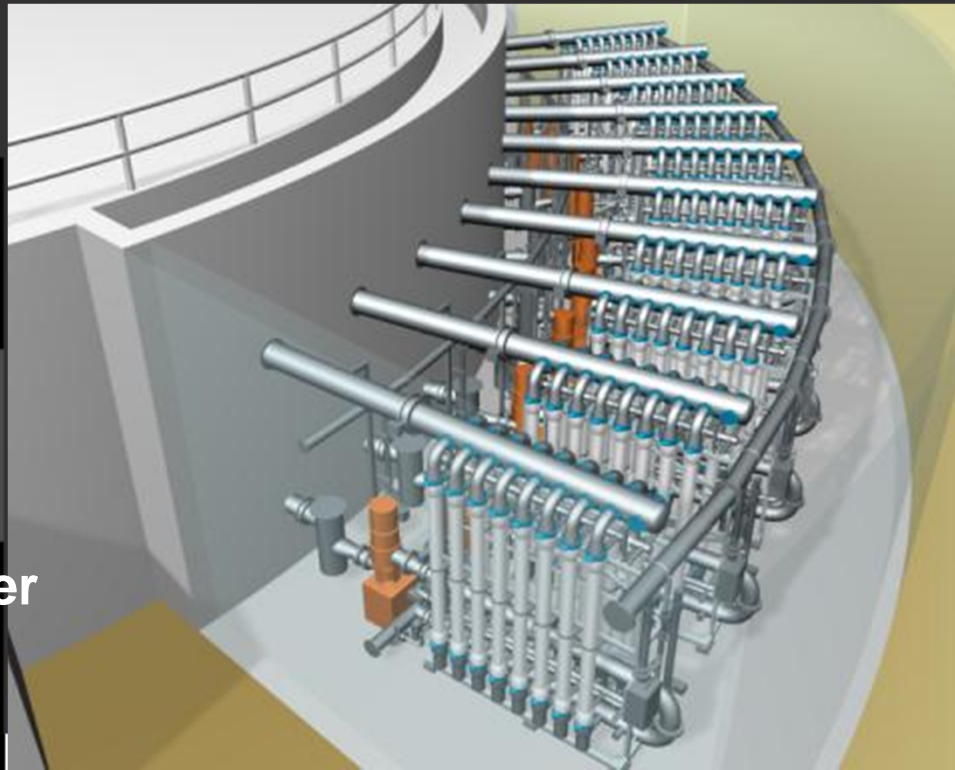


# Norit AirLift™ MBR



Ronald van 't Oever  
May 2011

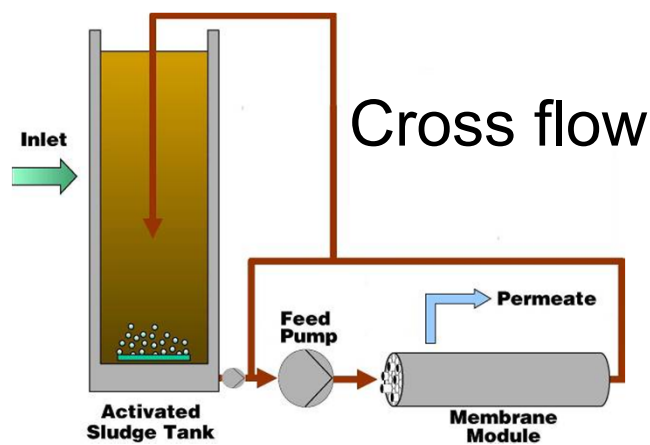
**Norit**

leading in purification

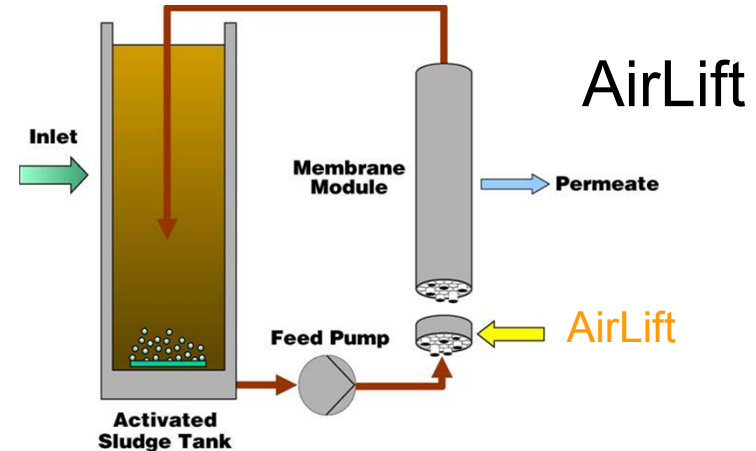
# Contents

1. Introduction
2. AL-UF standard skids
3. AL-UF plant lay-out
4. AL-UF process modes
5. AL-UF design parameters
6. AL-UF typical operation data
7. AL-MBR: examples

# 1. Introduction

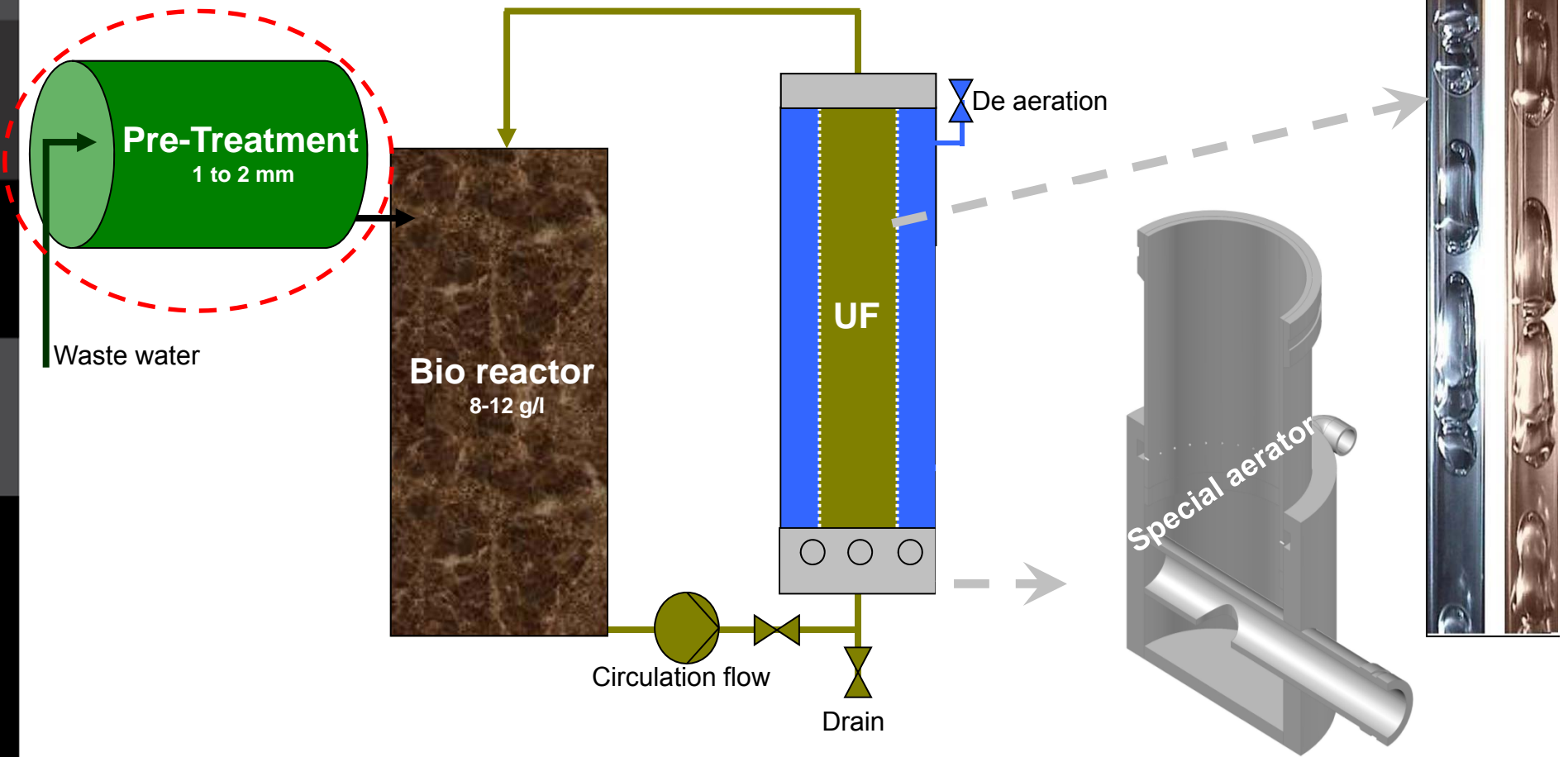


- MLSS 12 - 20 g/l
- Flux (40 - 130 l/m<sup>2</sup>h)
- Smallest footprint
- Higher energy consumption (1,5 - 4 kWh/m<sup>3</sup>)
- Inline straining required
- SIMPLE
- TMP (1 - 5 bar)



- MLSS 8 - 12 g/l
- Flux (30 - 65 l/m<sup>2</sup>h)
- Small footprint
- Low energy consumption (about 0,35 kWh/m<sup>3</sup>)
- No inline straining required (on condition that the bioreactor is covered)
- More valve processing
- Very low TMP (0,05 - 0,3 bar)

# 1. Introduction

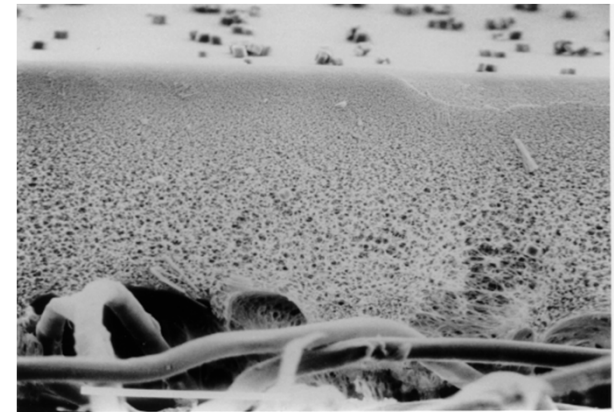


# 1. Introduction

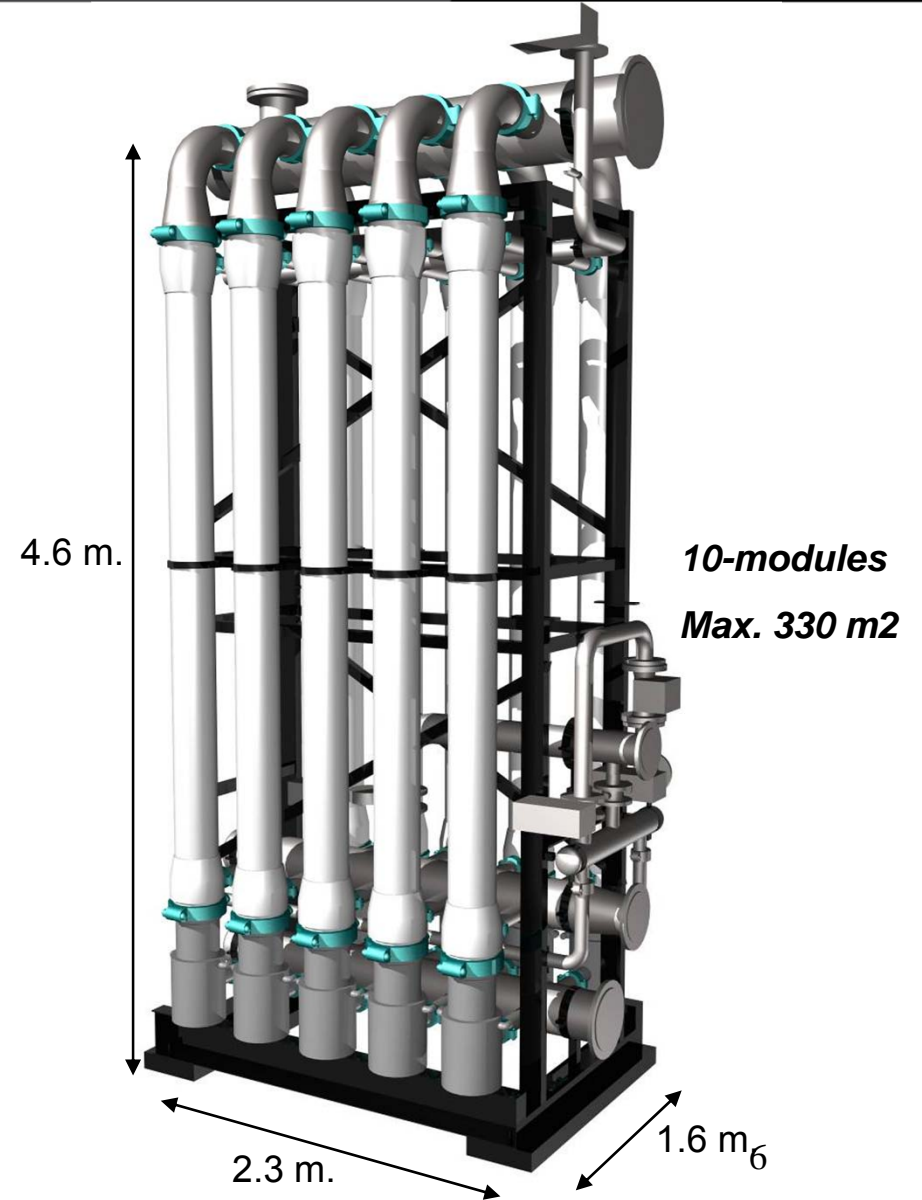
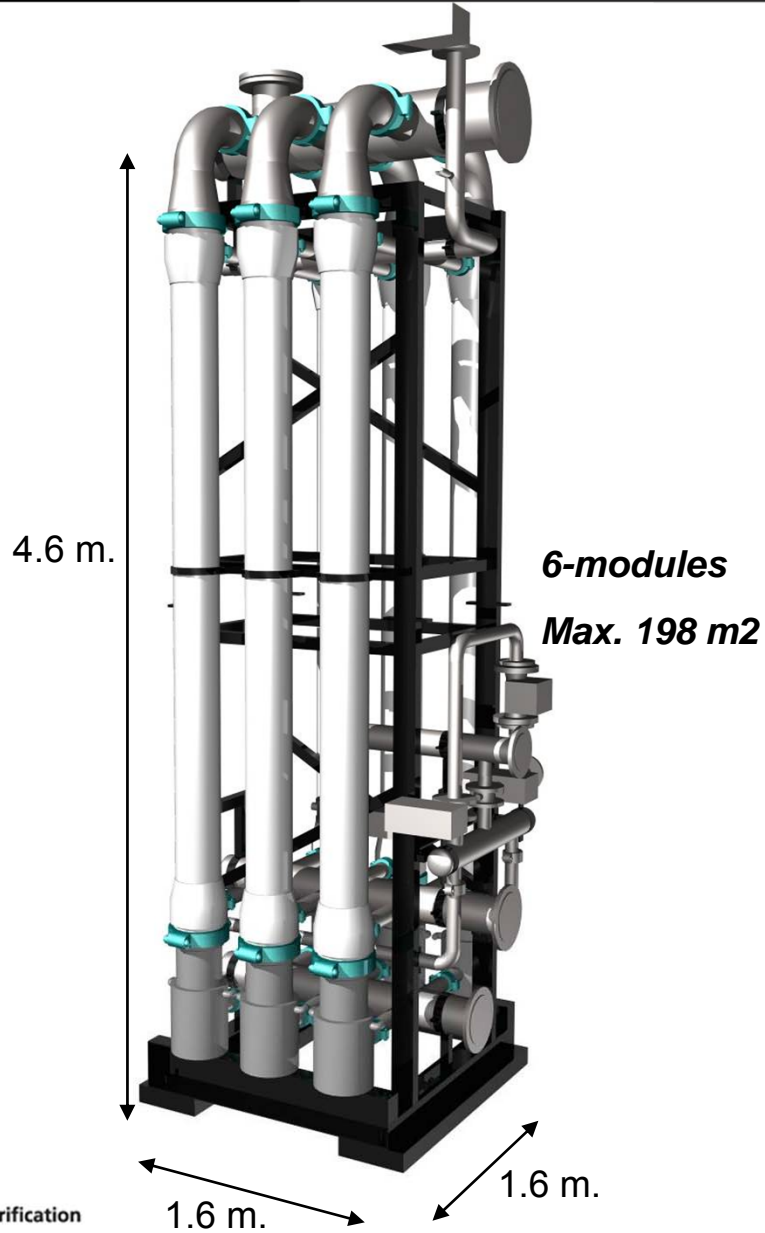
## TECHNICAL MODULE SPECIFICATIONS

