CS7

Map of Europe showing numbered locations:
- 7 TAIN
- 9 KALUNDBORG
- 2 NIEUW PRINSENLAND
- 5 OSTRAVA
- SAINT-MAURICE L'EXIL 8
- 3 ROSIGNANO
- LLEIDA 5
- 1 TARRAGONA
- NAFPLIO 4
- KARMIEL, SHAFDAN 6

Treatment systems

Existing system

New developments

Low-cost energy for heating

Boiler

Biogas

Ww

GLENMORANGIE

AnMBR

Effluent

Heat exchanger

Cu rich sludge

Barley fields

Water reuse

Heat

?

Ammonia

Fertiliser?

Stripping or ion exchange columns

Concentrate

RO membranes

Permeate

Discharge to the Dornoch Firth

AnMBR LE™

Peak/average AnMBR Feed flow rate (m³/d)	467/377
Design COD load (kg/d)	14,527
Average total COD removal	> 95%
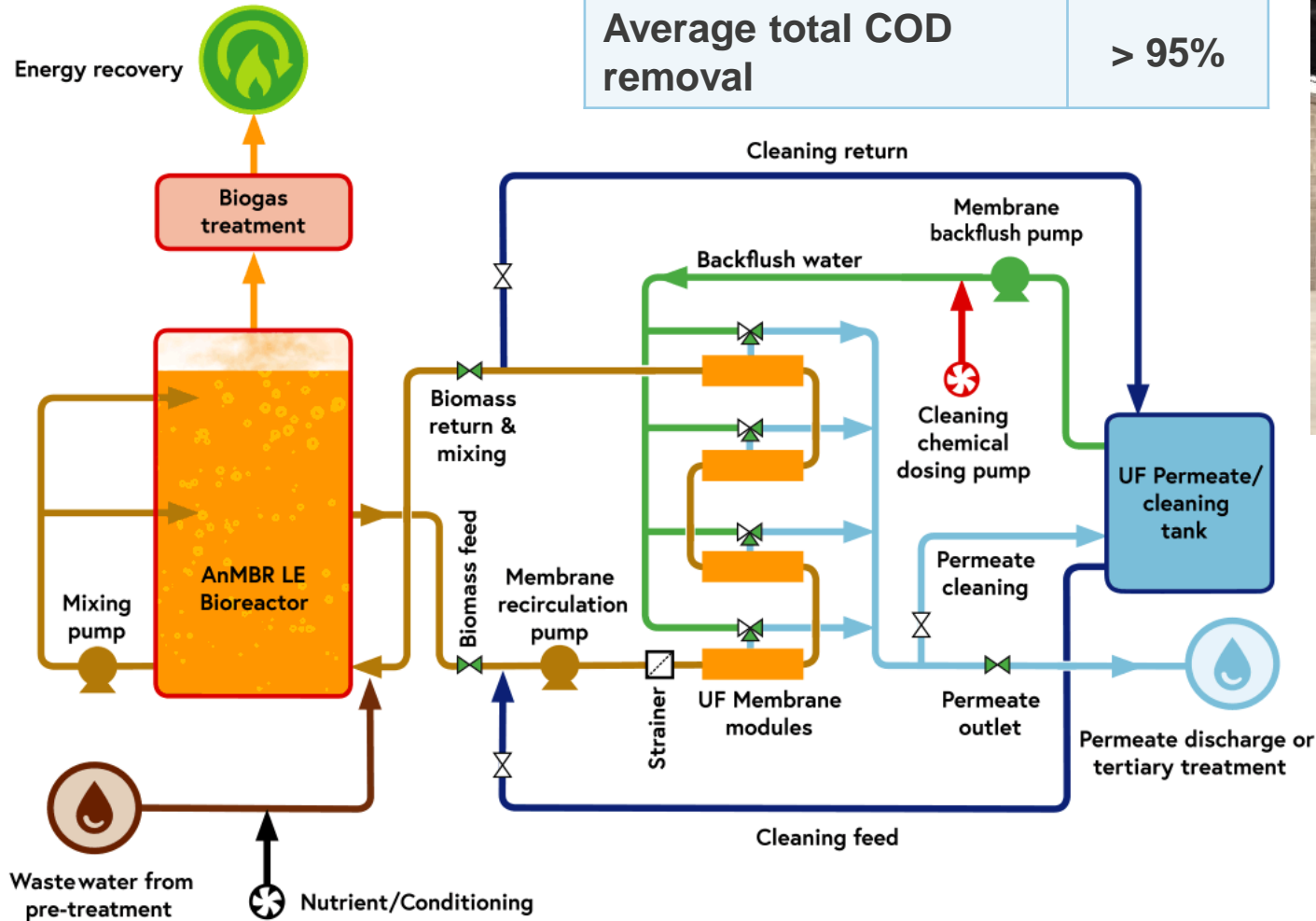
COD (mg/L)	656 (316 – 1454)
SS (mg/L)	3 (0 – 18)
NH_4-N (mg/L)	797 (329 – 1349)
NO_3-N (mg/L)	5 (4 – 8)
PO_4-P (mg/L)	252 (152 – 343)
pH	7.2 (6.4 – 8.0)

