

LIFE ACLIMA

Elke druppel telt



The ACLIMA-project has received funding from the LIFE Programme of the European Union. under contract number LIFE 20 CCA_BE_001720



PROEFBEDRIJF PLUIMVEEHOUDERIJ



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Waternverbruik stalkoeling



Recuperatie hemelwater



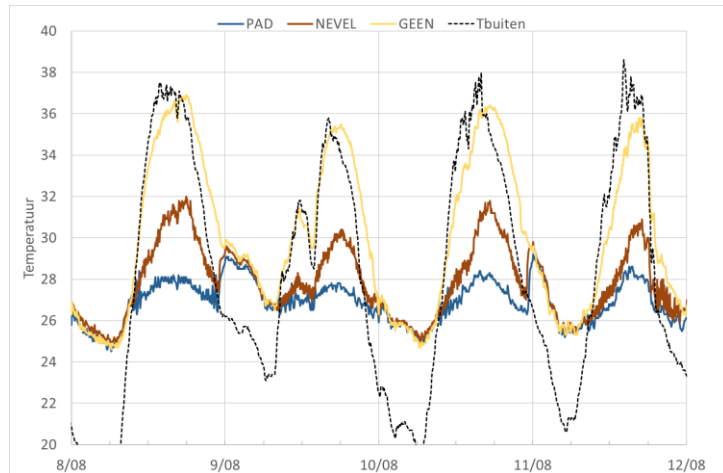
Circulair gebruik spoelwater



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Waternverbruik stalkoeling



Recuperatie hemelwater



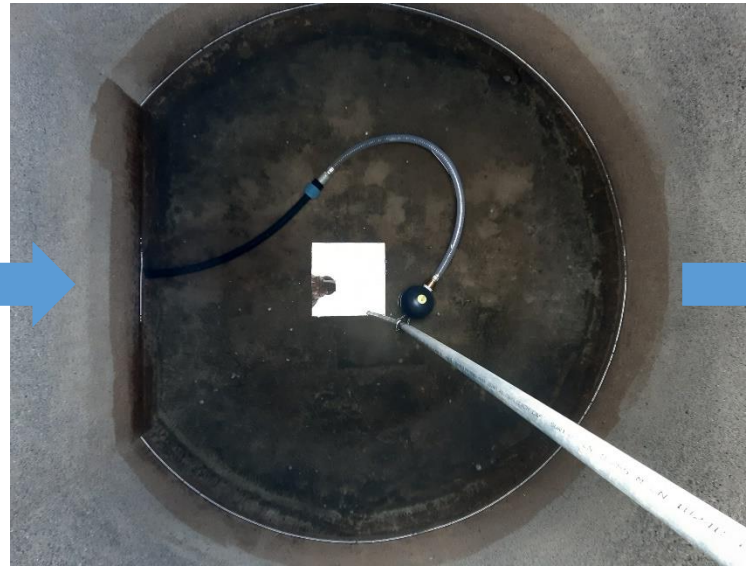
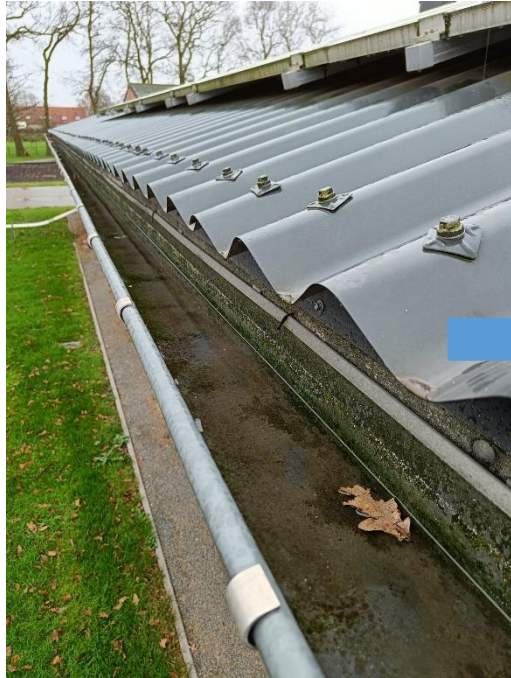
Circulair gebruik spoelwater