### AirLift MBR

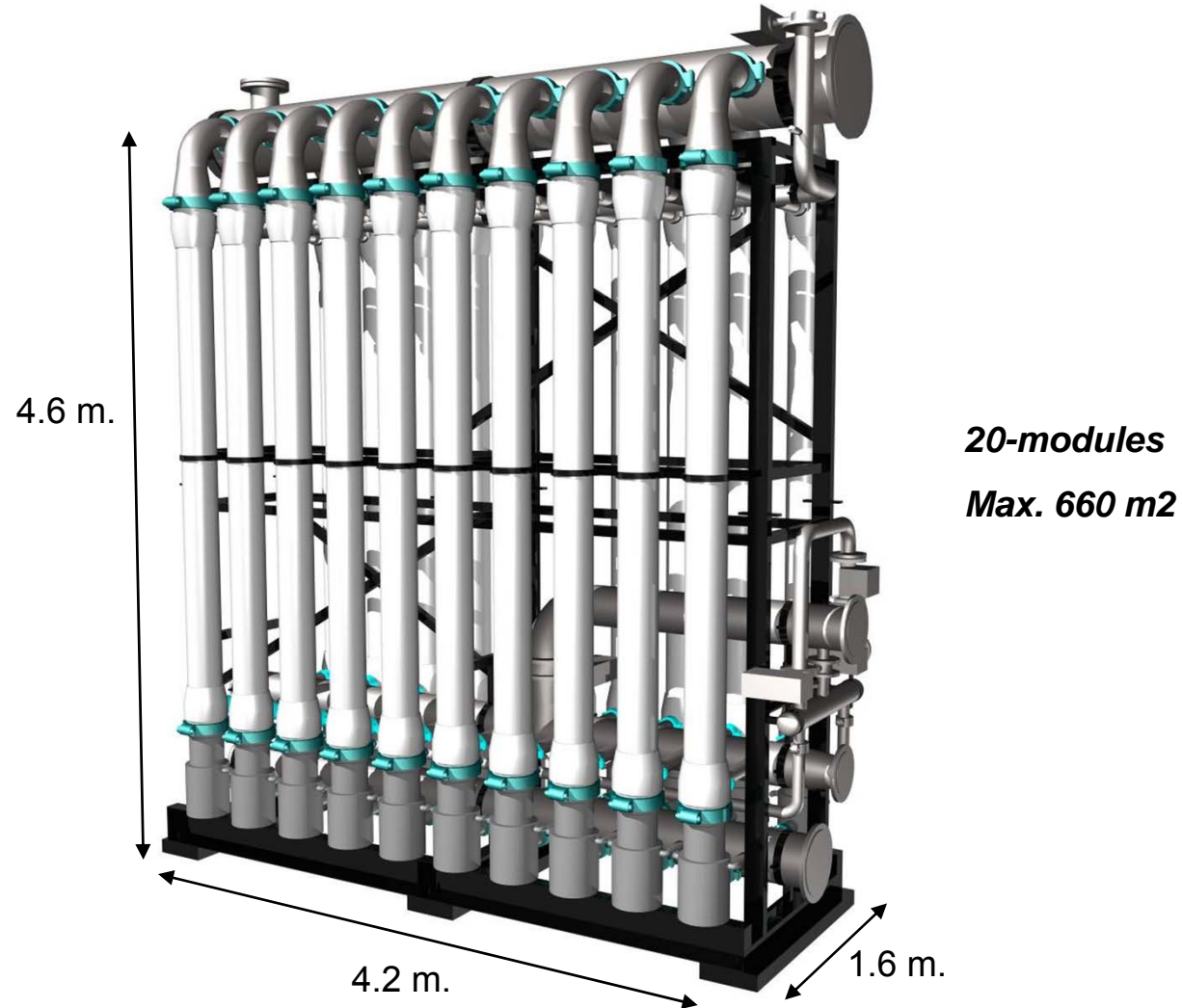
- Membrane type: F4385 (PVDF, 5.2 mm)
- Module type: 38PRV (33 m<sup>2</sup>)
- Configuration: parallel
- Process: AirLift (0,19 m/s air; 0,43 m/s sludge)
- Energy consumption: approx 0,35 kWh/m<sup>3</sup> produced
- Flux (gross): 50 l/mh (DWF)  
65 l/mh (RWF)
- TMP: 0,05 – 0,3 bar
- Membrane life time: 5-10 yr



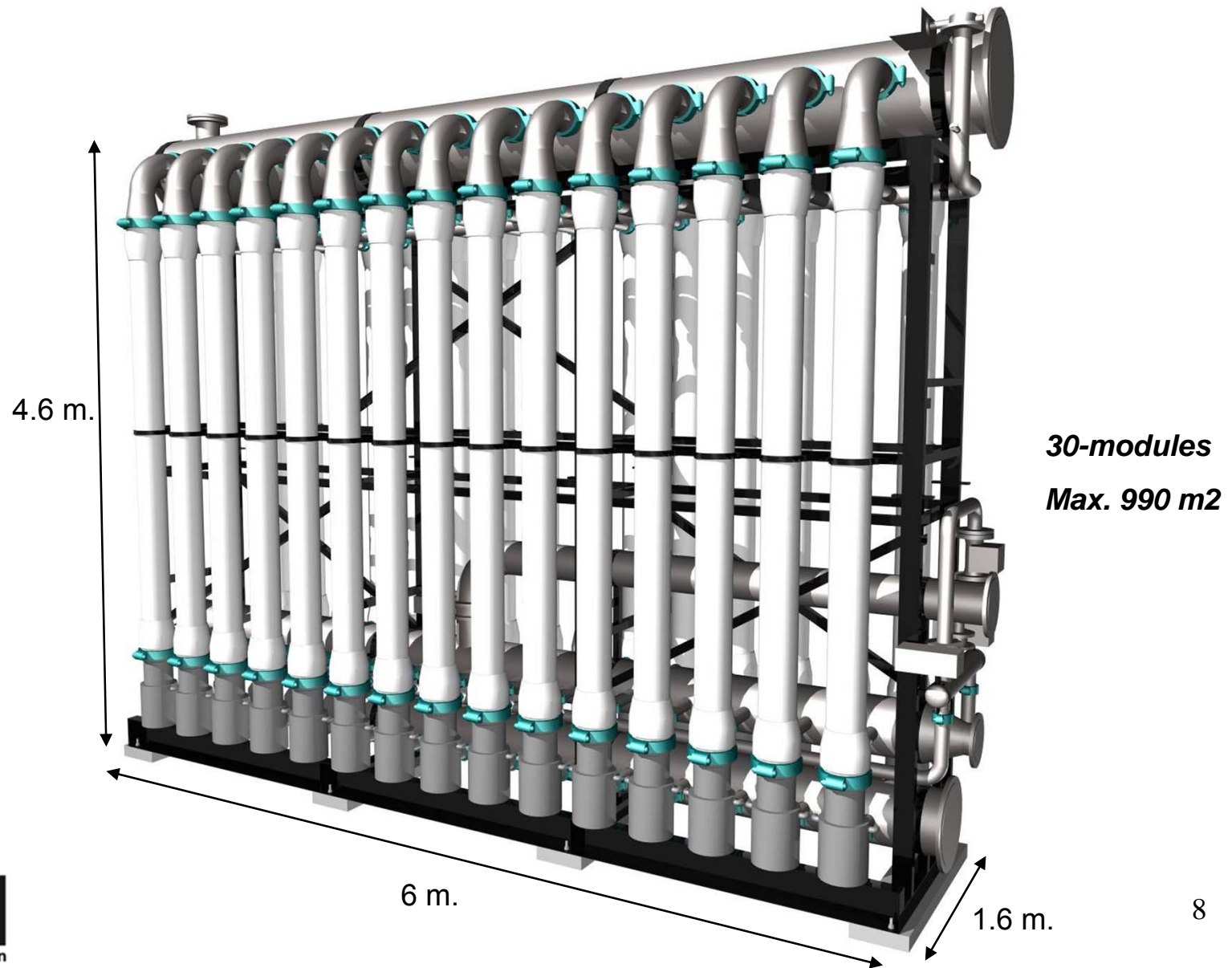
## 2. AL-UF standard skids



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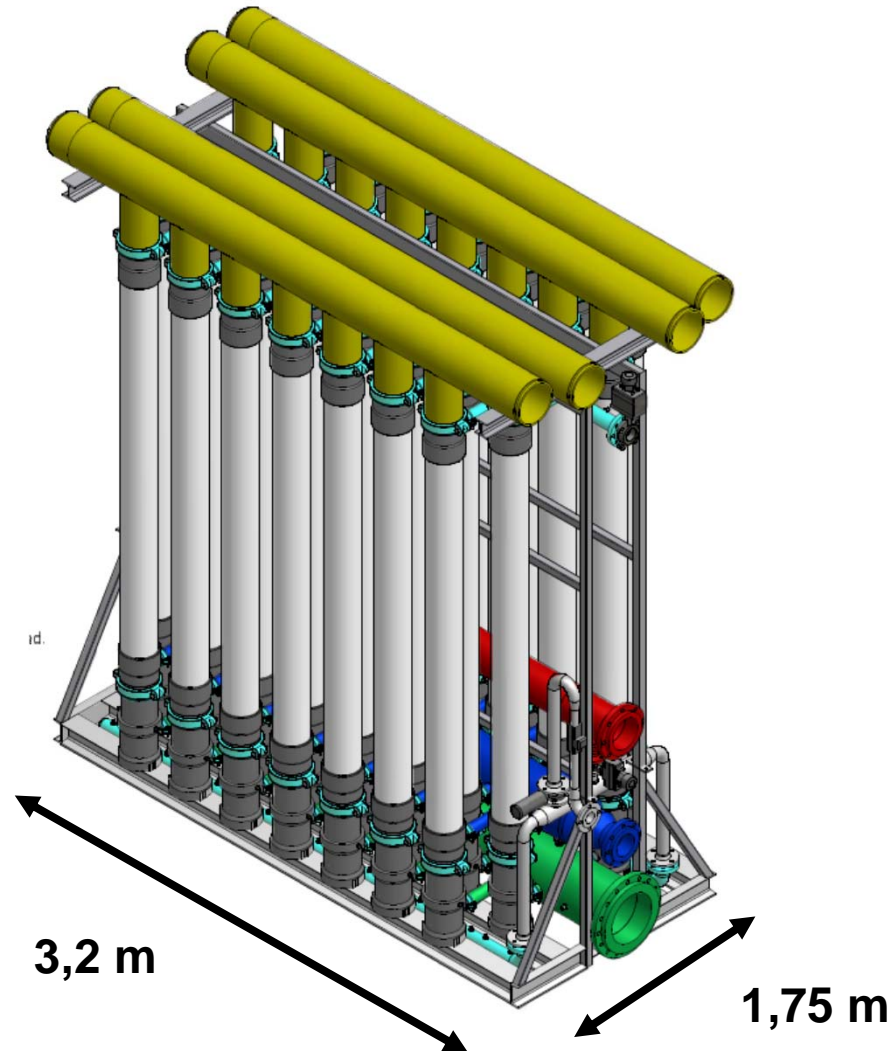
## 2. AL-UF standard skids





## 2. AL-UF standard skids

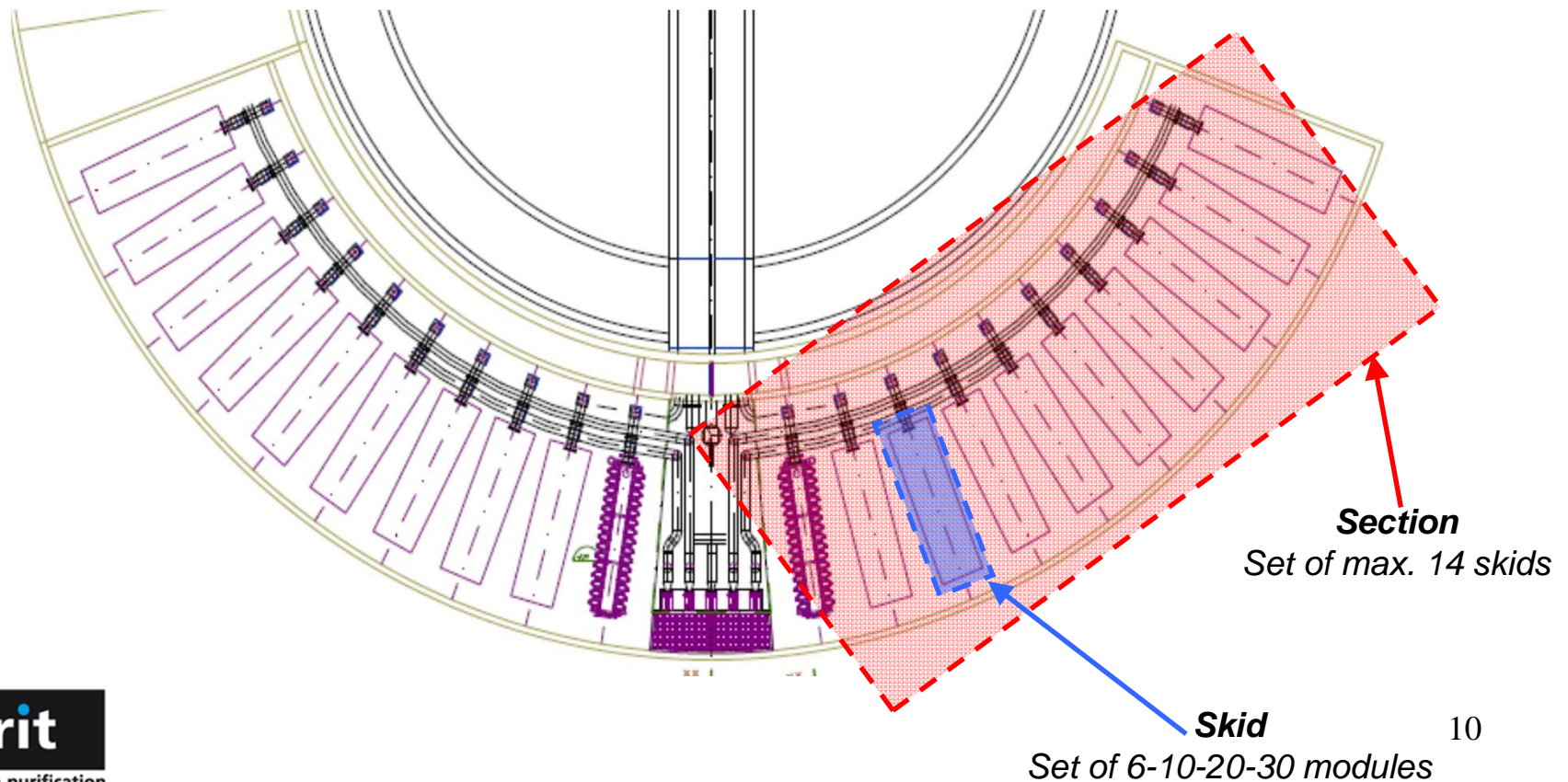
Staggered version 2 x 15 modules



# 3. AL-UF plant lay-out

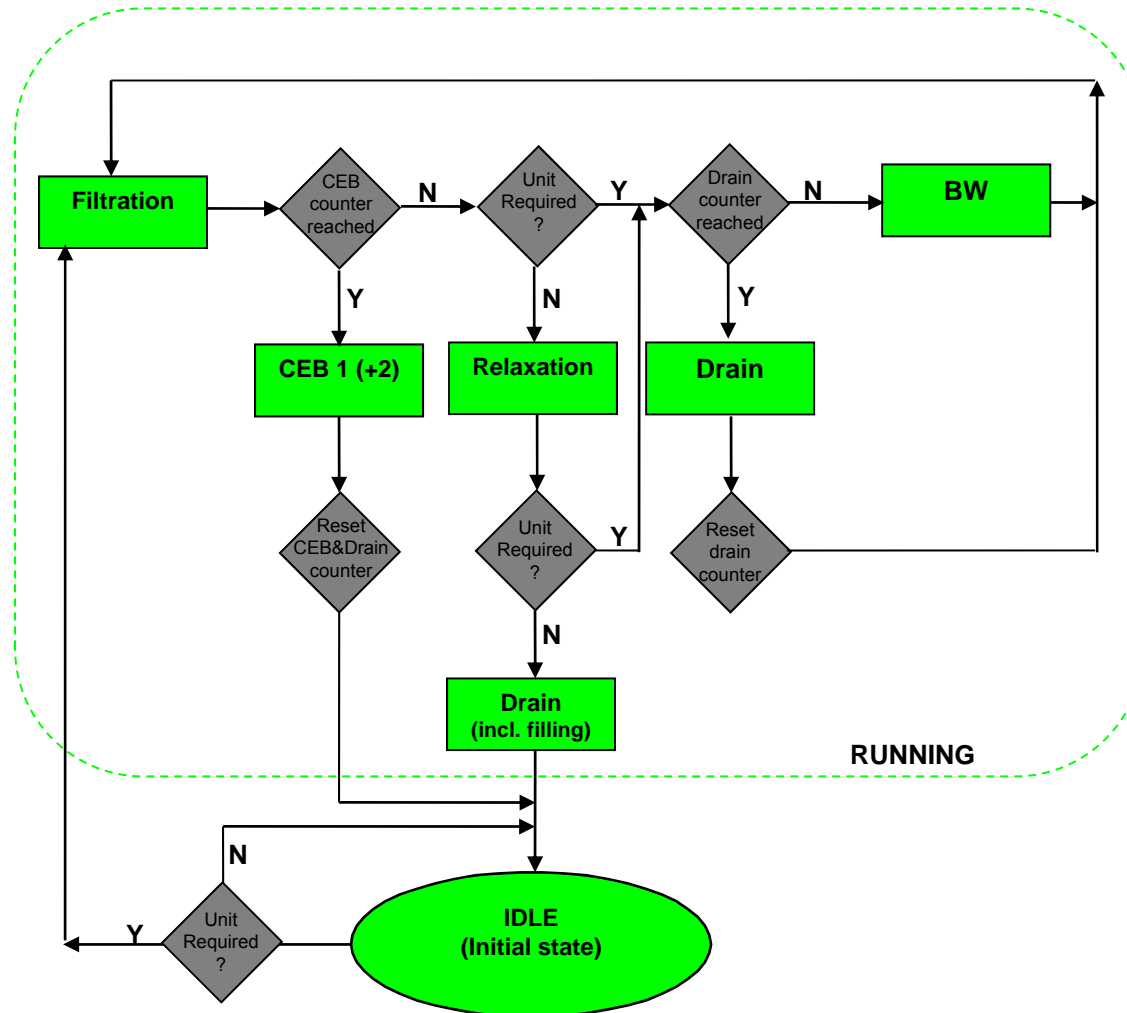
**Skids:** individually controlled. Operating programs: filtration, backwash, drain sequence & CEB performed at skid level.

