

# Upflow GAK

Removal of Micropollutants on WWTP Hapert,  
04-11-2021

# Pilots Upflow GAC

- Where are the pilots done?
- Which technologies are used in the pilots?
- What are the latest results?
- What is the upcoming research?

# Where?

## Top 10 regional Hotspotanalysis

Aa en Maas	AARLE RIXTEL	8,8%
De Dommel	EINDHOVEN	25,8%
De Dommel	TILBURG-NOORD	13,2%
Aa en Maas	LAND VAN CUIJK (HAPS)	5,4%
Aa en Maas	ODEN	4,1%
De Dommel	HAPERT	3,1%
Brabantse Delta	RIJEN	1,2%
Limburg	HOENSBROEK	3,7%
Aa en Maas	DINTHER	2,9%
De Dommel	HILVARENBEEK /BIEST-HOUTAKKER	1,9%

RWZI Hapert:

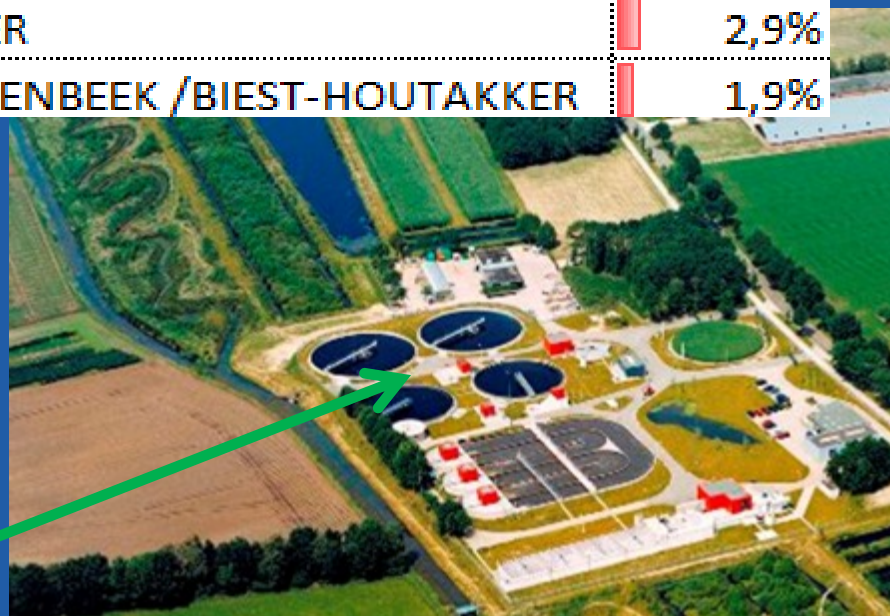
64.373 i.e.

12.085 m<sup>3</sup>/dag (average)