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RECUPERATIE HEMELWATER

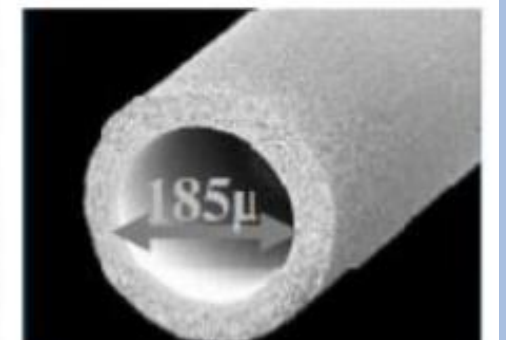
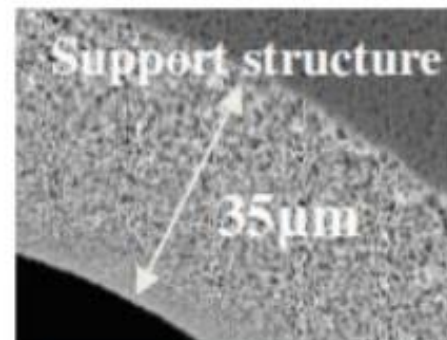
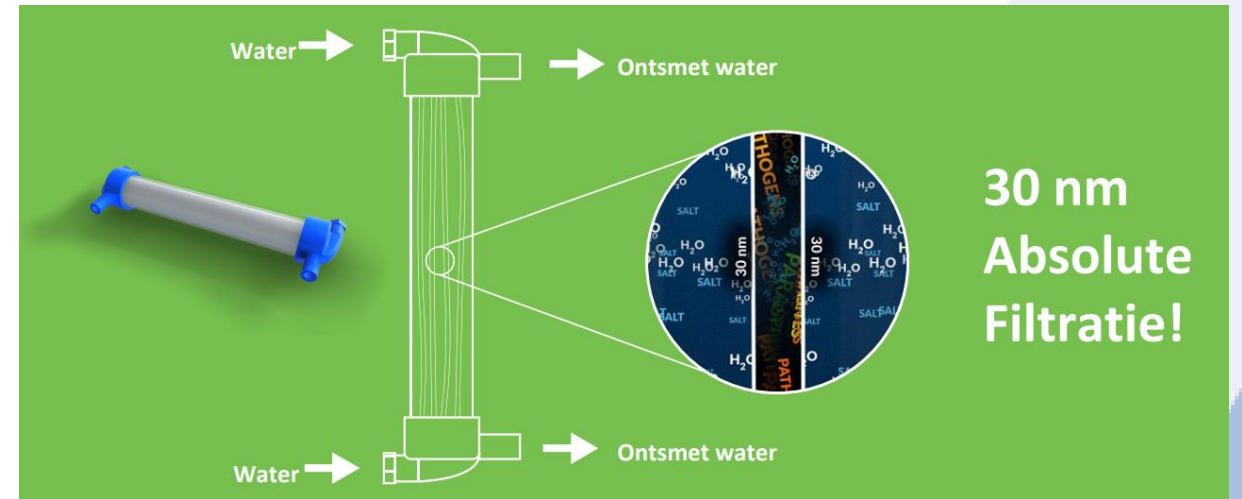


Zuiveringstrein



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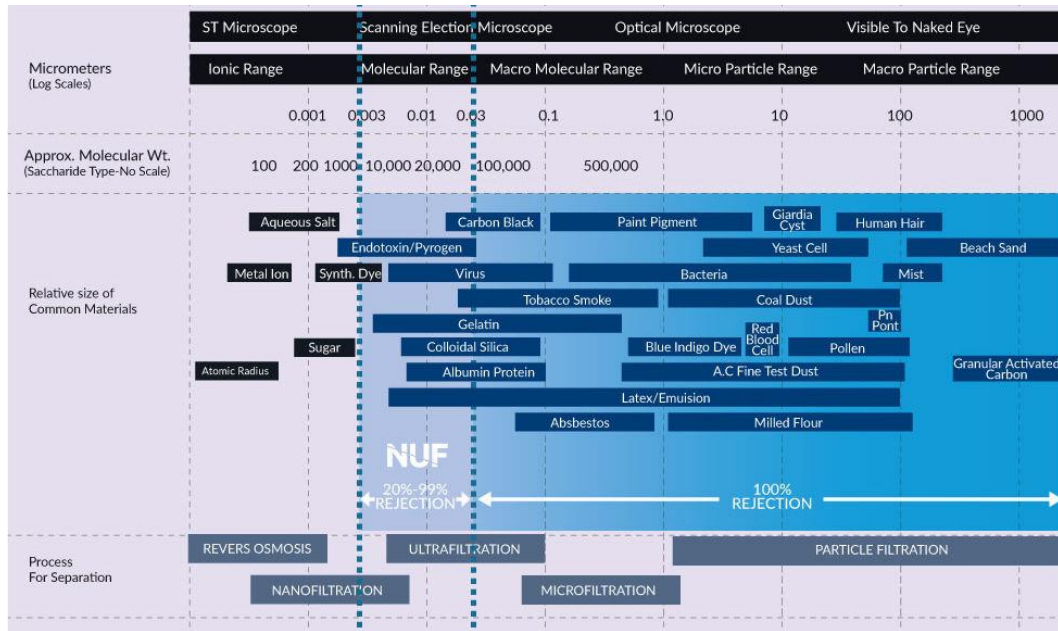
NANO ULTRAFILTRATIE (NUF)



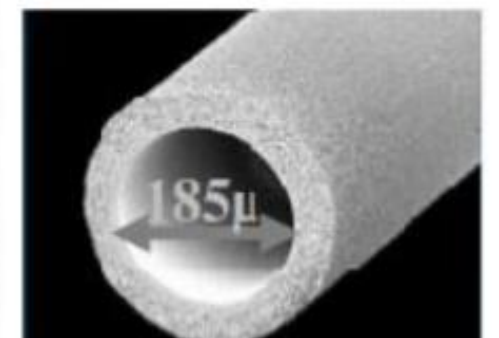
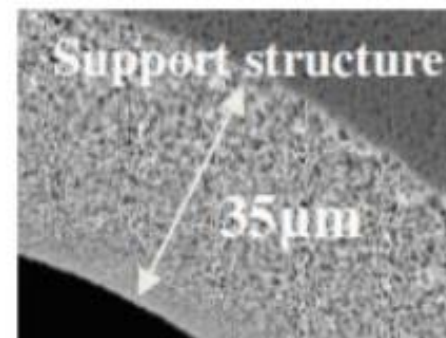
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NANO ULTRAFILTRATIE (NUF)

100% van de deeltjes groter dan 30 nm (0,03 micron)



PATHOGEN	TYPE	SIZE (µM)
Poliovirus	Virus	0.03
Bacillus	Bacteria	0.25-1.0
E. Coli (Escherichia coli)	Bacteria	0.5
Xanthomonas	Bacteria	0.4 – 1.0
Rhizobia (Crazy Roots)	Bacteria	0.5 - 0.9
CMM Clavibacter michiganensis	Bacteria	0.5 - 1.0
Pseudomonas	Bacteria	0.5-1.0
Salmonella	Bacteria	0.7 - 1.5
Fusarium	Fungi	4 – 7
Botrytis	Fungi	5 – 9



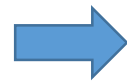
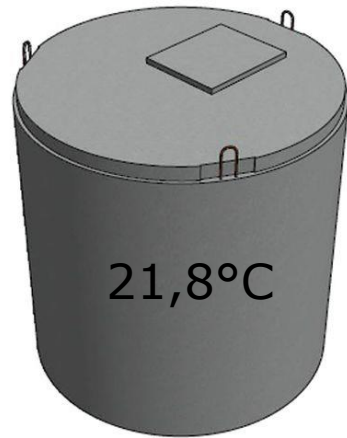
ZUIVERINGSTREIN



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Seizoensinvloeden

Max. buitentemperatuur
25/08: 33°C



23°C



26°C



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Analyseresultaten regenwater

Chemische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
Datum	<u>08/04/2022</u>	<u>08/04/2022</u>	<u>02/06/2022</u>	<u>02/06/2022</u>	<u>08/07/2022</u>	<u>08/07/2022</u>	<u>02/08/2022</u>	<u>02/08/2022</u>	<u>25/08/2022</u>	<u>25/08/2022</u>	
pH	7,5	7,7	5,7	6,5	7,2	6,8	7,1	7,0	6,0	6,4	4 - 9
Mg mg/L	<1,0	1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	
Ca mg/L	19,0	21,0	5,0	5,2	4,4	4,4	5,7	5,7	6,0	6,1	
Na mg/L	2,4	3,8	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<200 mg/L
Tot Hardheid	4,7	5,7	5,0	1,3	1,1	1,1	1,4	1,4	1,5	1,5	<20°D
SO4 mg/L	8,9	9,5		1,8	1,4	1,4	1,6	1,6	-	-	<200 mg/L
Nitriet mg/L	<0,020	<0,020		0,18	<0,010	0,02	<0,010	<0,010	-	-	<1,0 mg/L
Ijzer mg/L	0,060	0,210	0,060	0,090	0,026	0,040	0,031	0,280	0,11	0,14	<= 2,5 mg/l



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Analyseresultaten regenwater

Biologische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
Datum	08/04/2022	08/04/2022	02/06/2022	02/06/2022	08/07/2022	08/07/2022	
Tot. Kiemgetal 22°C per ml	3.100	17.000	7.400	2.100	6.600	59.000	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	2.500	15.000	390	15.000	6.700	15.000	<= 100.000 kve/ml
Coliformen per 100ml	720	9	150	<1	240	<1	
E. Coli per 100 ml	690	3	3	<1	13	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	88	<1	88	<1	24	<1	<= 1 kve/100ml
Schimmels per ml	20	10	60	50	80	50	<= 10.000 kve/ml
Gisten per ml	90	<10	<10	<10	60	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	<1	<1	20	<1	<1	<1	
Clostridium perfringens	<1	<1	<1	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA



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Analyseresultaten regenwater

Biologische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
<u>Datum</u>	<u>02/08/2022</u>	<u>02/08/2022</u>	<u>25/08/2022</u>	<u>25/08/2022</u>	<u>20/09/2022</u>	<u>20/09/2022</u>	
Tot. Kiemgetal 22°C per ml	1.500	68.000	6.700	1900	12.000	1.500	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	65	16.000	3.400	<1	6.500	630	<= 100.000 kve/ml
Coliformen per 100ml	4	7	450	<1	230	<1	
E. Coli per 100 ml	4	7	380	<1	3	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	21	1	160	<1	300	<1	<= 1 kve/100ml
Schimmels per ml	20	100	10	<10	40	<10	<= 10.000 kve/ml
Gisten per ml	1.400	200	50	<10	360	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	10	<1	230	<1	1.400	<1	
Clostridium perfringens	<1	<1	230	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA

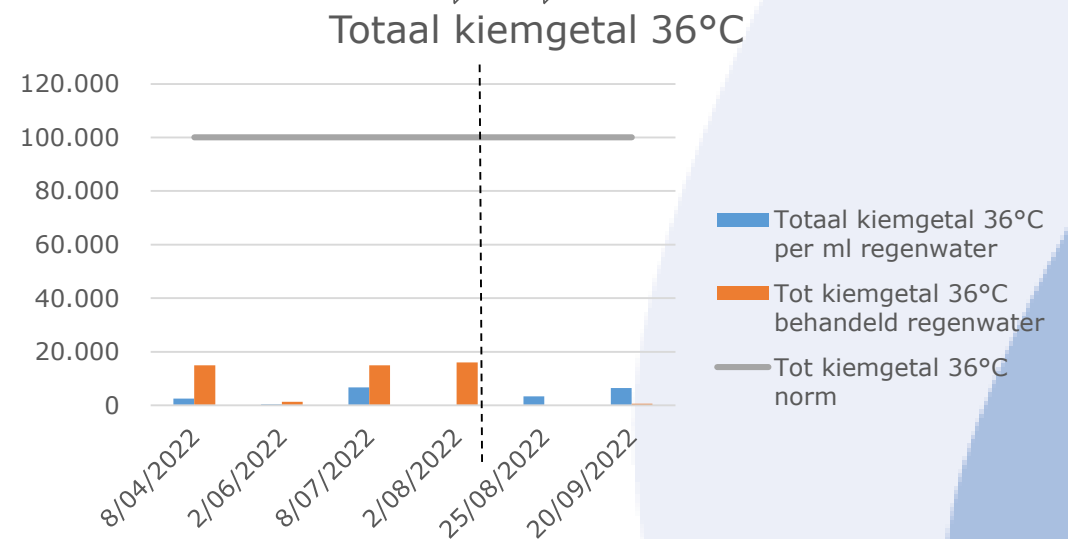
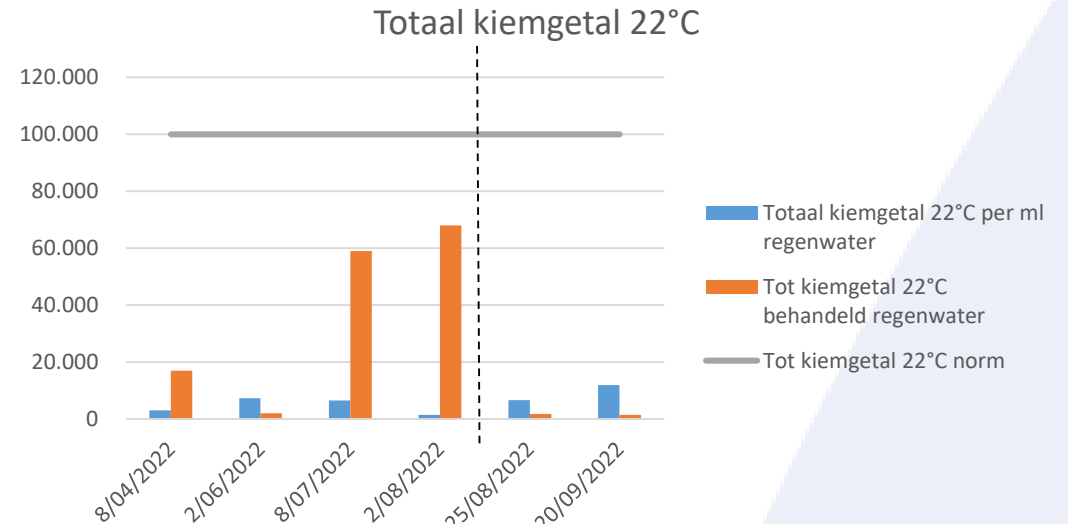


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Analyseresultaten regenwater

Datum	8/04	2/06	8/07	2/08	25/08	20/09
Totaal kiemgetal 22°C per ml regenwater	3.100	7.400	6.600	1.500	6.700	12.000
Tot kiemgetal 22°C behandeld regenwater	17.000	2.100	59.000	68.000	1.900	1.500

Datum	8/04	2/06	8/07	2/08	25/08	20/09
Totaal kiemgetal 36°C per ml regenwater	2.500	390	6.700	65	3.400	6.500
Tot kiemgetal 36°C behandeld regenwater	15.000	1.400	15.000	16.000	<1	630



Analyseresultaten regenwater

Biologische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
<u>Datum</u>	<u>08/04/2022</u>	<u>08/04/2022</u>	<u>02/06/2022</u>	<u>02/06/2022</u>	<u>08/07/2022</u>	<u>08/07/2022</u>	
Tot. Kiemgetal 22°C per ml	3.100	17.000	7.400	2.100	6.600	59.000	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	2.500	15.000	390	15.000	6.700	15.000	<= 100.000 kve/ml
Coliformen per 100ml	720	9	150	<1	240	<1	
E. Coli per 100 ml	690	3	3	<1	13	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	88	<1	88	<1	24	<1	<= 1 kve/100ml
Schimmels per ml	20	10	60	50	80	50	<= 10.000 kve/ml
Gisten per ml	90	<10	<10	<10	60	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	<1	<1	20	<1	<1	<1	
Clostridium perfringens	<1	<1	<1	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA



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Analyseresultaten regenwater

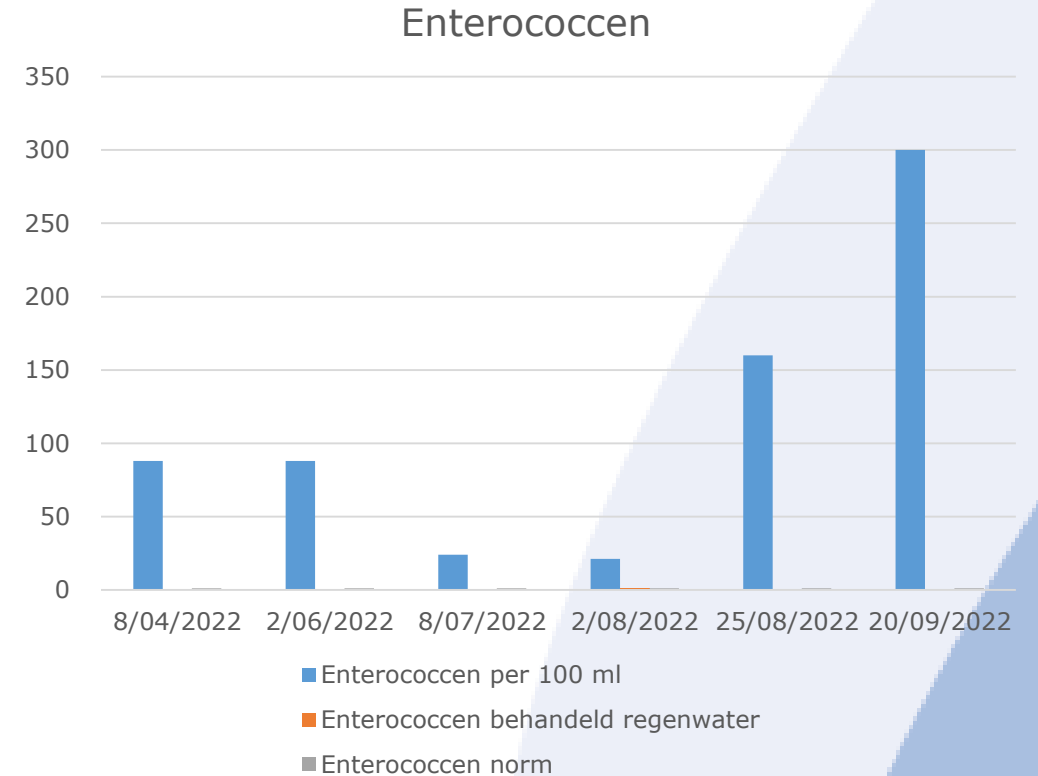
Biologische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
<u>Datum</u>	<u>02/08/2022</u>	<u>02/08/2022</u>	<u>25/08/2022</u>	<u>25/08/2022</u>	<u>20/09/2022</u>	<u>20/09/2022</u>	
Tot. Kiemgetal 22°C per ml	1.500	68.000	6.700	1.900	12.000	1.500	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	65	16.000	3.400	<1	6.500	630	<= 100.000 kve/ml
Coliformen per 100ml	4	7	450	<1	230	<1	
E. Coli per 100 ml	4	7	380	<1	3	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	21	1	160	<1	300	<1	<= 1 kve/100ml
Schimmels per ml	20	100	10	<10	40	<10	<= 10.000 kve/ml
Gisten per ml	1.400	200	50	<10	360	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	10	<1	230	<1	1.400	<1	
Clostridium perfringens	<1	<1	230	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA



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Analyseresultaten regenwater

Datum	8/04	2/06	8/07	2/08	25/08	20/09
Enterococcen per 100 ml	88	88	24	21	160	300
Enterococcen behandeld regenwater	<1	<1	<1	1	<1	<1
Enterococcen norm	1	1	1	1	1	1



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<u>Datum</u>	<u>02/08/2022</u>	<u>02/08/2022</u>	<u>25/08/2022</u>	<u>25/08/2022</u>	<u>20/09/2022</u>	<u>20/09/2022</u>	
Tot. Kiemgetal 22°C per ml	1.500	68.000	6.700	1.900	12.000	1.500	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	65	16.000	3.400	<1	6.500	630	<= 100.000 kve/ml
Coliformen per 100ml	4	7	450	<1	230	<1	
E. Coli per 100 ml	4	7	380	<1	3	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	21	1	160	<1	300	<1	<= 1 kve/100ml
Schimmels per ml	20	100	10	<10	40	<10	<= 10.000 kve/ml
Gisten per ml	1.400	200	50	<10	360	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	10	<1	230	<1	1.400	<1	
Clostridium perfringens	<1	<1	230	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA



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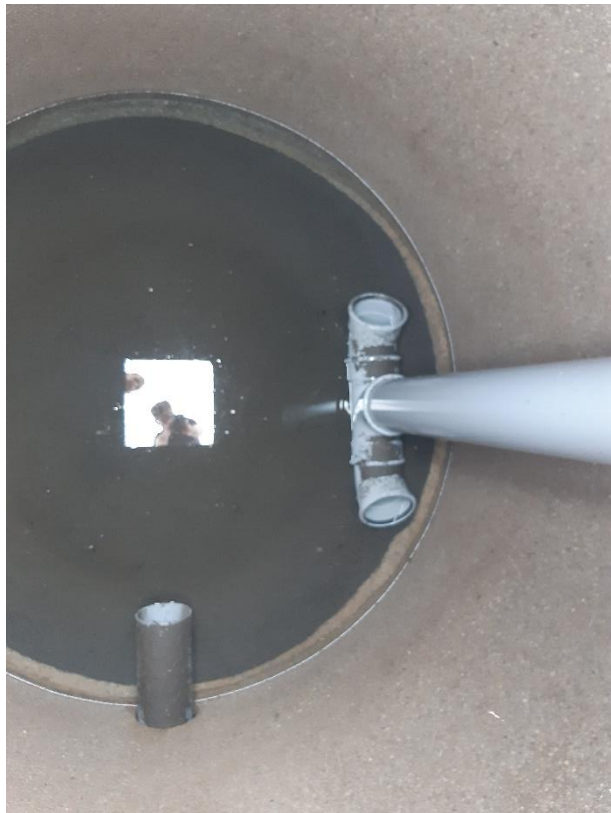
Analyseresultaten regenwater

Biologische parameters	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Regenwater	Behandeld regenwater	Norm
<u>Datum</u>	<u>02/08/2022</u>	<u>02/08/2022</u>	<u>25/08/2022</u>	<u>25/08/2022</u>	<u>20/09/2022</u>	<u>20/09/2022</u>	
Tot. Kiemgetal 22°C per ml	1500	68.000	6700	1900	12000	1500	<= 100.000 kve/ml
Tot. Kiemgetal 36°C per ml	65	16.000	3400	<1	6500	630	<= 100.000 kve/ml
Coliformen per 100ml	4	7	450	<1	230	<1	
E. Coli per 100 ml	4	7	380	<1	3	<1	<= 1000 kve/100ml
Enterococcen per 100 ml	21	1	160	<1	300	<1	<= 1 kve/100ml
Schimmels per ml	20	100	10	<10	40	<10	<= 10.000 kve/ml
Gisten per ml	1400	200	50	<10	360	<10	<= 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	10	<1	230	<1	1400	<1	
Clostridium perfringens	<1	<1	230	<1	<1	<1	
Salmonella	NA	NA	NA	NA	NA	NA	NA



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Opslag regenwater



Microbiologie		
Totaal kiemgetal 22°C per ml	45.000	≤ 100.000 kve/ml
Totaal kiemgetal 36°C per ml	4.800	≤ 100.000 kve/ml
Coliformen per 100 ml	1.400	
E. coli per 100 ml	1.400	≤ 1000 kve/100ml
Enterococcen per 100 ml	460	≤ 1 kve/100ml
Schimmels per ml	<10	≤ 10.000 kve/ml
Gisten per ml	3.200	≤ 10.000 kve/ml
Sulfietreducerende anaeroben per 100 ml	10.000	
Clostridium perfringens	10.000	
Salmonella	niet aangetoond	



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Conclusie

- Waterbehandeling van regenwater start bij schone daken, dakgoten en wateropslag
- Op het Proefbedrijf worden twee zuiveringssystemen getest
 - Nano ultrafiltratie
 - Metingen opnieuw gestart
 - Zuiveringstrein
 - Behaalt drinkwaternormen voor pluimvee na behandeling
- Extra aandacht voor hoog kiemgetal in de zomermaanden