**Section:** equipped with 1 backwash set (incl. central backwash header) and central drain header



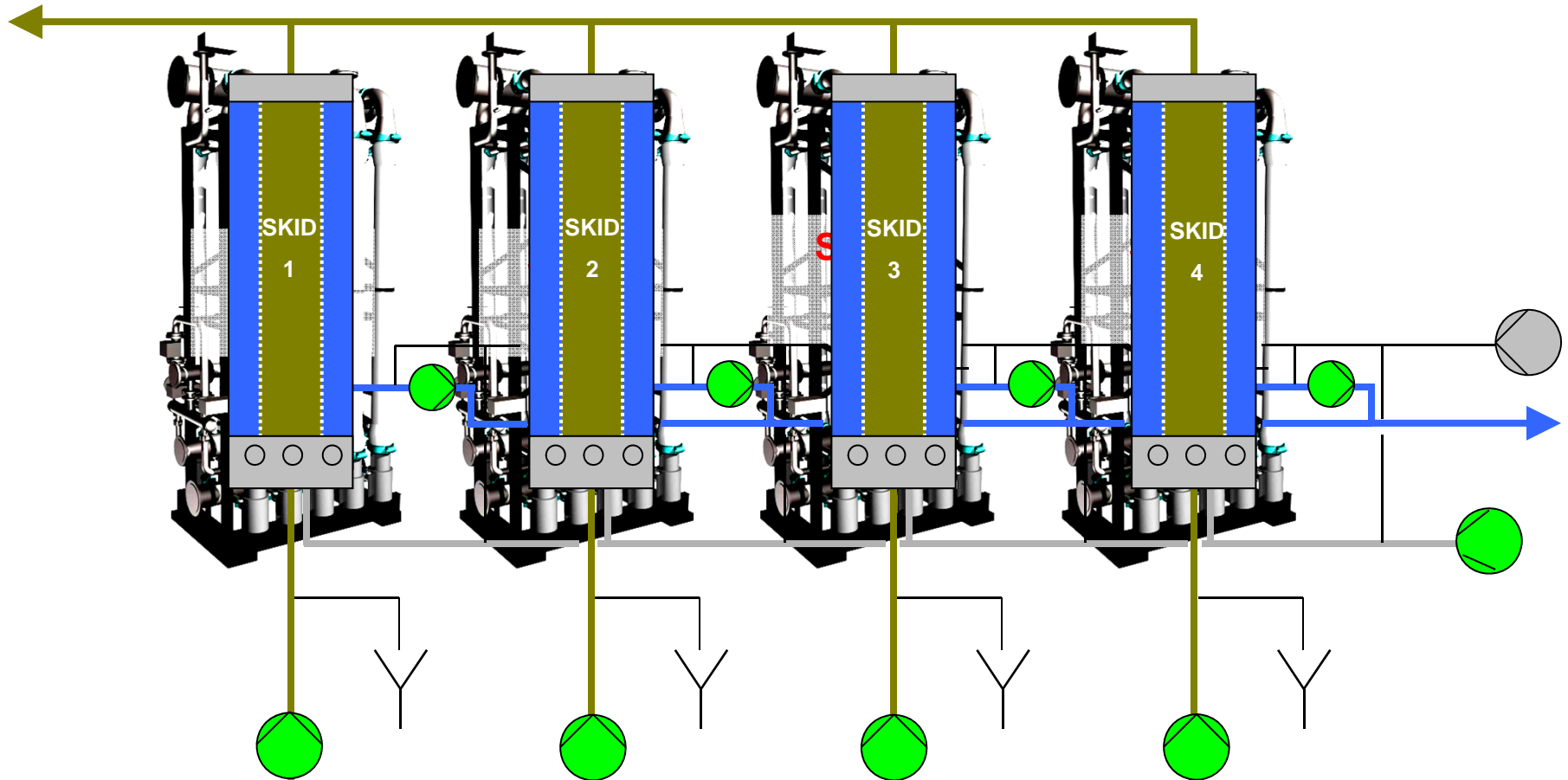
# 4. AL-UF process modes

AirLift UF: Automatic program sequence



# 4. AL-UF process modes

## AirLift UF: Filtration



# 4. AL-UF process modes

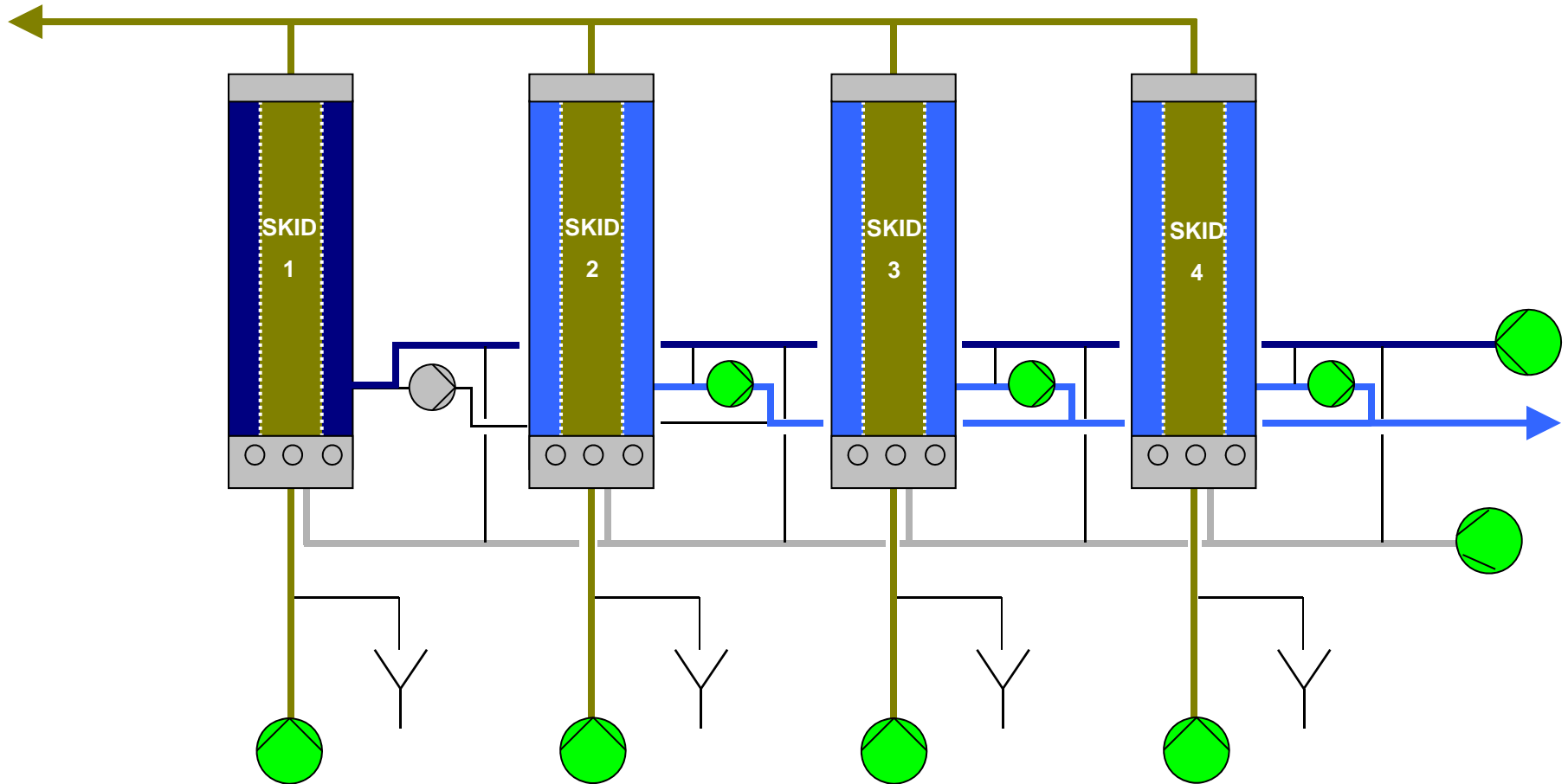
AirLift UF: Filtration



**Filtration**

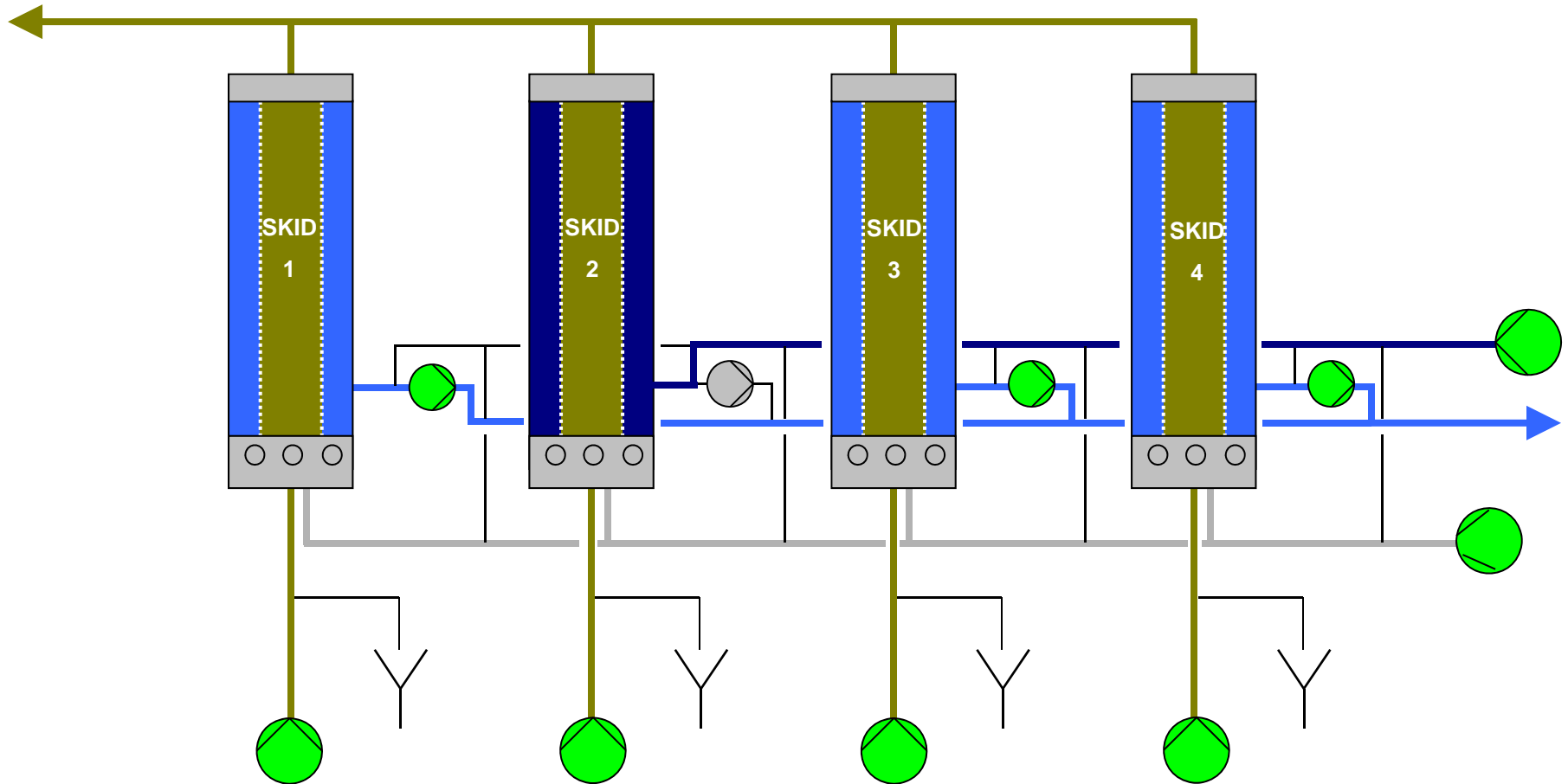
# 4. AL-UF process modes

AirLift UF: Stream backwash



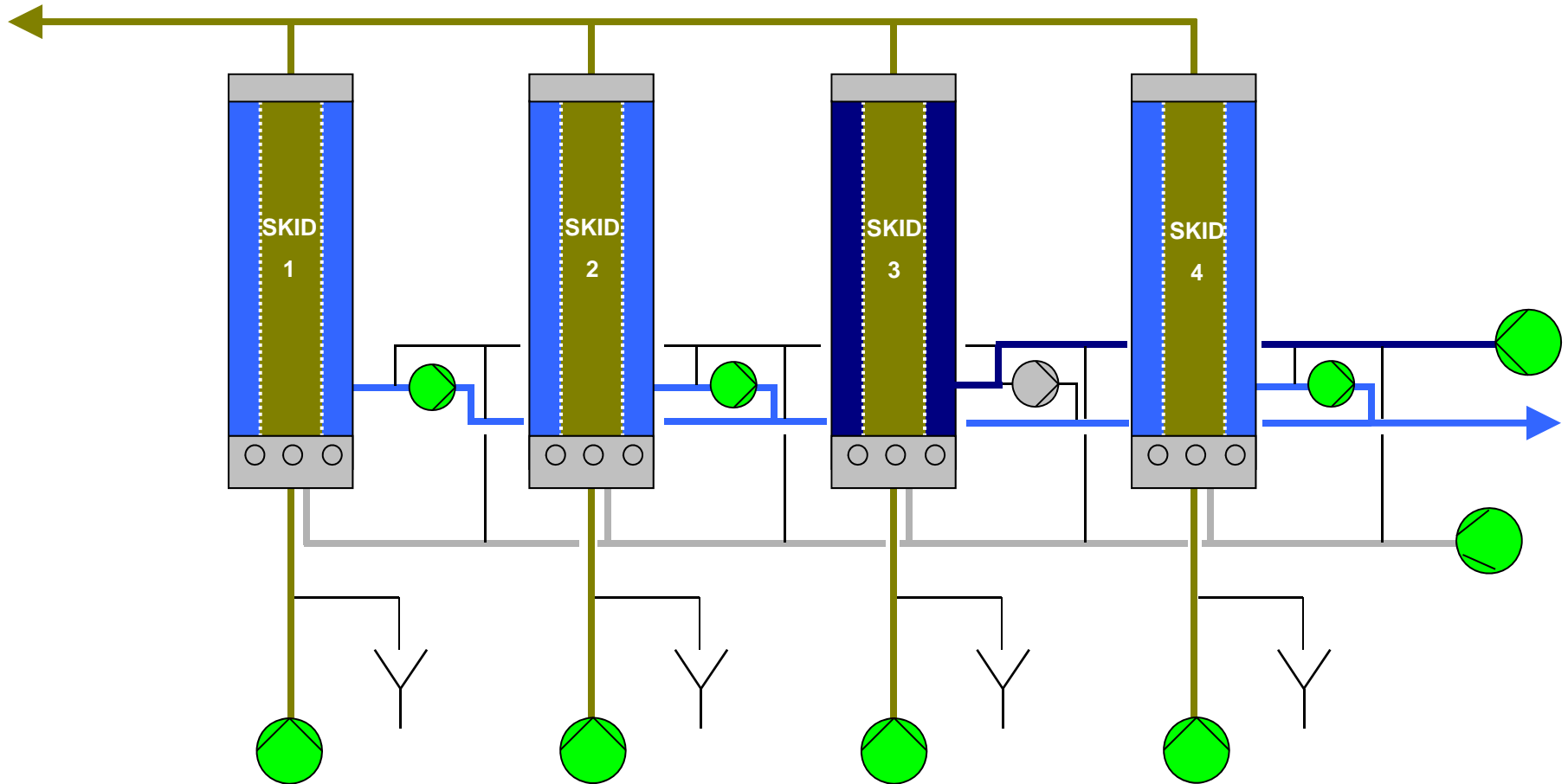
# 4. AL-UF process modes

AirLift UF: Stream backwash



# 4. AL-UF process modes

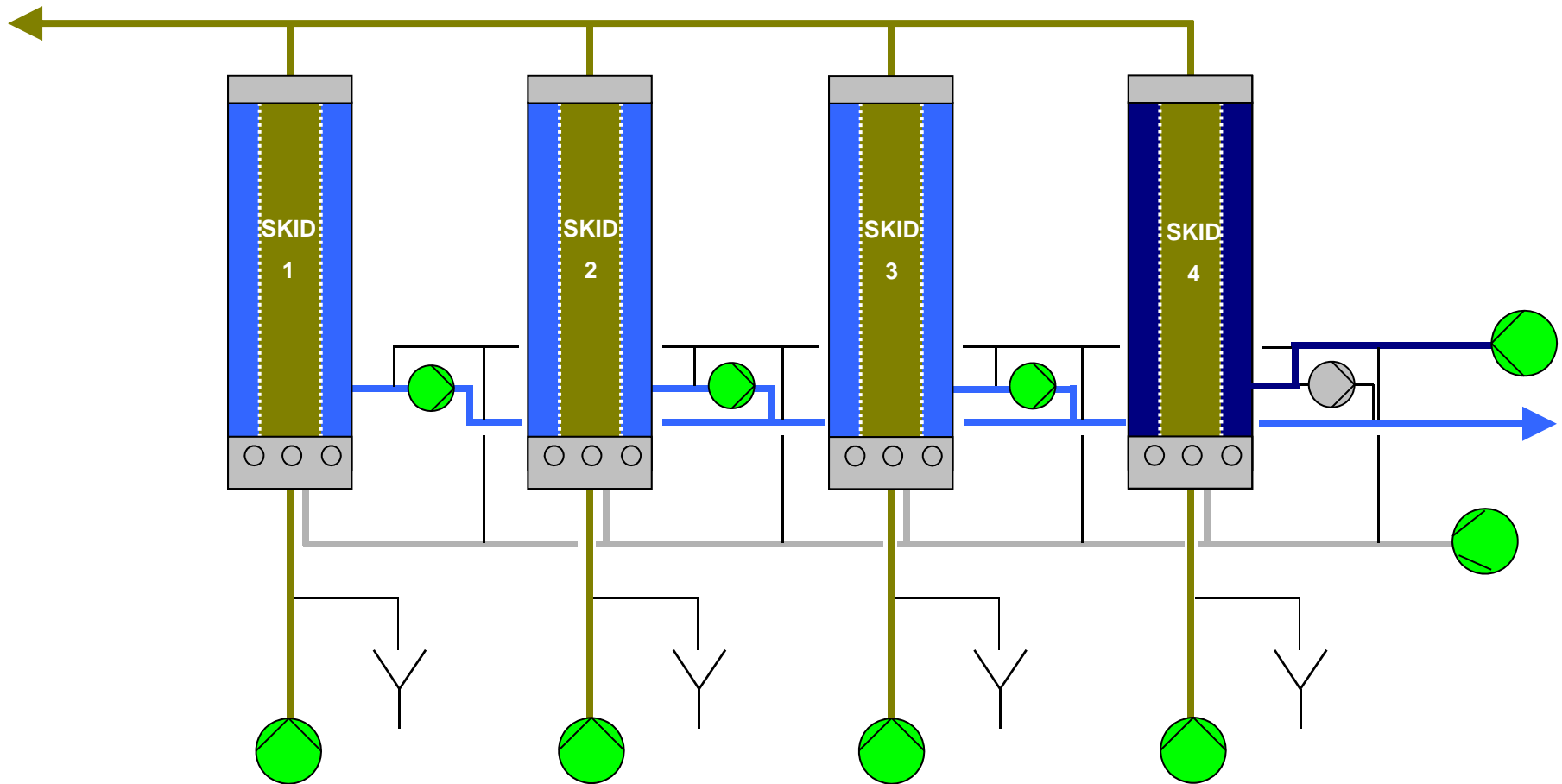
AirLift UF: Stream backwash





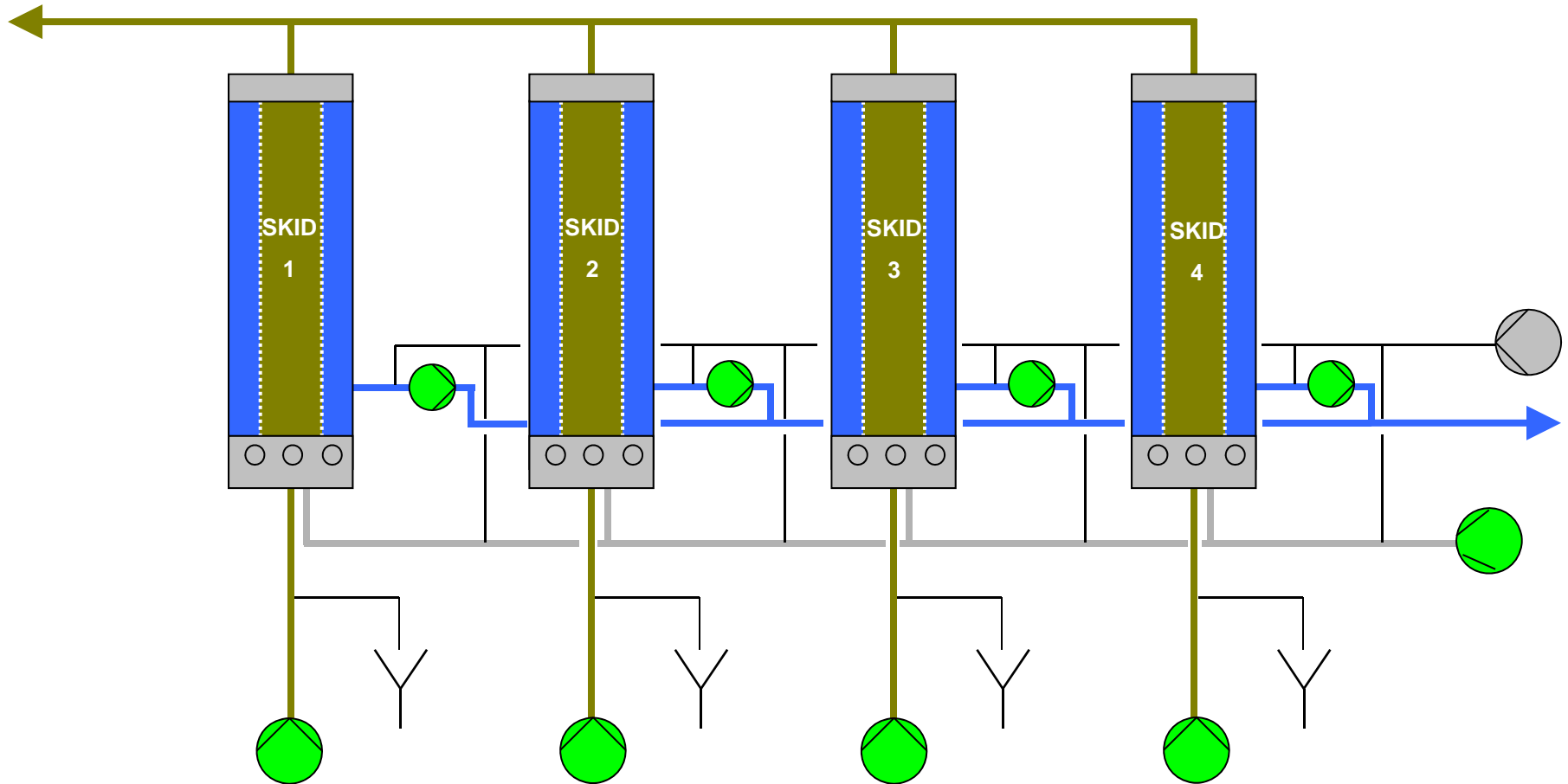
# 4. AL-UF process modes

AirLift UF: Stream backwash