Reverse osmosis
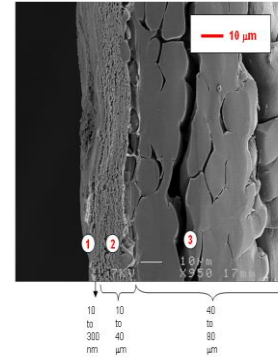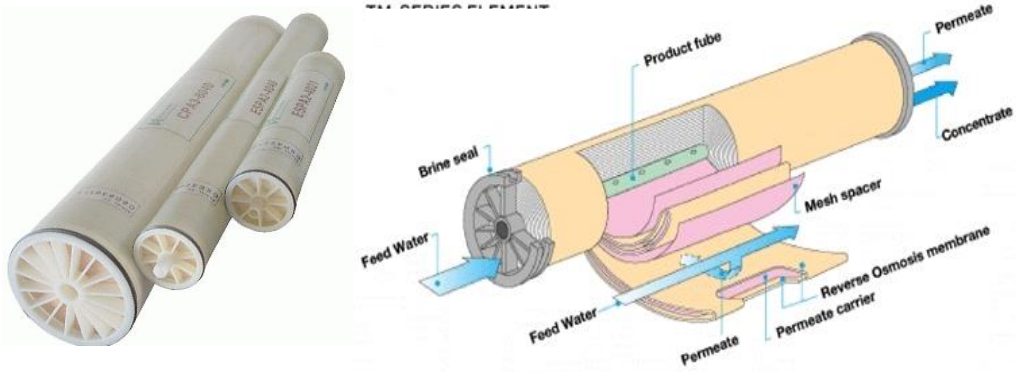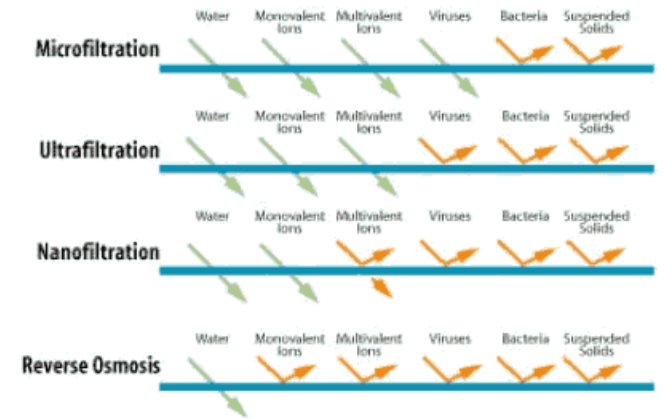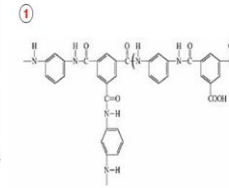
Demonstration of the application:

- Operational performance

- Treatment performance (fit for purpose)