Effluent treated in waterharmonica

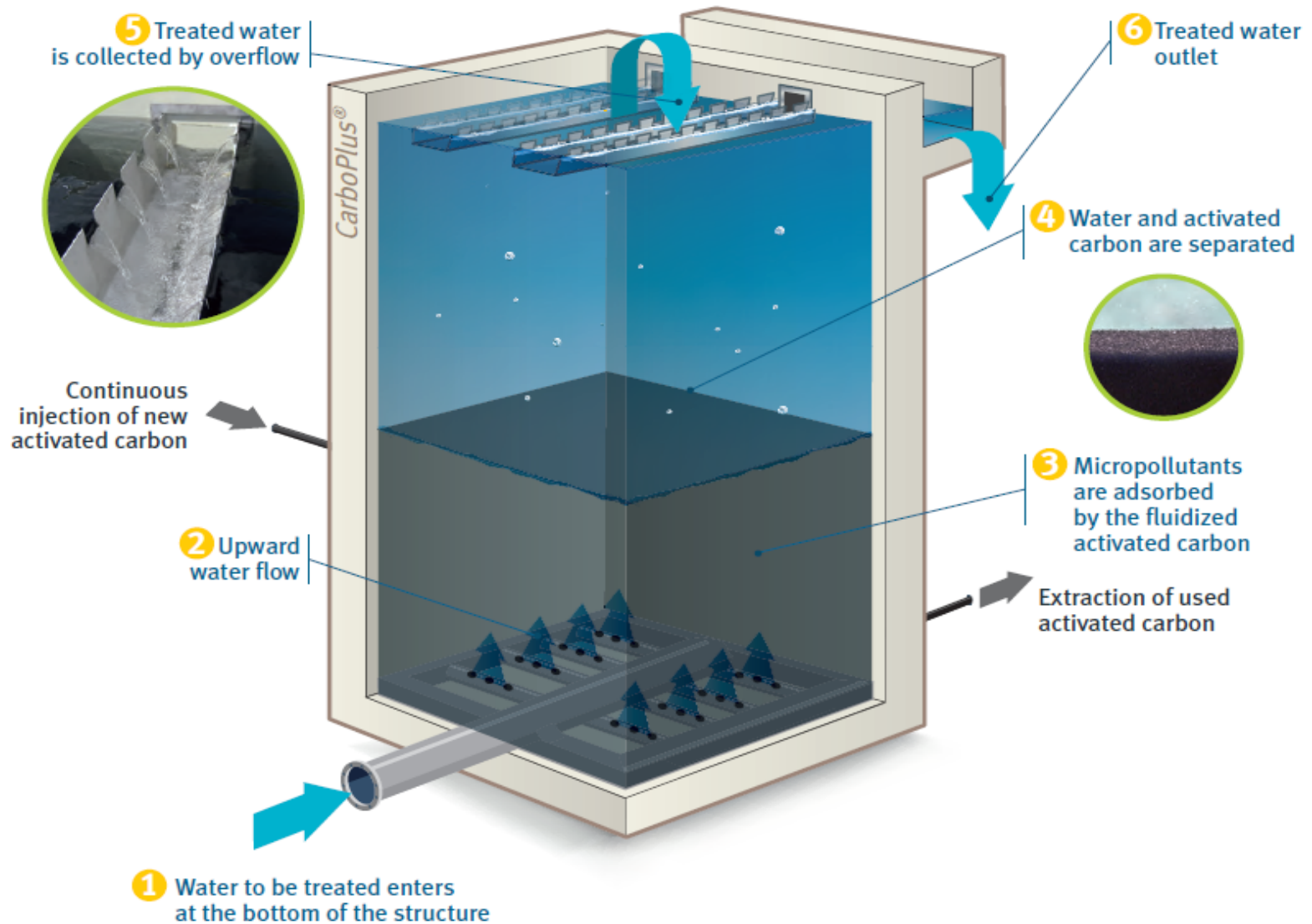
Effluent released on “Grote Beerze”

Location pilots



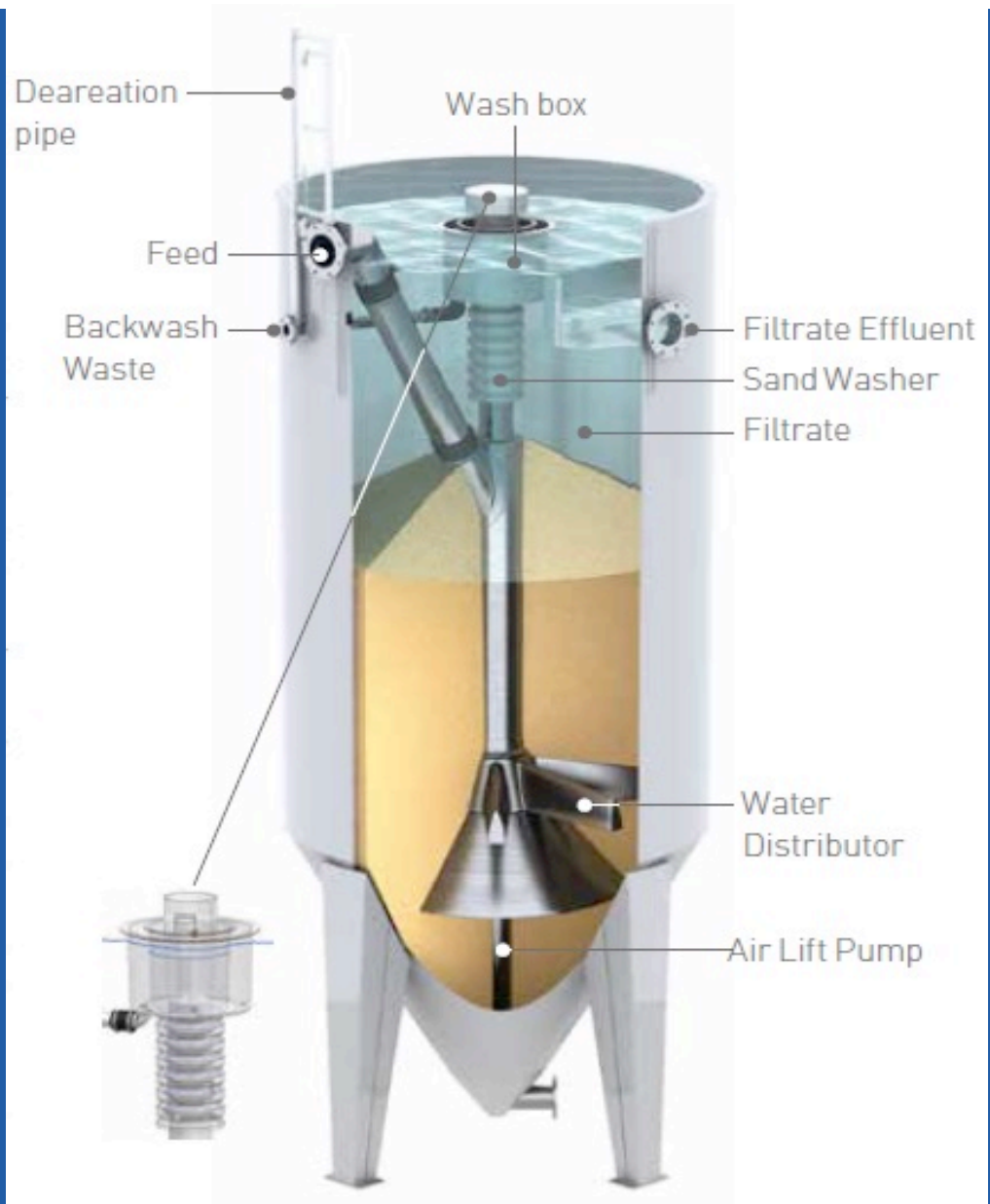
# Which technologies?

CarboPlus  
by Stereau



# Which technologies?

DynaCarbon by Nordicwater





# Which coal?

Which type of coal?

Dynacarbon

Granular  
Activated  
Carbon

$\pm 2\text{mm}$

Carboplus

MICRO Granular  
activated carbon

$\pm 0,5\text{mm}$

PACAS

Powdered  
Activated  
carbon

$\pm 0,05\text{mm}$



# Carboplus

What does the pilot look like?

Insert coal

Effluent pilot

Outlet flushing water

Extract coal

Air flush injection

Influent pilot



# Carboplus

**Used Carbon: Cyclecarb 305, Chemviron**

**Bed height at rest: ~1,50m => Bed height in expansion: ~ 2,10m**

**Feed flow rate: ~ 0,266m<sup>3</sup>/h => Total treated volume: 1841 m<sup>3</sup>**

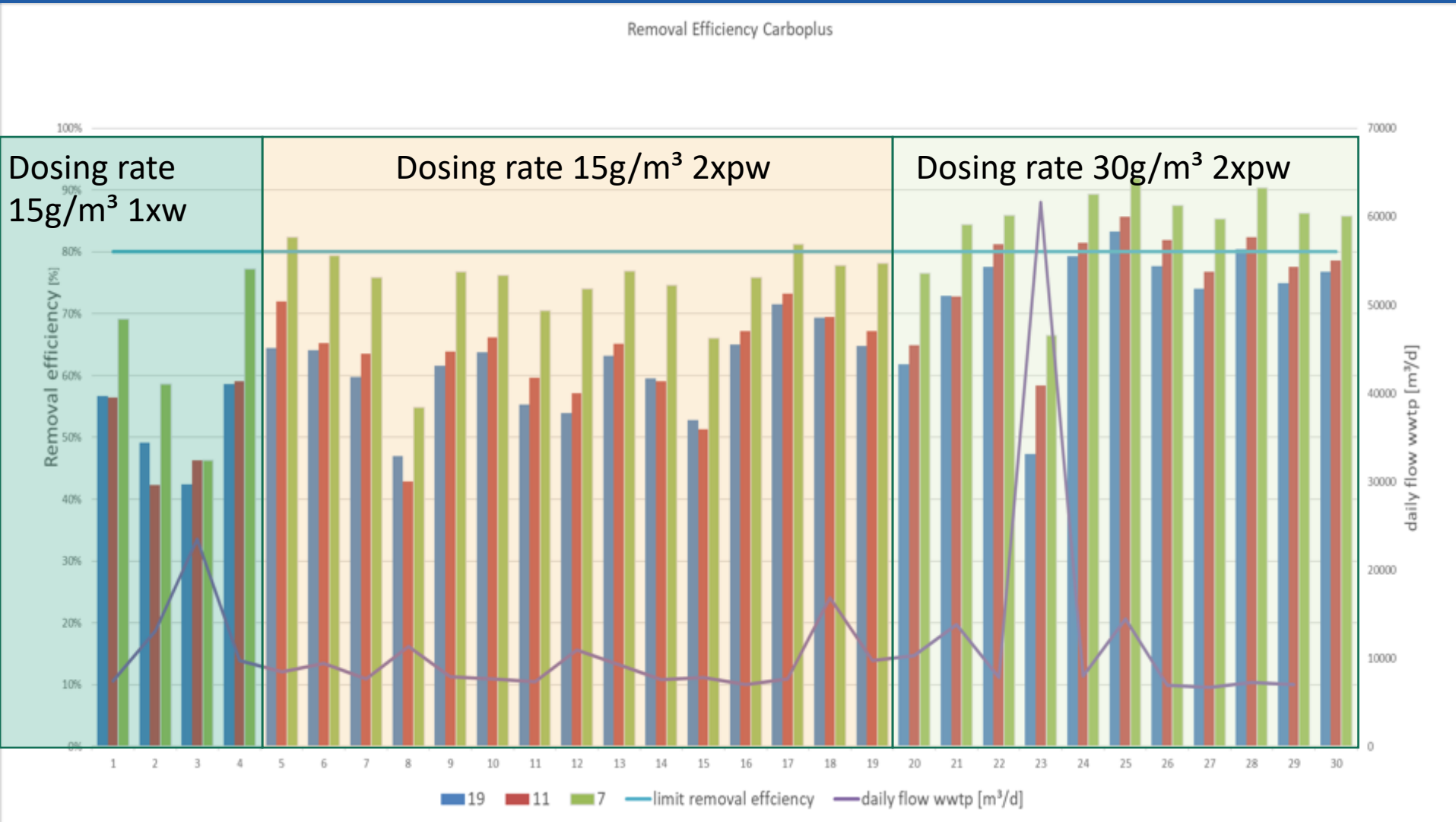
**Average feeding rate: 15, 30, 20 g/m<sup>3</sup>**

Phase	Loadingrate	Treated volume [m <sup>3</sup> ]	Results
Opstartfase	Fill until bed height is reached(15g/m <sup>3</sup> )	392	1 sample
Fase 1	1 x week 15g/m <sup>3</sup> micro-grain	355	4 samples
Fase 2	2 x week 15g/m <sup>3</sup> micro-grain	354	12 samples
Fase 3	2 x week 30g/m <sup>3</sup> micro-grain	765	14 samples
Fase 4	2 x week 20g/m <sup>3</sup> micro-grain	tbd	tbd



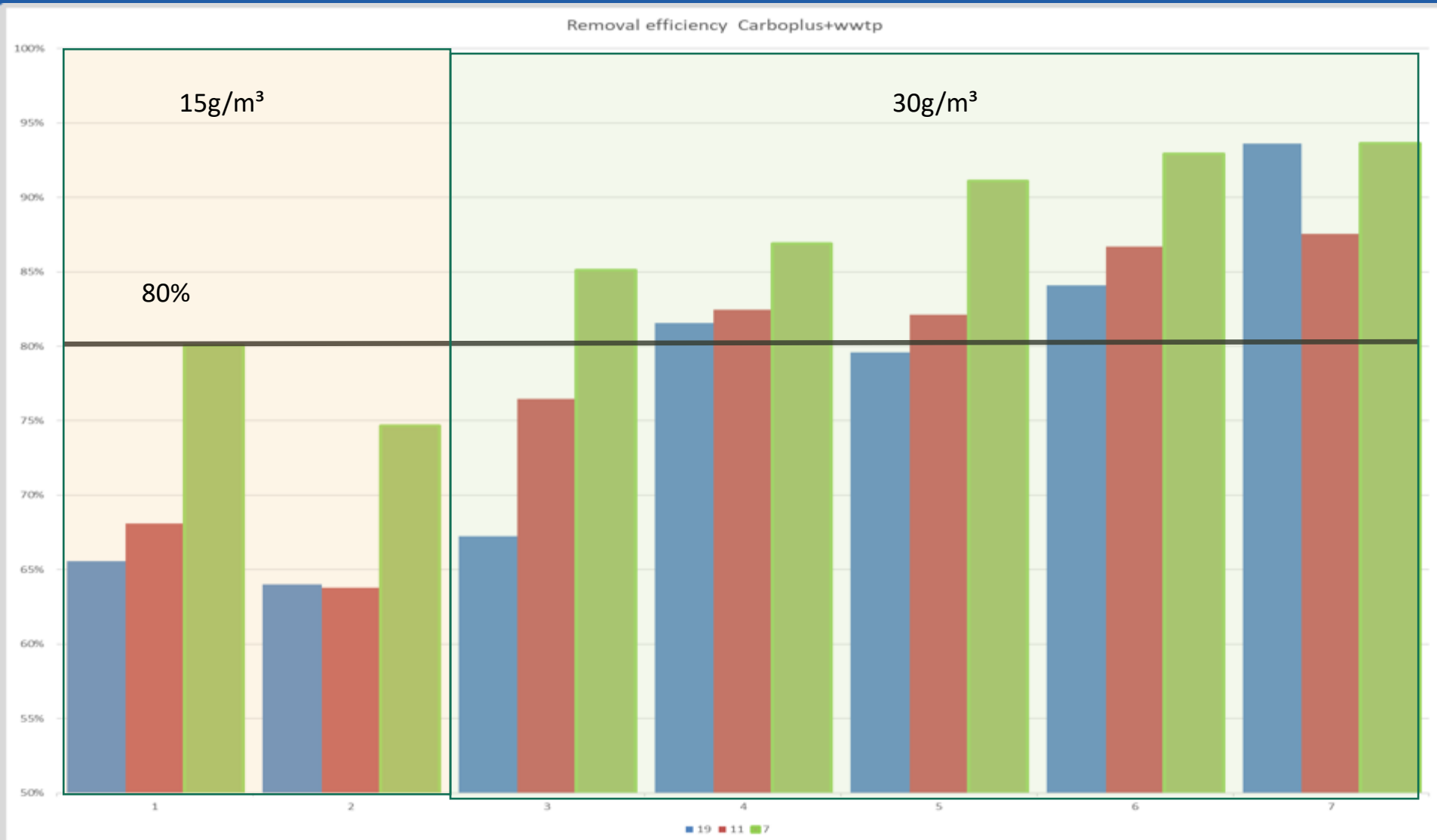
# Carboplus

## Removal efficiency Carboplus



# Carboplus

Total removal efficiency (influent wwtp – effluent pilot)



# Dynacarbon

What does the pilot look like?