# 4. AL-UF process modes

## AirLift UF: Filtration



## 4. AL-UF process modes

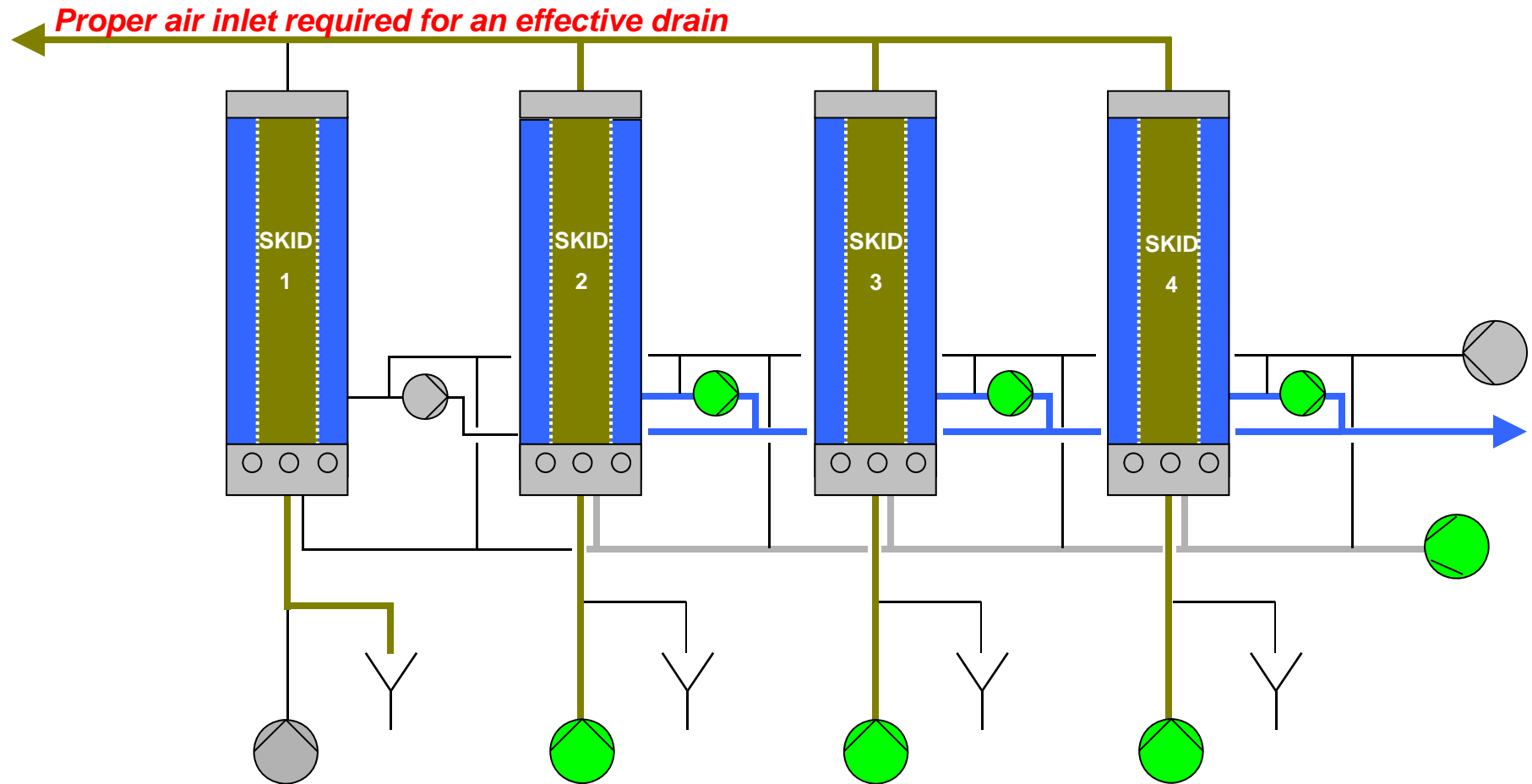
AirLift UF: Stream backwash



**Back flush**

# 4. AL-UF process modes

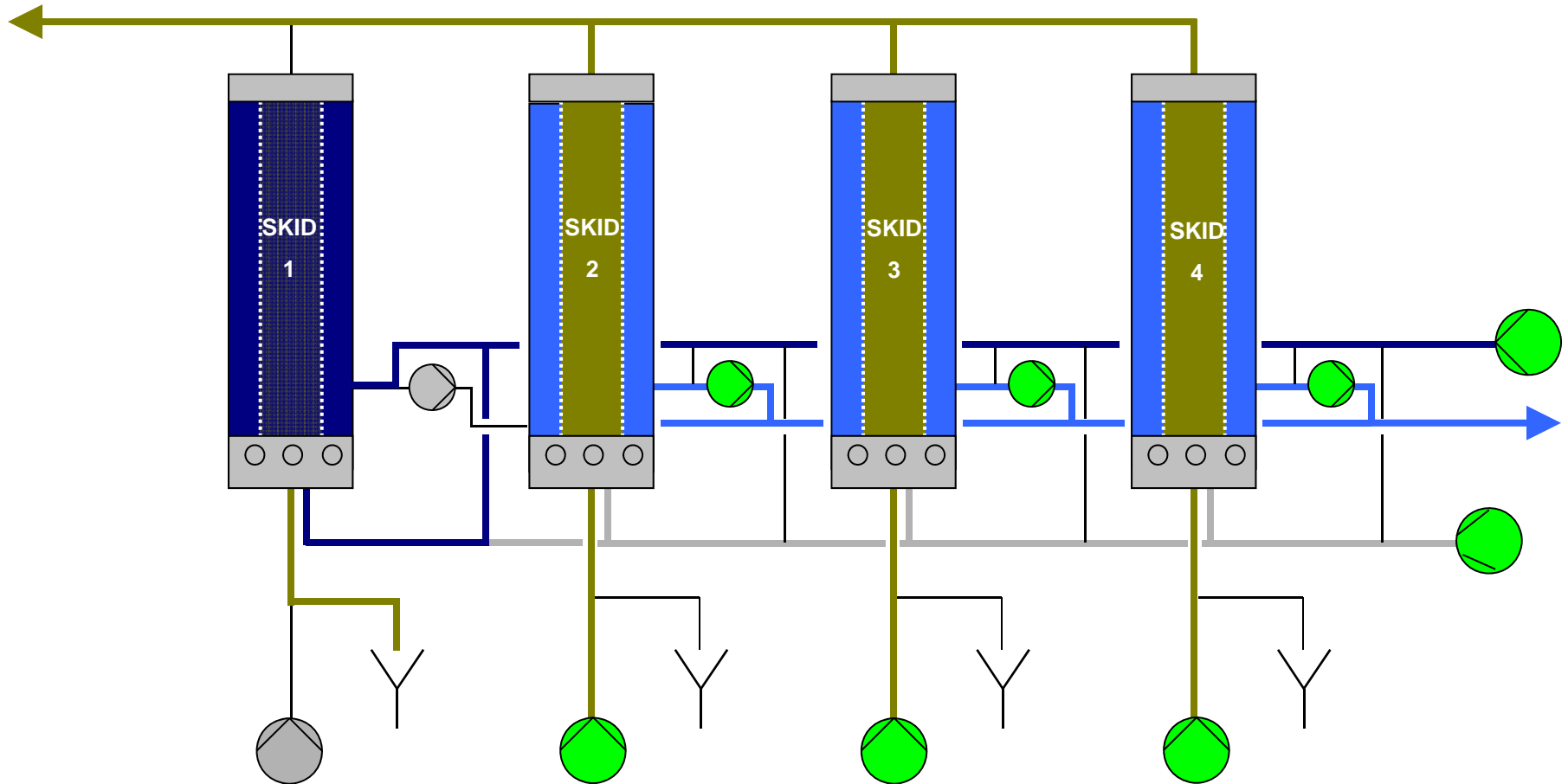
## AirLift UF: Drain sequence



*Stop recirculation and filtration*

# 4. AL-UF process modes

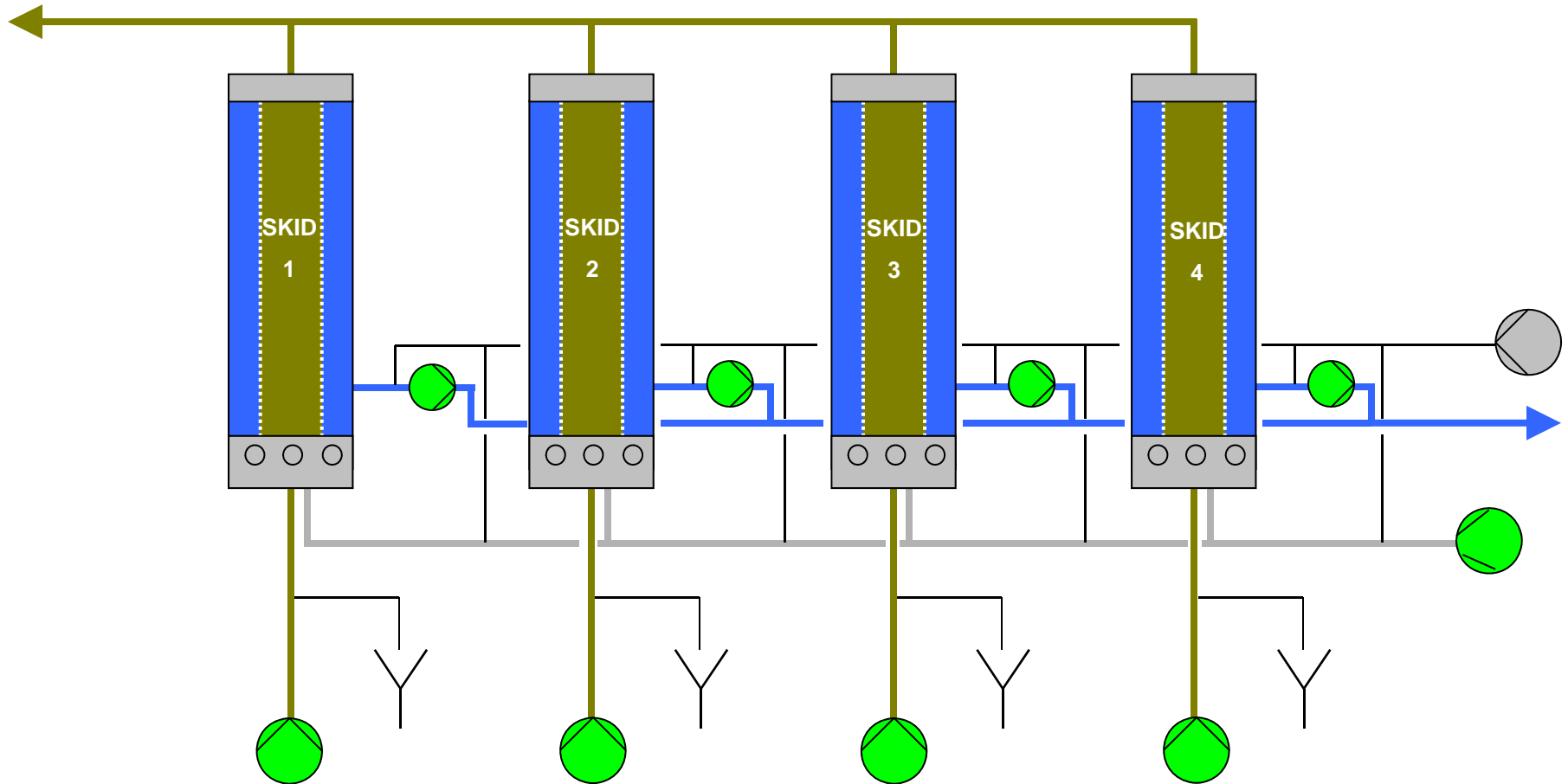
## AirLift UF: Drain sequence



*Backwash incl. cleaning of the aerator*

# 4. AL-UF process modes

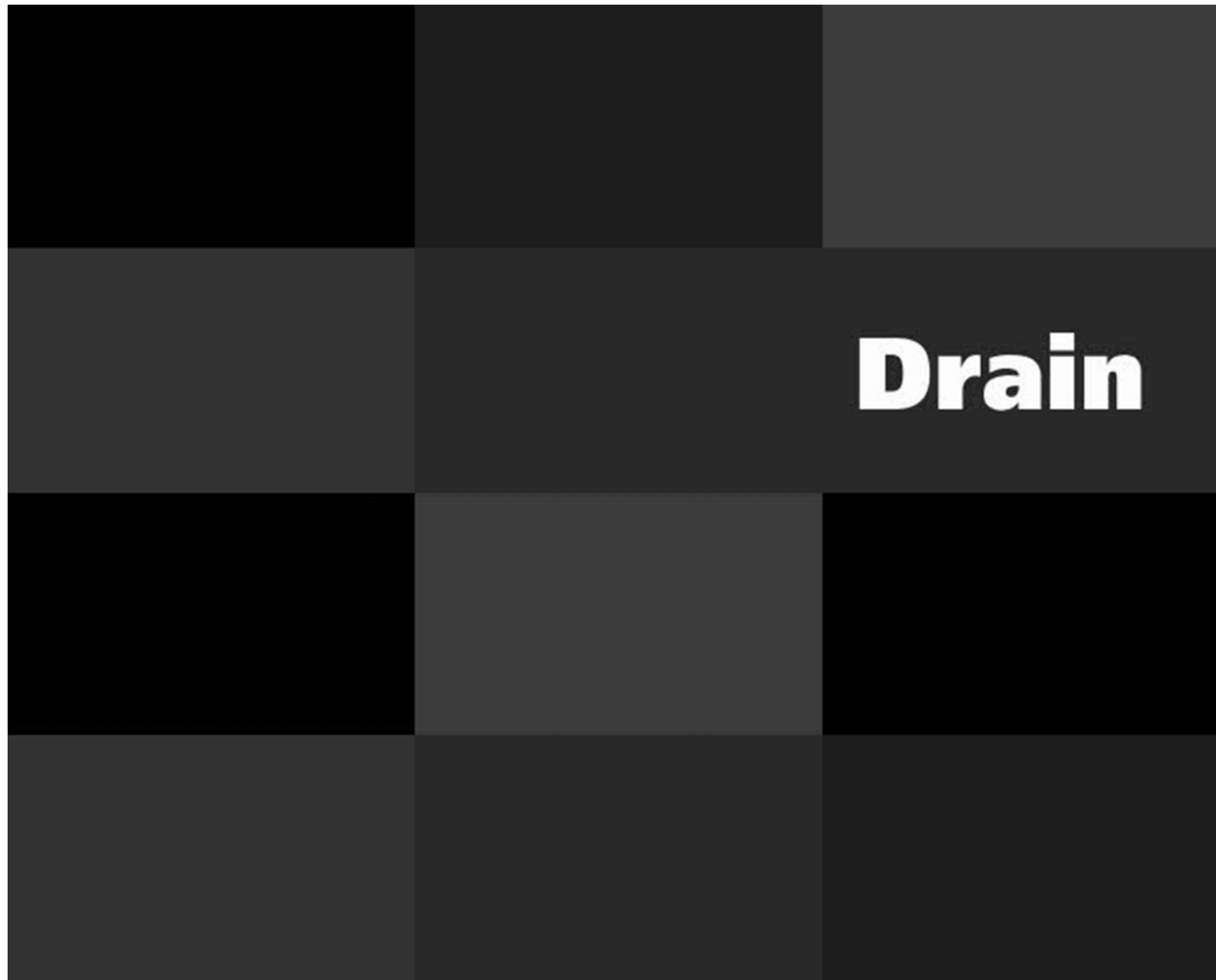
## AirLift UF: Filtration



*Resume recirculation and filtration*

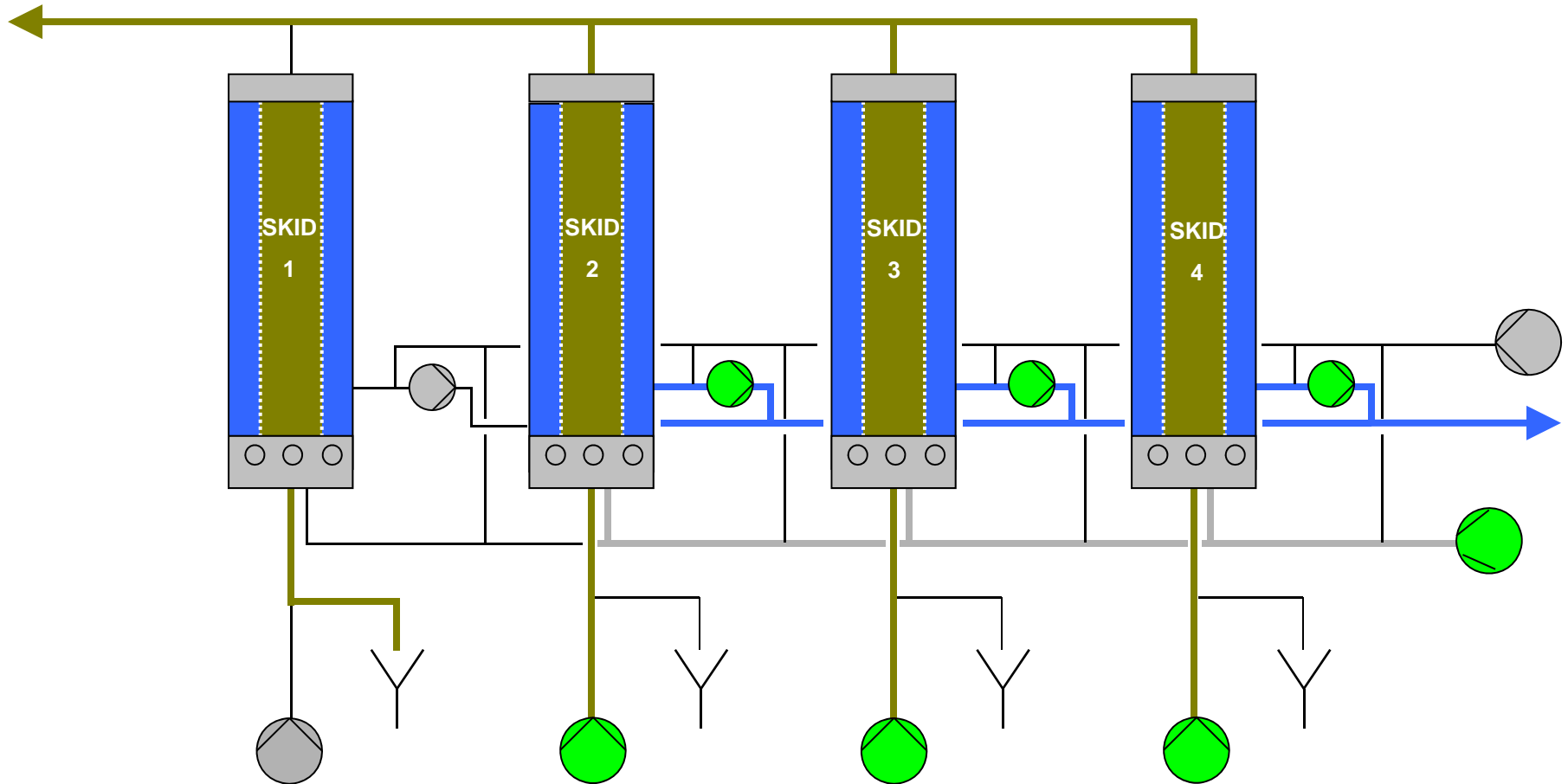
# 4. AL-UF process modes

AirLift UF: Drain sequence



# 4. AL-UF process modes

AirLift UF: CEB (Drain sequence)

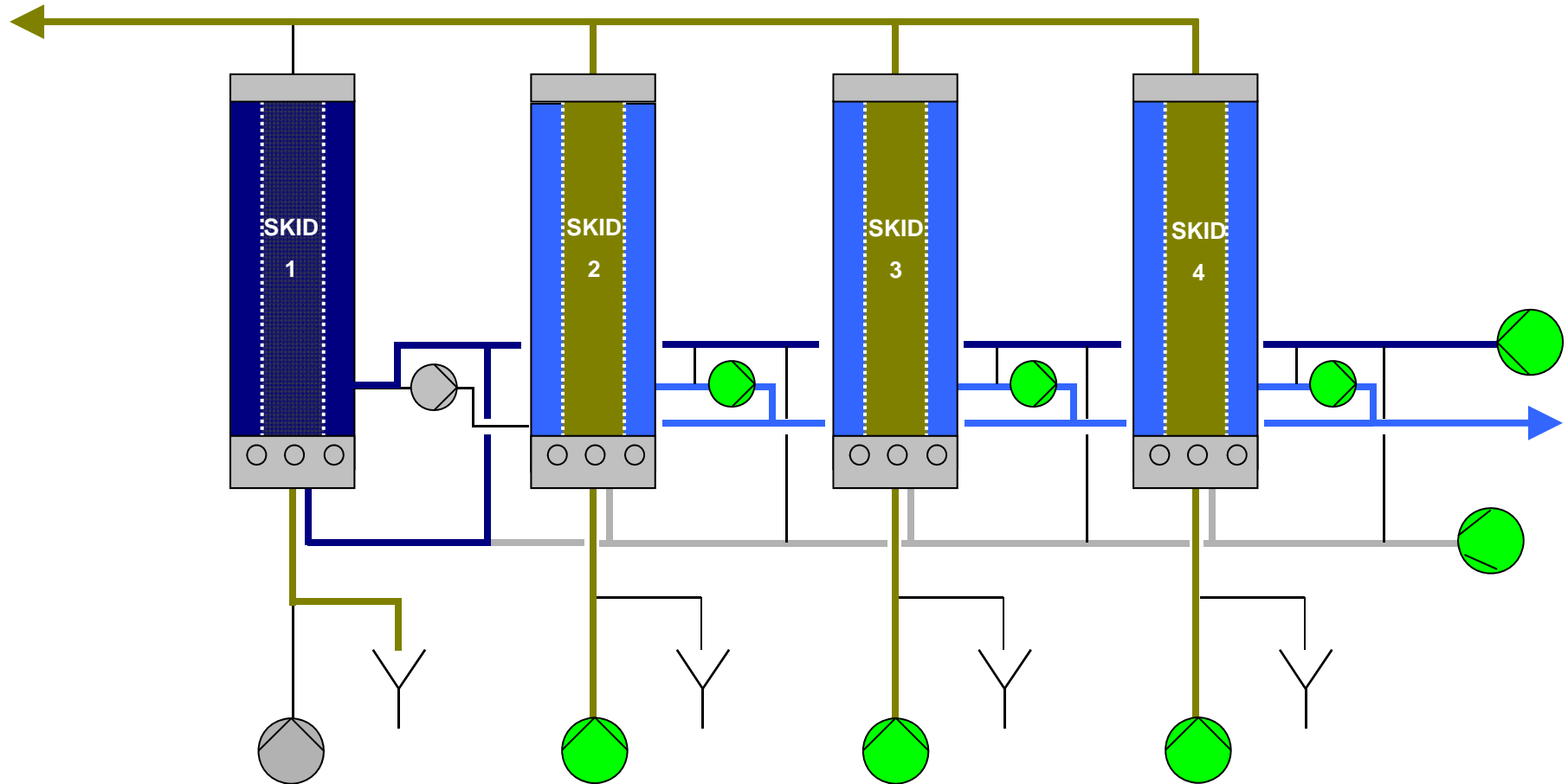


*Stop recirculation and filtration*



# 4. AL-UF process modes

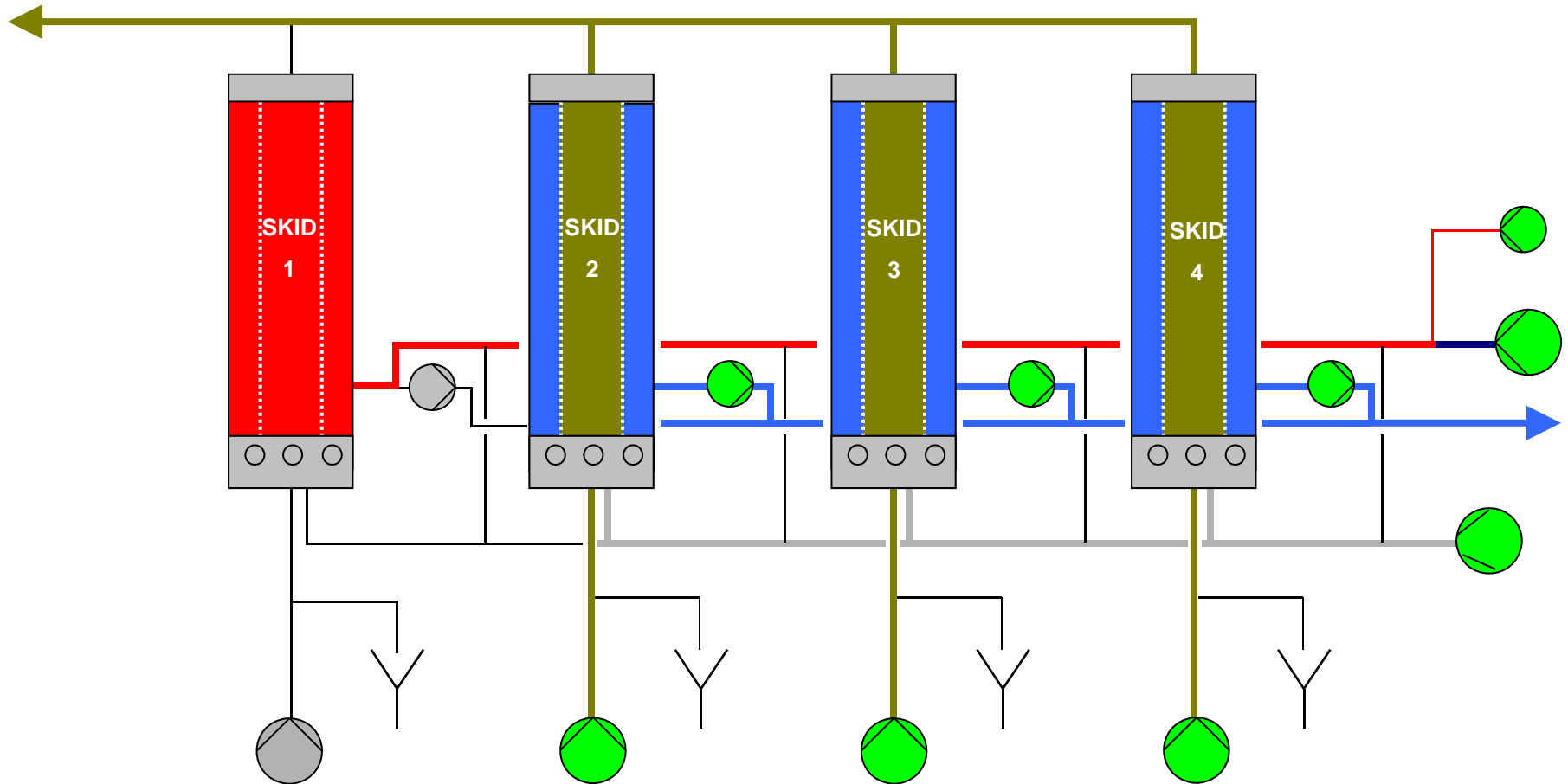
AirLift UF: CEB (Drain sequence)



*Backwash incl. cleaning of the aerator*

# 4. AL-UF process modes

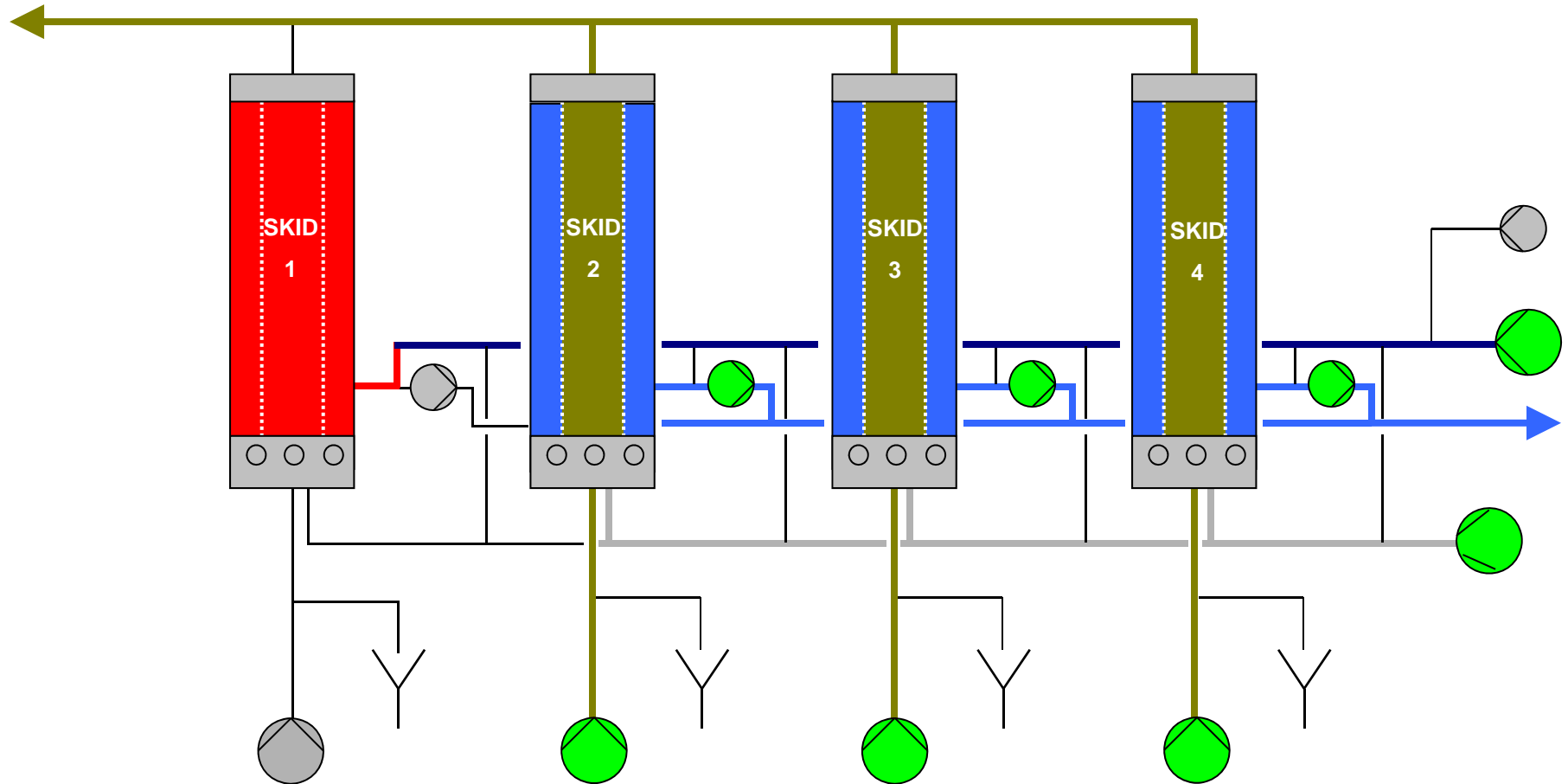
AirLift UF: CEB (Chemical dosing)



*Typical with NaOCl and Citric Acid*

# 4. AL-UF process modes

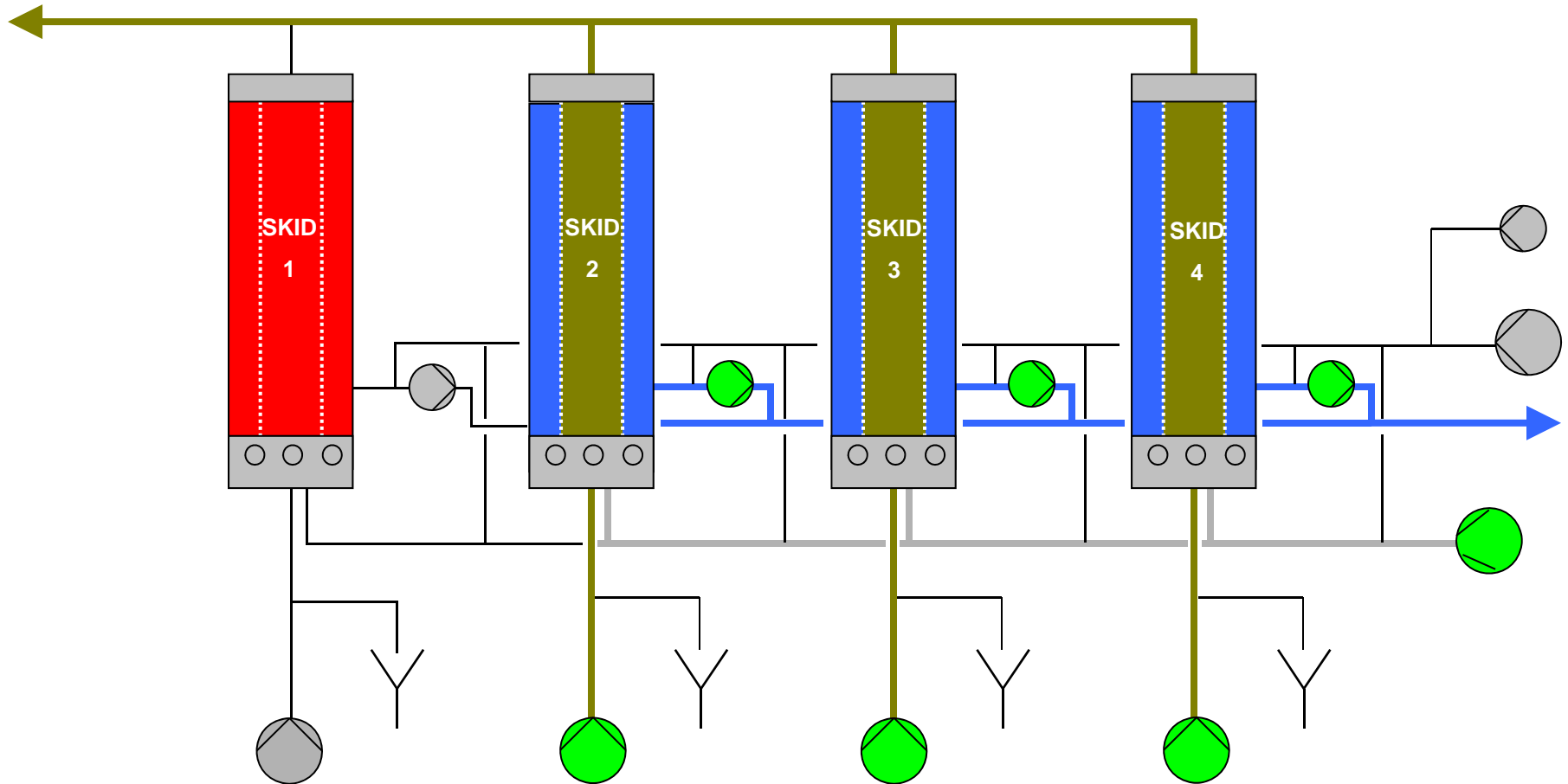
AirLift UF: CEB (Post dosing)



*Flush out BW lines*

# 4. AL-UF process modes

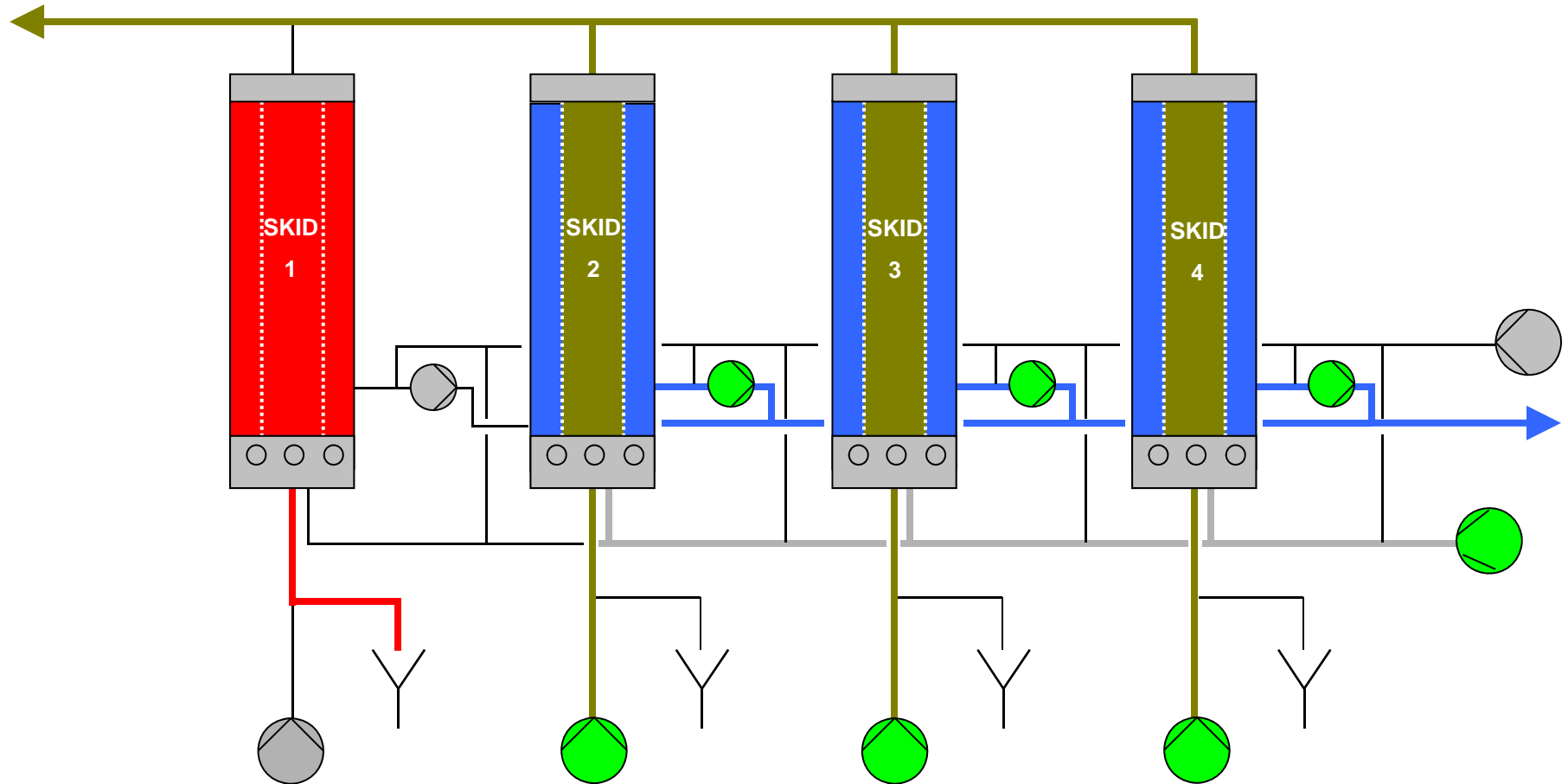
AirLift UF: CEB (Soaking)