- System integration

Previous experience – food processing

Bakkavor Cucina Sano WWRP Scheme, Boston, Lincolnshire, United Kingdom
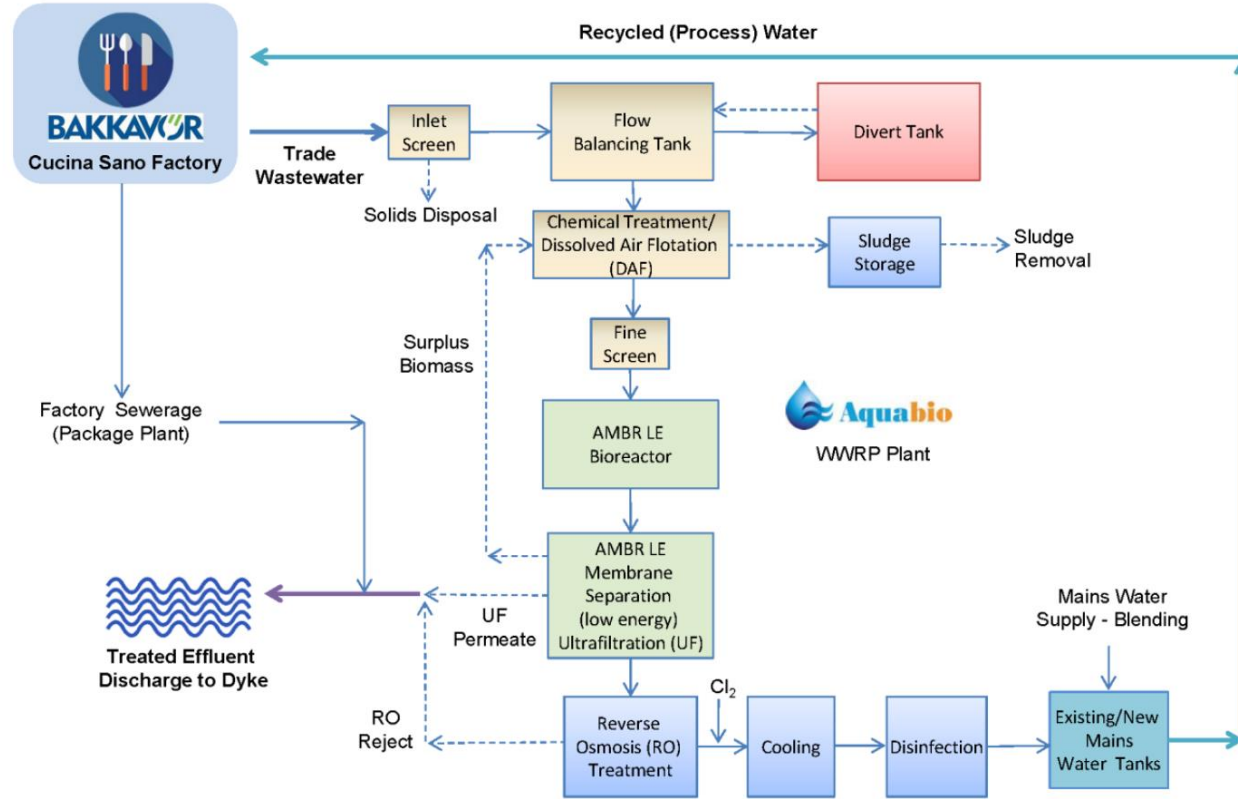
Average AeMBR flow rate (m³/d)	500
Average COD load (kg/d)	3566
Average RO permeate flow rate (m³/d)	425
Total water recovery for reuse	75-80%

Trials

Operational performance:

- Optimum operation (flux, pressure)
- Fouling formation and cleaning regime
- Recovery rate

Integration (sequence):

- Heat => energy use
- Nutrients => fouling vs concentration

Treatment performance:

- Organics (including trace organic compounds)
- Nutrients
- Metals and other ions
- Microbial contamination
- Concentrate management

| Internal milestones: water recovery | 2020 | | | | | | | 2021 | | | | | | | | | | | | 2022 | | | | | | | | | | | | 2023 | | | | | | | | | | | | 2024 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| Wastewater characterisation | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lab to smale pilot scall trials | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demo unit design | | | | | | | | | | | | | | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demo unit build | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demo unit commisioning | | | | | | | | | | | | | | | | | | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demo unit peration | | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |