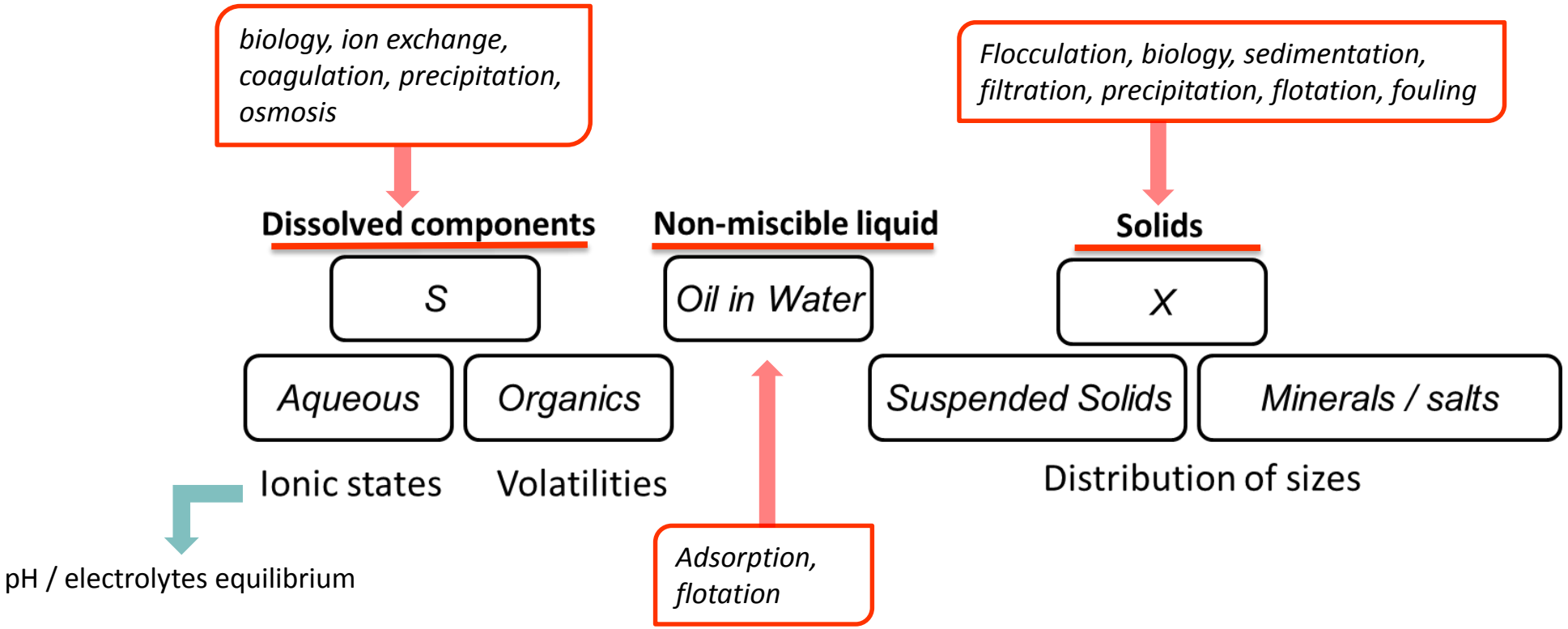
Wastewater treatment technologies for Shale Gas



gWATER structure

- Flexible water characterisation
- Modularity

Challenge : water characterisation



- All stream components are classified into one of these groups
- The number and the nature of components is fully customisable
- Each groups will behave differently in the different process units models

Biology combined with reactor modelling

Bio-models

- ASM family models
- Anaerobic digestion models
- PW model
- Two-step nitrification / annamox
- Any customised models
- **Industry specifics models**

Reactors

- Two-phase CSTR
- Two-phase PFR
- Packed-bed reactor
- Sequencing Batch (on dev)
- Membranes based reactor
- Connection to CFD

Biofilm

- Growing 1D
- Growing 0D (fully penetrated)

Any combination of that **(that make sense)** is possible, thanks to the modularity

gWATER added value

- Treatment chain design, sizing
  - What combination of equipment?
  - How many units? Optimal layout?
  - Energy demand and possible reuse? (Pressure exchangers, etc…)
  - Water demand and reuse.

- Operational decisions linked to constraints
  - Optimal number of units/lines in use.
  - Batch/continuous process (electricity cost)
  - Other managing options (e.g. Shale gas produced water)

Thank you