*Soaking time depending on chemical solution*

# 4. AL-UF process modes

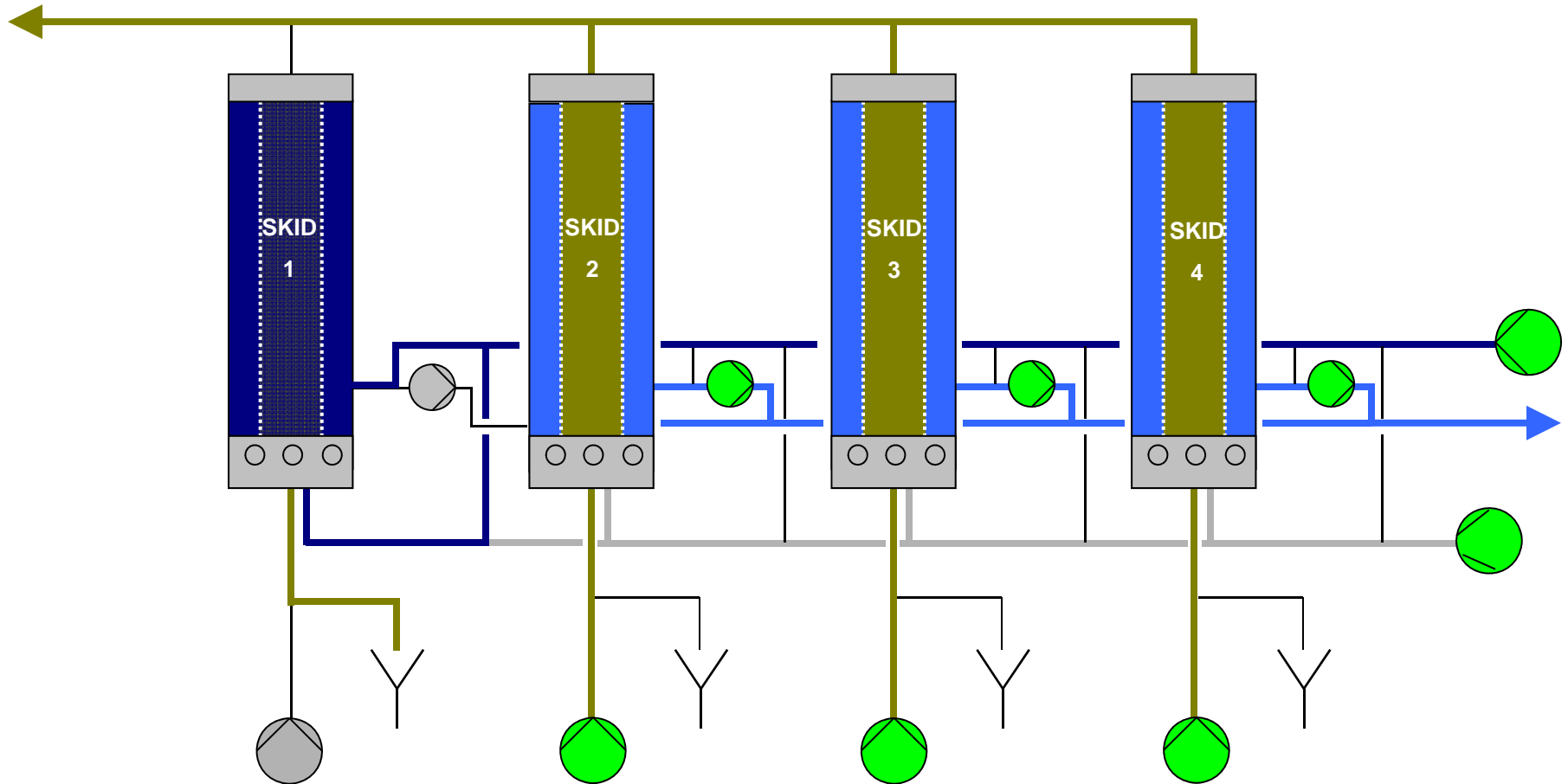
AirLift UF: CEB (Drain sequence)



*Discharge of the (spent!) chemical solution to drain tank*

# 4. AL-UF process modes

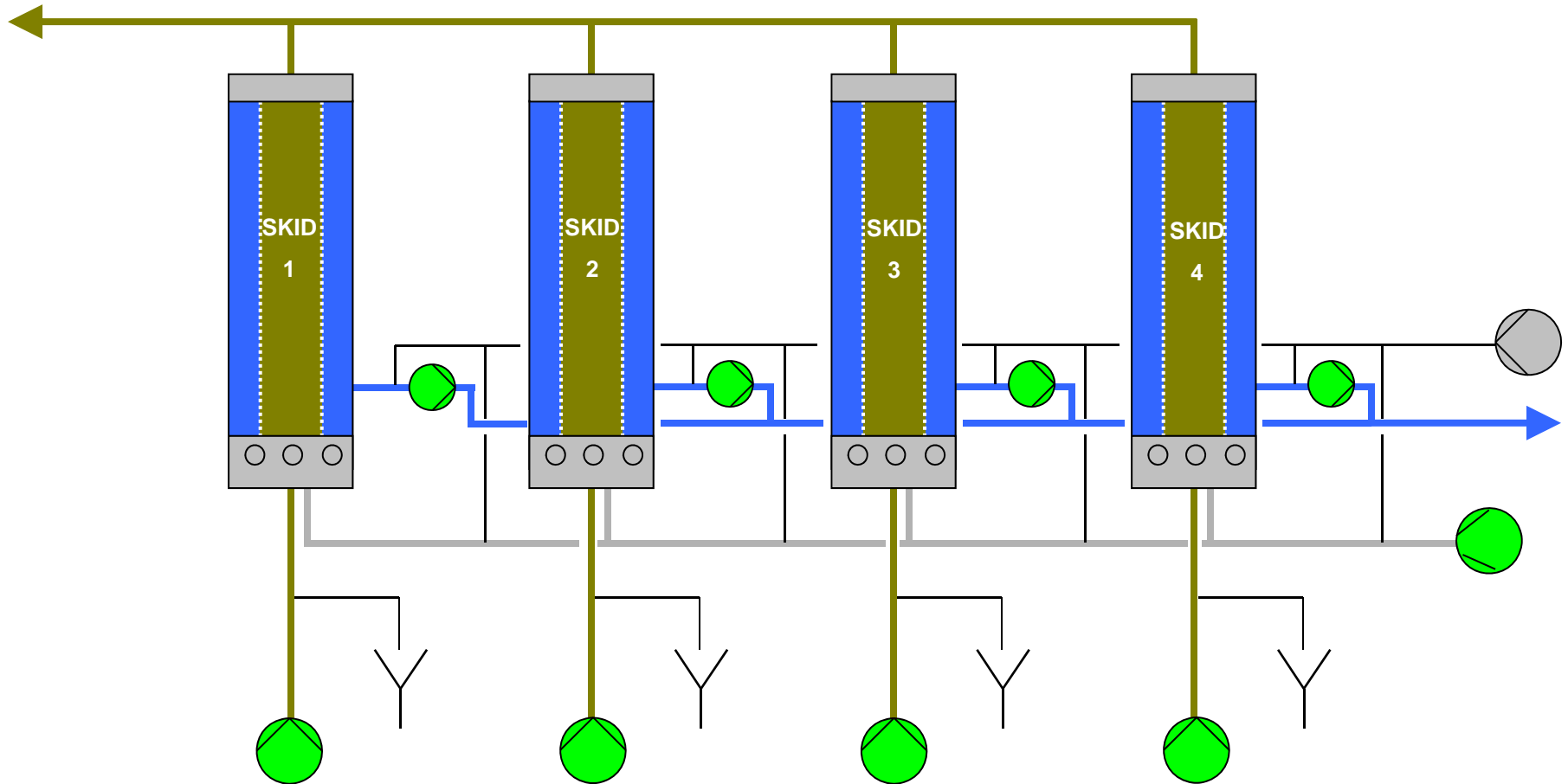
AirLift UF: CEB (Drain sequence)



*Backwash incl. cleaning of the aerator*

# 4. AL-UF process modes

## AirLift UF: Filtration



*Resume recirculation and filtration*

## 4. AL-UF process modes

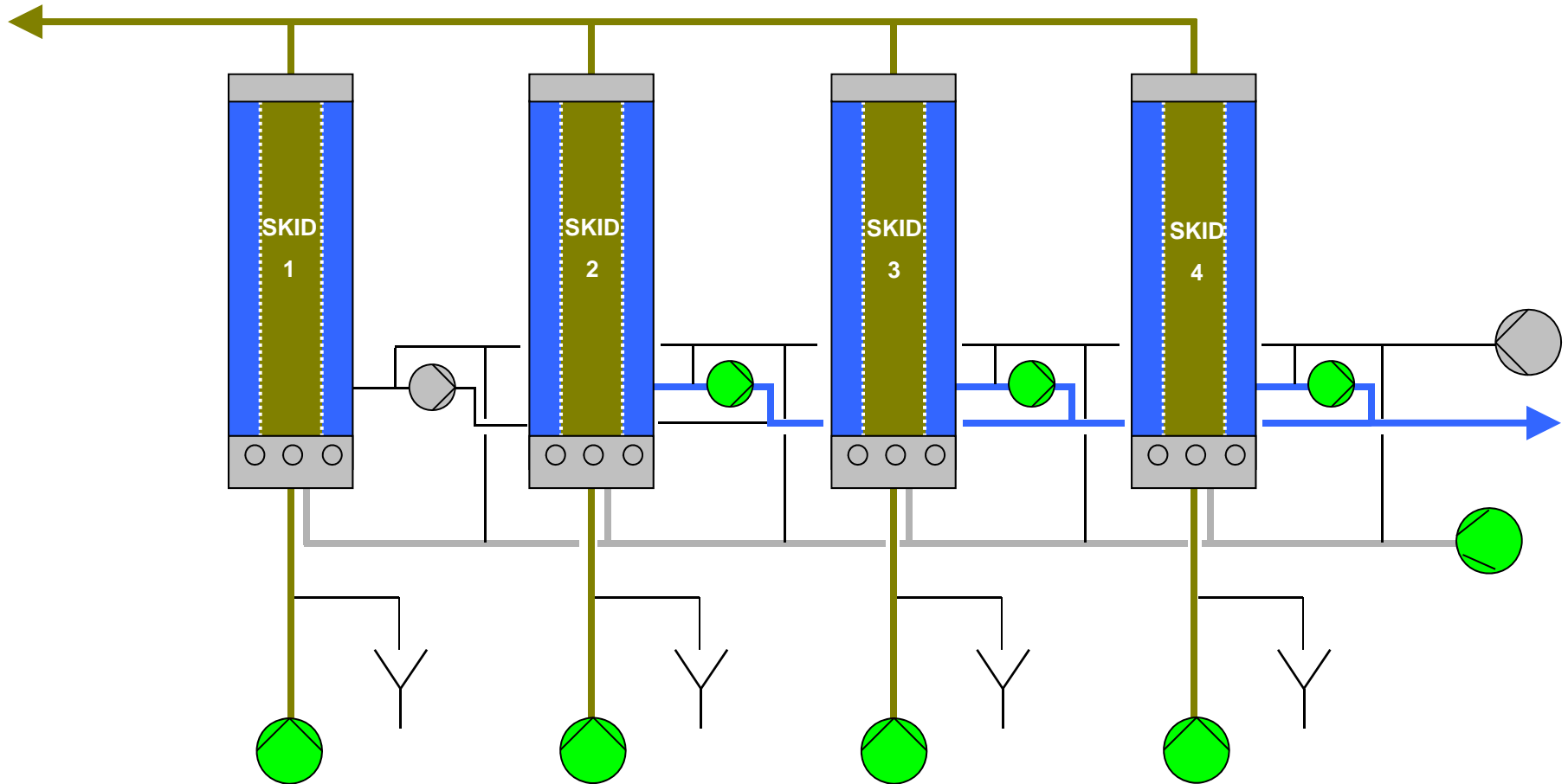
AirLift UF: CEB (Drain sequence)

