There are 5 containers that each contain a water treatment technology. The containers are modular and thus can be operated as a stand-alone unit or connected to each other in a treatment train. A UV disinfection unit can be connected to each of the containers. Also, there is the option to connect the effluent to a final buffer tank (2 m³ on a skid + mixing + sensors), which can regulate the effluent flows to a certain ratio or conductivity.

The experimental setup of the containers allows remote operation and continuous monitoring of critical parameters, including temperature, pH, conductivity, turbidity, and chloride. The robust local PLC-based control level is complemented with an IIoT Edge gateway with a double purpose: it enables secure remote access to all HMIs from a central operating system and makes reliable data acquisition towards the cloud possible.

An overview of the power supply and electrical data that is the same for all the containers is given beneath.

|  |  |
| --- | --- |
| Power supply and electrical data (all containers) | |
| Power supply voltage | 400 Vac |
| Power supply frequency | 50 Hz |
| Power supply phases | 3P + N + PE\* |
| Power supply connection | CEE 5 pin male 32A |
| Power supply net type | TN-S |
| Short circuit current rating | 10 kA |
| Control voltage | 24 Vdc |
| Max power supply cable length (10 mm²) | 60 m |
| Max power supply cable length (16 mm²) | 89 m |

\*3 fasensysteem, neutral draad en beschermende aarde



MMF



UF

In/out

Out/in



dNF

+ cfUF



ACF



RO + CCRO

### Direct nanofiltration / cross-flow ultrafiltration (dNF/cfUF-6-2)

|  |  |
| --- | --- |
| Power supply and electrical data (specific for dNF) | |
| Total installed power | 12.56 kW |
| Full load current | 30.03 A |

##### Description

A room with pipes and machinery

Description automatically generatedDirect nanofiltration provides removal of organics and partial salinity (high rejection of multivalent ions and low rejection of monovalent ions). Furthermore, there is colour removal, COD/BOD removal, humic acids removal, reclamation of cleaning solutions or colouring dye from water, removal of microplastics, and micropollutants like pesticides, pharmaceuticals, and some PFAS. The biggest advantage is the possibility to treat (surface) water almost directly, with minimal pre-treatment of feed water. In addition, in this pilot has been designed so that it is possible to test as well crossflow UF technology.The membranes are operated **in parallel**.

##### Connections

* Inlet: service water, compressed air, feed water
* Outlet: concentrate out (pressurized), waste out non-chemical (pressurized), waste out chemical (pressurized), draining feed tank, permeate out 1, permeate out 2.
* Chemicals:
  + Acid: H2SO4 50%, H3PO4 30% or C6H8O7 50%
  + Base: NaOH 30%
  + Antiscalant
  + Oxidant: NaOCl
  + Coagulant

##### Monitoring parameters

* Prefilter: inlet & outlet pressure.
* Feed: pH, temperature, tank level, UV sensor, turbidity, conductivity.
* Filter: feed flow, cross-flow flow, bottom & top feed pressure.
* Permeate: turbidity, flow, conductivity, UV sensor, chloride, tank level, transfer pressure, product out flow.
* Concentrate: flow, temperature.

##### Dimensions and weight

|  |  |
| --- | --- |
| Size container (L x W x H) | 610 x 244 x 289 cm |
| Weight container | 4500 kg |

##### Process data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Unit | 1 membrane | 2 membranes |
| Direct nanofiltration membrane: NX | | m² | 43 | 86 |
| Feed flow | @ 75% recovery | m³/h | 1.15 | 2.29 |
| @ 90% recovery | m³/h | 0.96 | 1.91 |
| Backwash flow | @ 20 LMH flux | m³/h | 0.86 | 1.72 |
| @ 40 LMH flux | m³/h | 1.72 | 3.44 |
| Circulation flow | @ 0.2 m/s CF velocity | m³/h | 3.96 | 7.92 |
| @ 0.3 m/s CF velocity | m³/h | 5.94 | 11.88 |
| @ 0.5 m/s CF velocity | m³/h | 9.9 | 19.8 |
| Crossflow ultrafiltration membrane: Pentair | | m² | 20 | 40 |
| Feed flow | @ 40 LMH inst. flux | m³/h | 0.80 | 1.60 |
| @ 50 LMH inst. flux | m³/h | 1.00 | 2.00 |
| @ 70 LMH inst. flux | m³/h | 1.40 | 2.80 |
| Backwash flow | @ 120 LMH flux | m³/h | 2.4 | 4.8 |
| @ 230 LMH flux | m³/h | 4.6 | 9.2 |
| Circulation flow | @ 0.2 m/s CF velocity | m³/h | 3.8 | 7.6 |
| @ 1.0 m/s CF velocity | m³/h | 19 | 38 |
| @ 2.0 m/s CF velocity | m³/h | 38 | 76 |