720kg GAC inserted

Automated liquid and air flush

Influent wwtp in, effluent pilot out

Pre-treatment  
effluent wwtp  
Sobeye-filter  
=>algae removal



# Dynacarbon

Used Carbon: Cyclecarb 401, Chemviron

Start november 2020 using 720 kg GAC

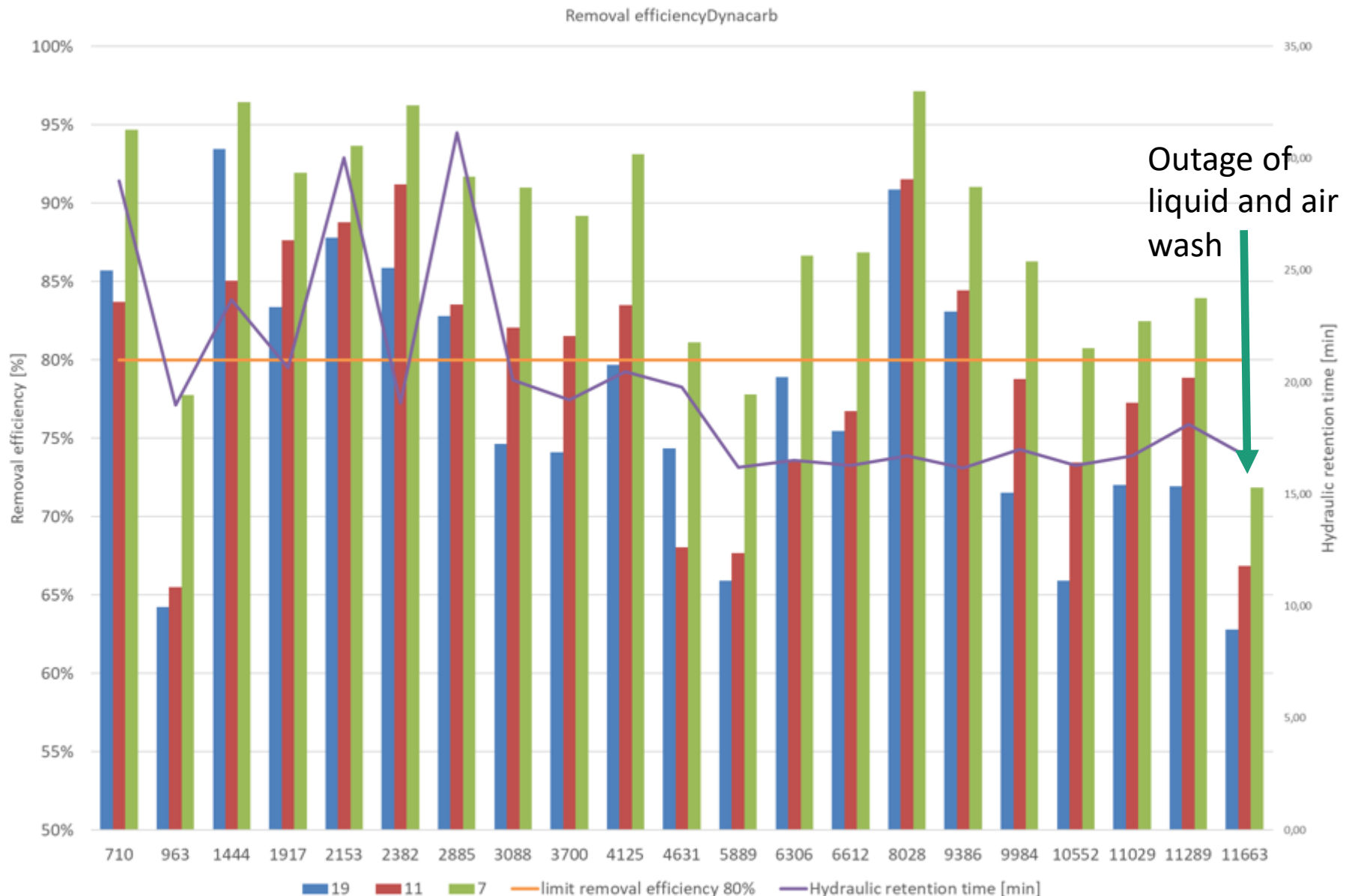
Stopped march after 4293m<sup>3</sup>

restart 1-4-2021 using 720kg GAC

Phase	Acties	Average HRT	Treated volume [m <sup>3</sup> ]	Results
0	Start november 720kg	unknown	4293	5 samples
1	Restart 1-4-2021 720kg	20min (flow 5,2m <sup>3</sup> /h)	3885	11 samples
2	Following phase 1	16min (flow 5,8m <sup>3</sup> /h)	8015	15 samples
3	Following phase 2	18 min ( flow 5,5m <sup>3</sup> /h)	tbd	tbd