**Chemical cleaning**



# 4. AL-UF process modes

## AirLift UF: Relaxation

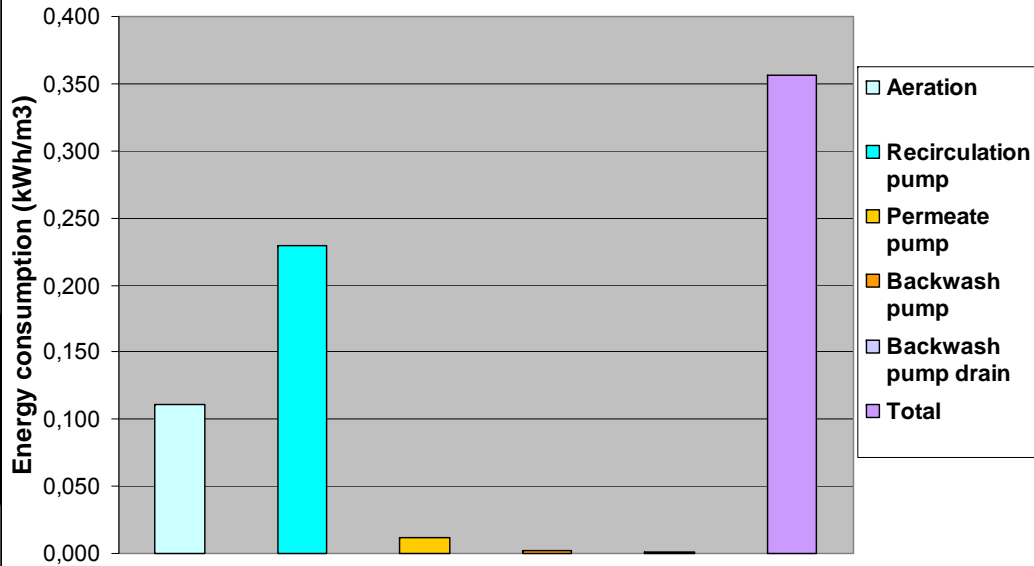


**Stop Filtration. Circulation and AirLift continue operating**



# Energy consumption

Maximal energy consumption equipment



- Energy consumption: 0,36 kWh/m<sup>3</sup>

- High sludge and air flow during nominal operation

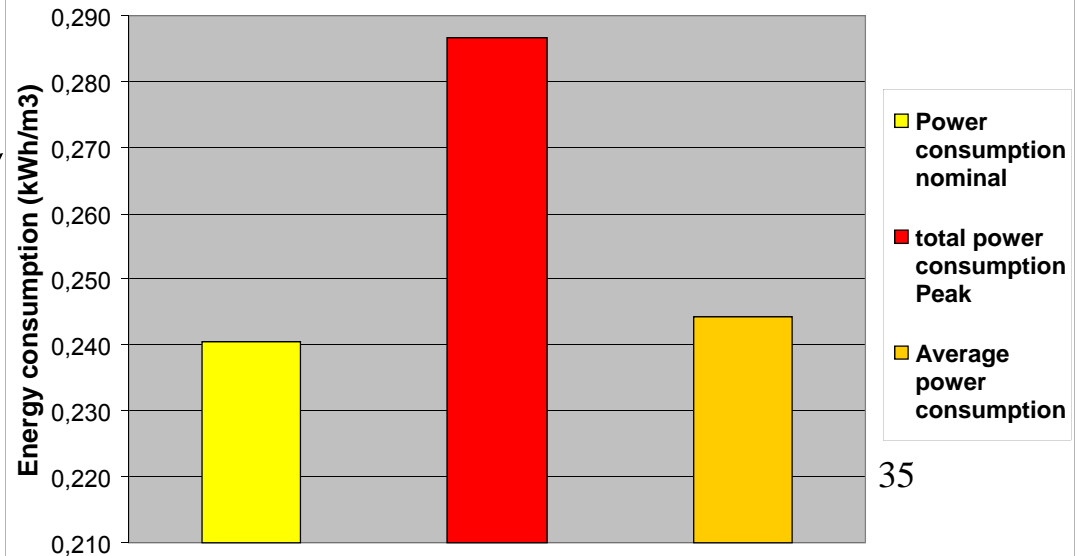


- Energy consumption: 0,25 kWh/m<sup>3</sup>

- Low sludge and air flow during nominal operation

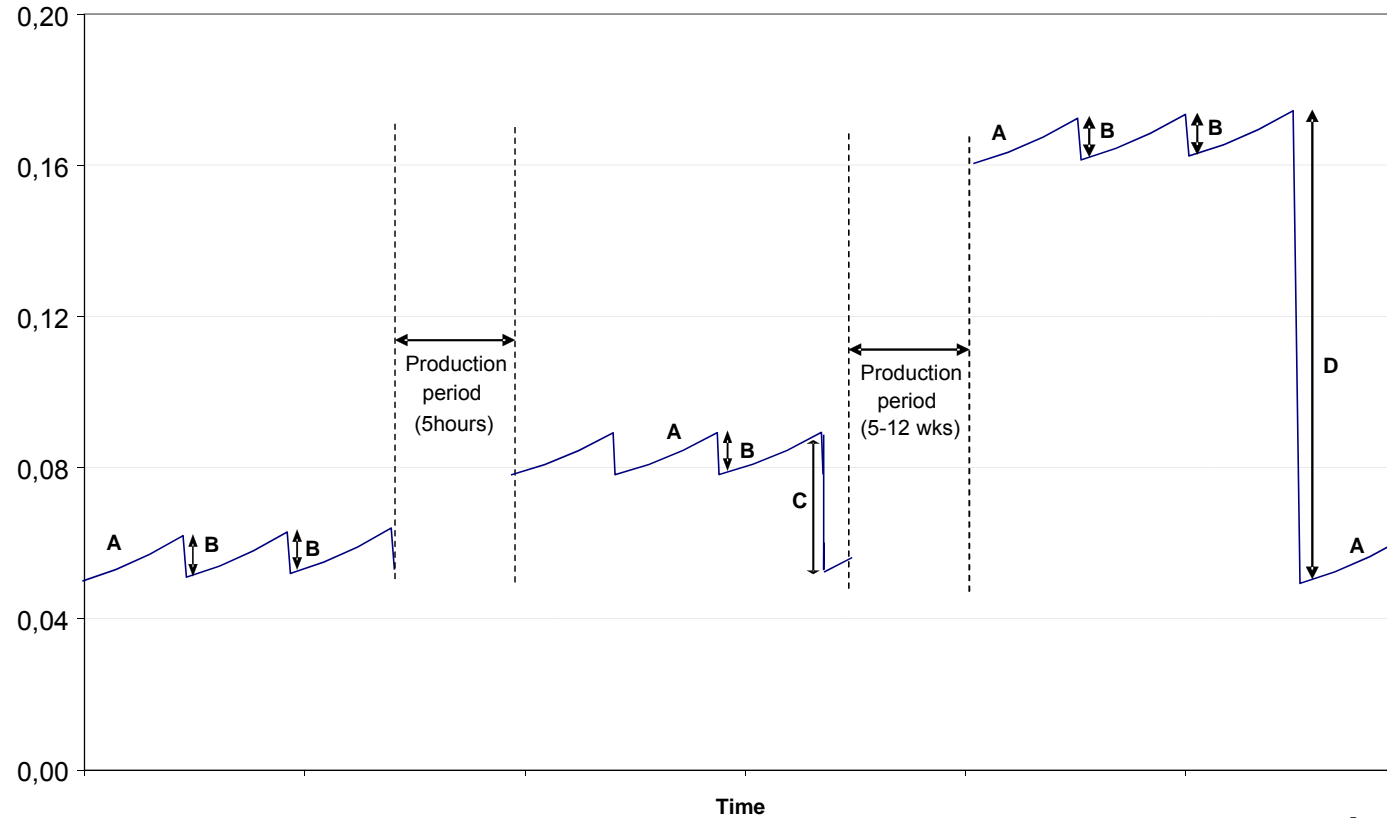
- Proper design and automation needed!

Total energy consumption



# 6. AL-UF typical operation data

Trans membrane Pressure (Bar)



A= filtration period

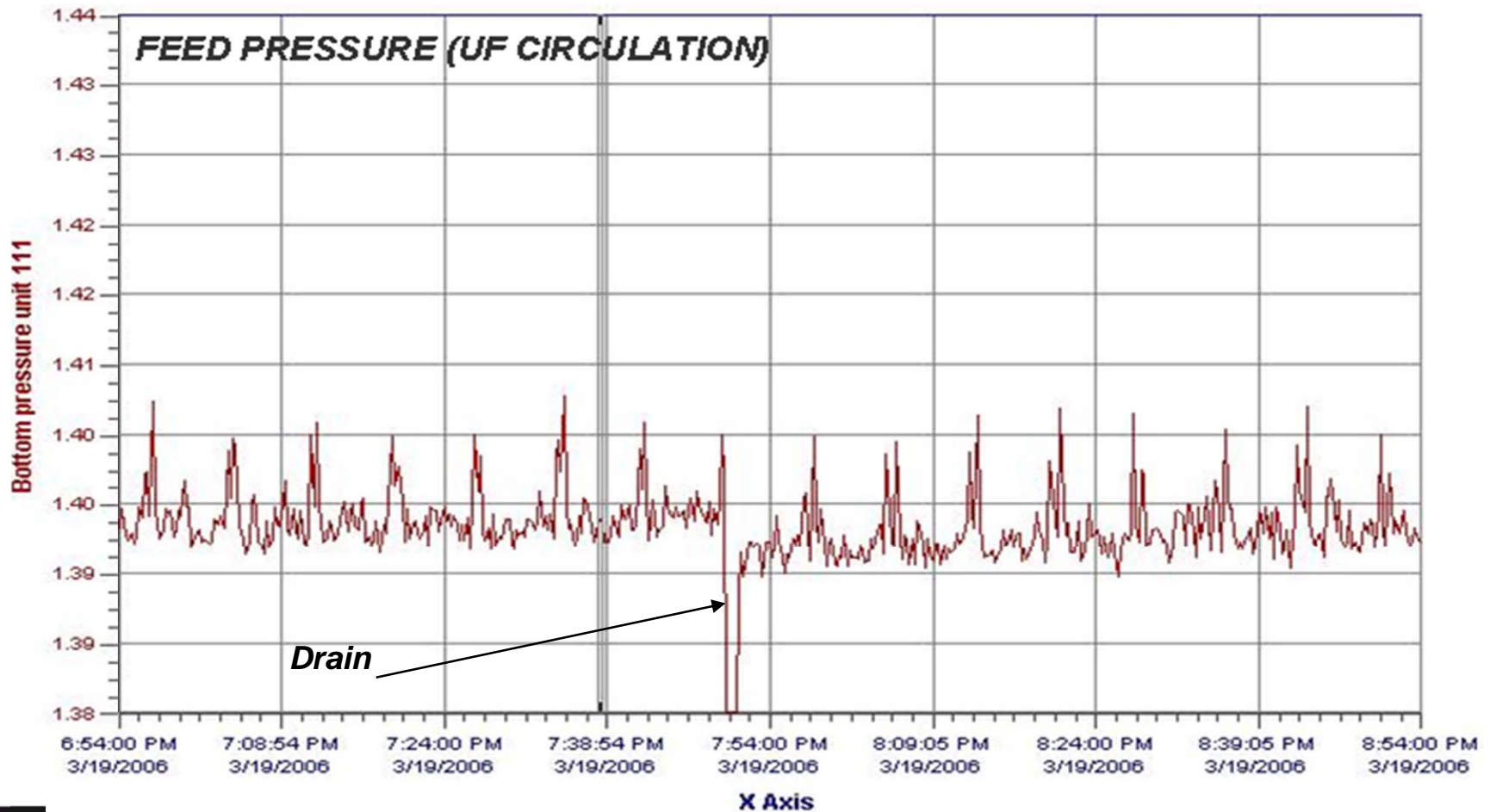
B= Backwash

C= Drain

D= CEB

36

# 6. AL-UF typical operation data



# 7. AL-MBR: Examples

## AirLift MBR – Demonstration/ pilot plants



Austria - 1999



Netherlands 1999



Germany - 2001



Netherlands - 2002



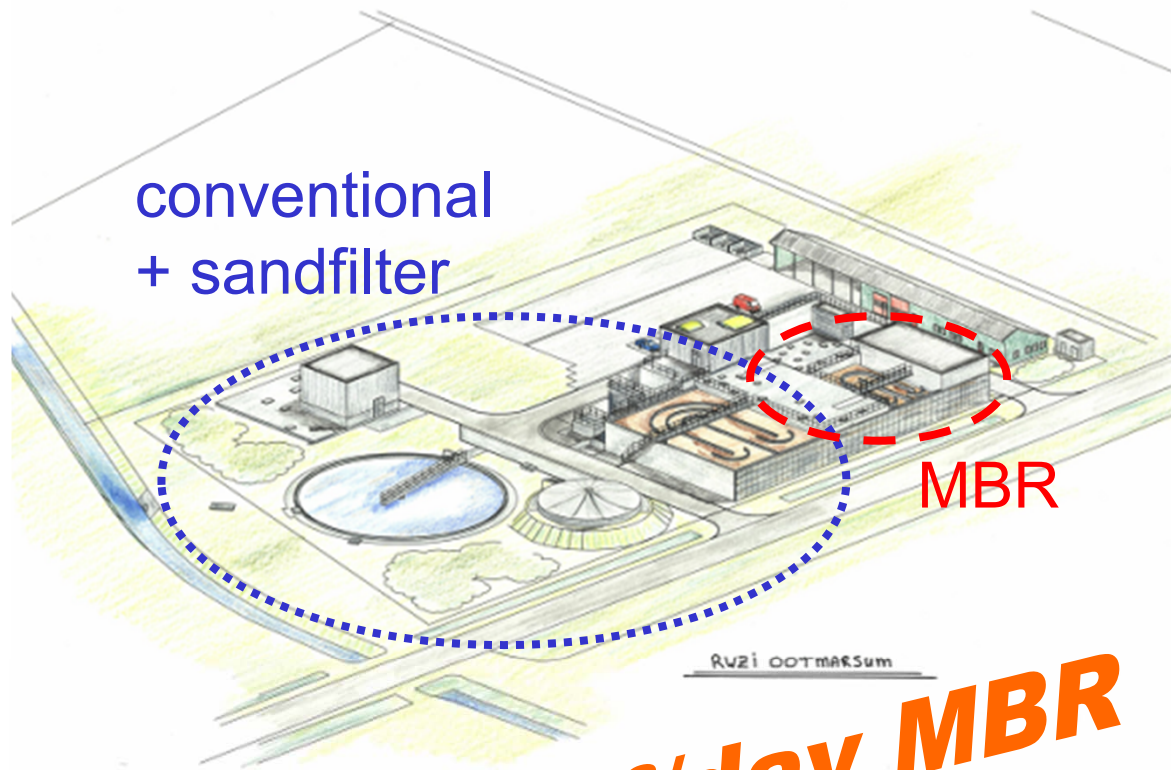
Japan - 2002



Netherlands 2004

# 7. AL-MBR: Examples

## WWTP Ootmarsum - Netherlands

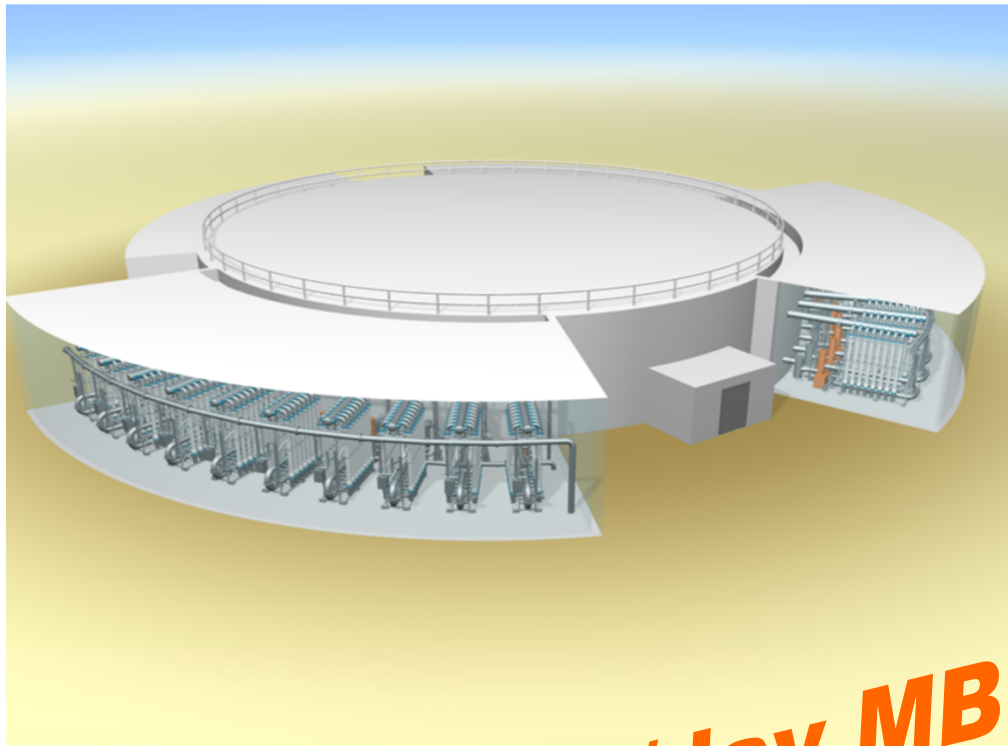


**3600 m<sup>3</sup>/day MBR**



# 7. AL-MBR: Examples

## MBR Palm Jumeirah - Dubai



**17000 m<sup>3</sup>/day MBR**





# 7. AL-MBR: Examples

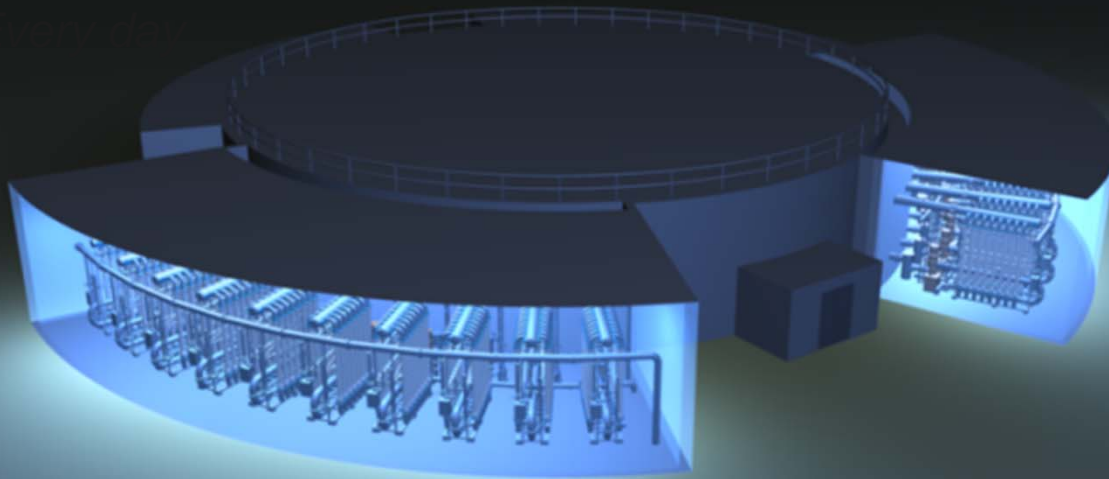
## MBR Terneuzen



**10.000 m<sup>3</sup>/day MBR**

# NORIT AIRLIFT MBR

*Reliable & Clean*



*And every night*

No doubts. Norit. Just Proof.

**Norit**

leading in purification