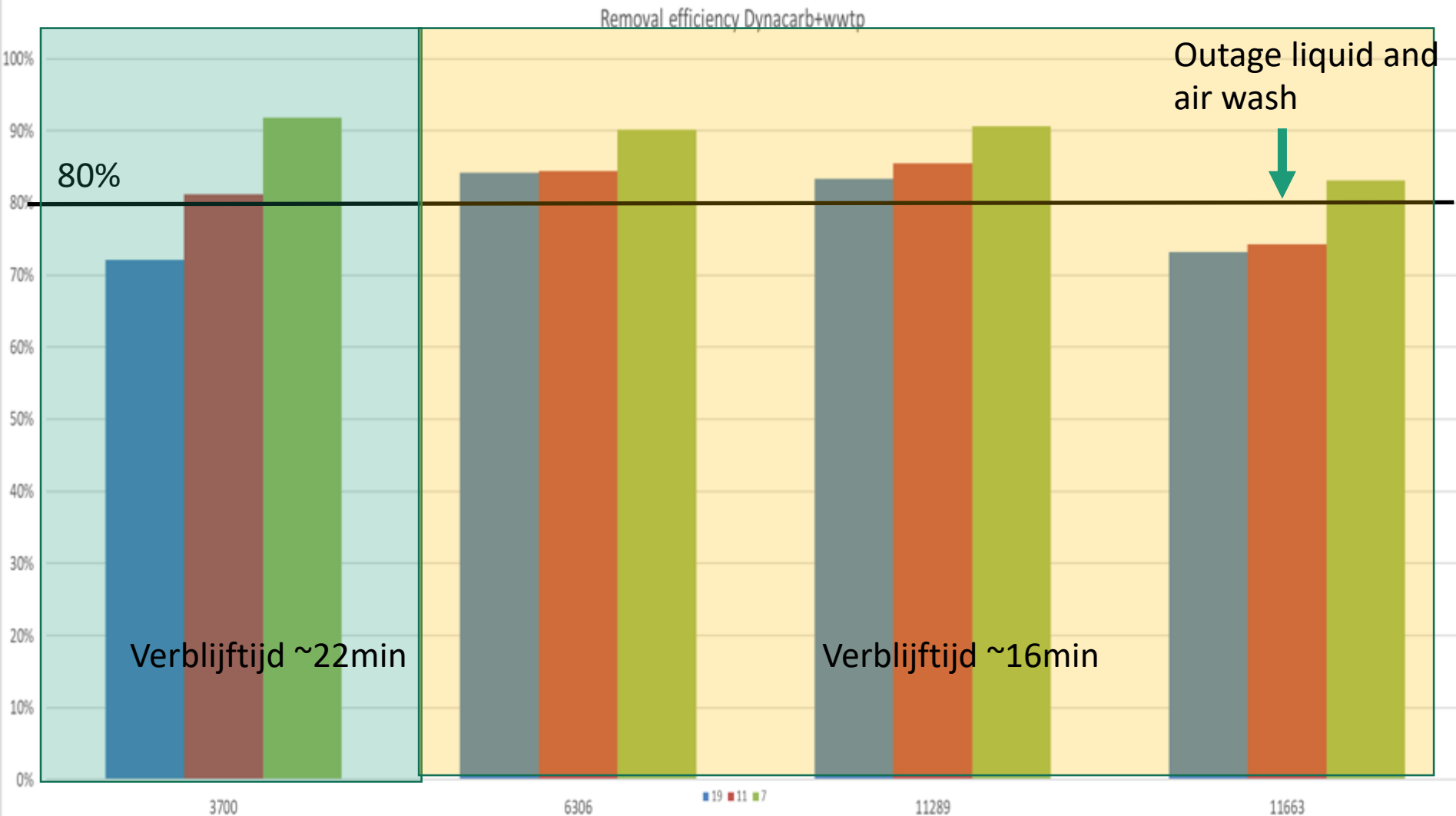


# Dynacarbon



# Dynacarbon

Total removal efficiency influent wwtp- effluent pilot



# Upcoming research?

- Carboplus
  - Varying dosing rate micro-grain
- Dynacarb:
  - Flowrate at 5,5m<sup>3</sup>/h, HRT ~ 18min
  - Treat more bedvolumes and wait...
- Analytics both pilots:
  - Leachate of carbon in effluent pilot?
  - Removal of PFAS?
  - Ecotoxicology screening both pilots?
  - Screening for removal antibiotic resistance?



**Thank you for your attention!**

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**stowa**



Rijkswaterstaat  
Ministry of Infrastructure  
and Water Management

**Tackling Micropollutants in Wastewater**  
**Approaches on Implementation and Innovation in Europe and The Netherlands**

**November 3 and 4 2021**  
**Aquatech Amsterdam**