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Opwaarderen hemelwater tot drinkwater Hooibeekhoeve

Water bubble Life ACLIMA – 4 oktober 2022

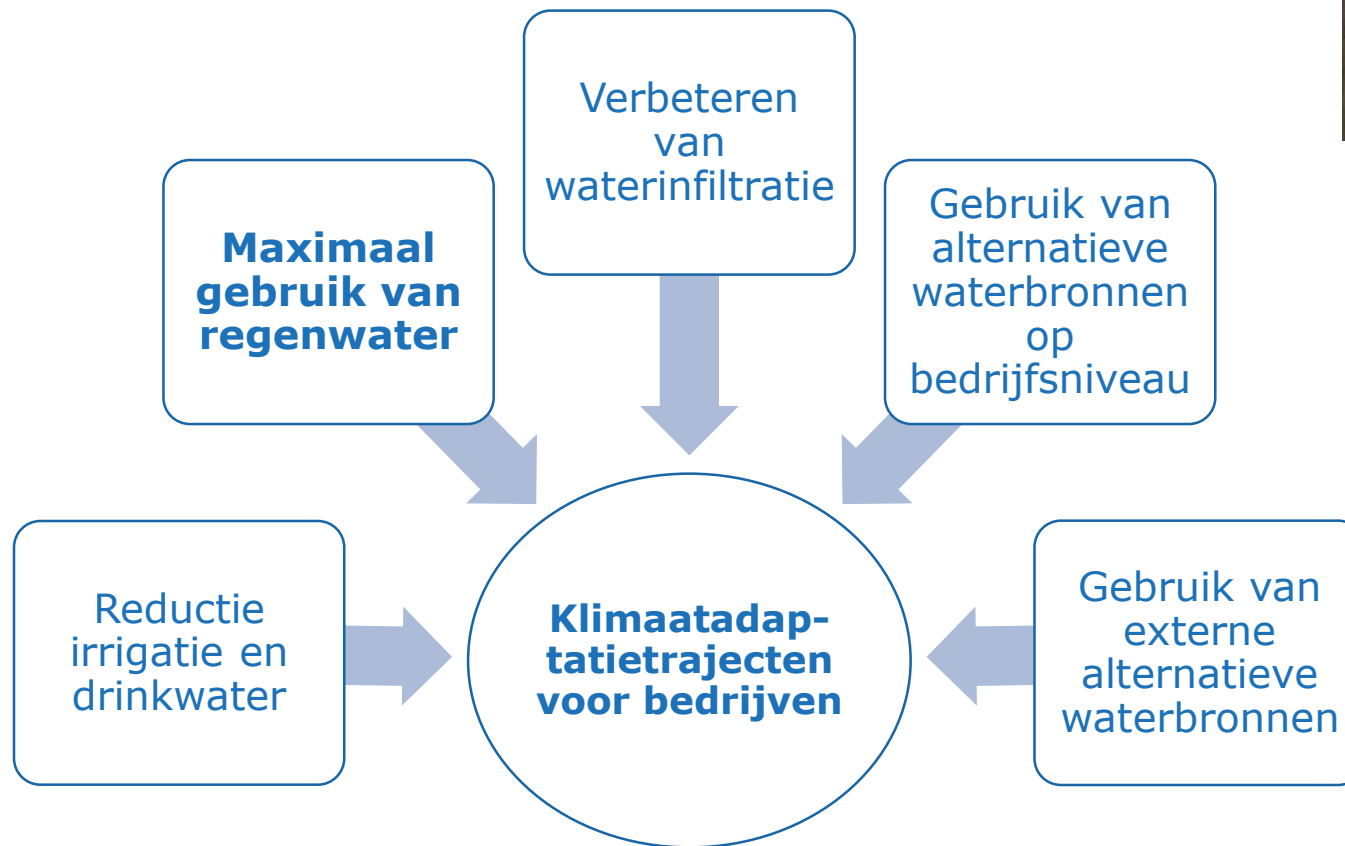
Els Stevens - Hooibeekhoeve



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Life ACLIMA



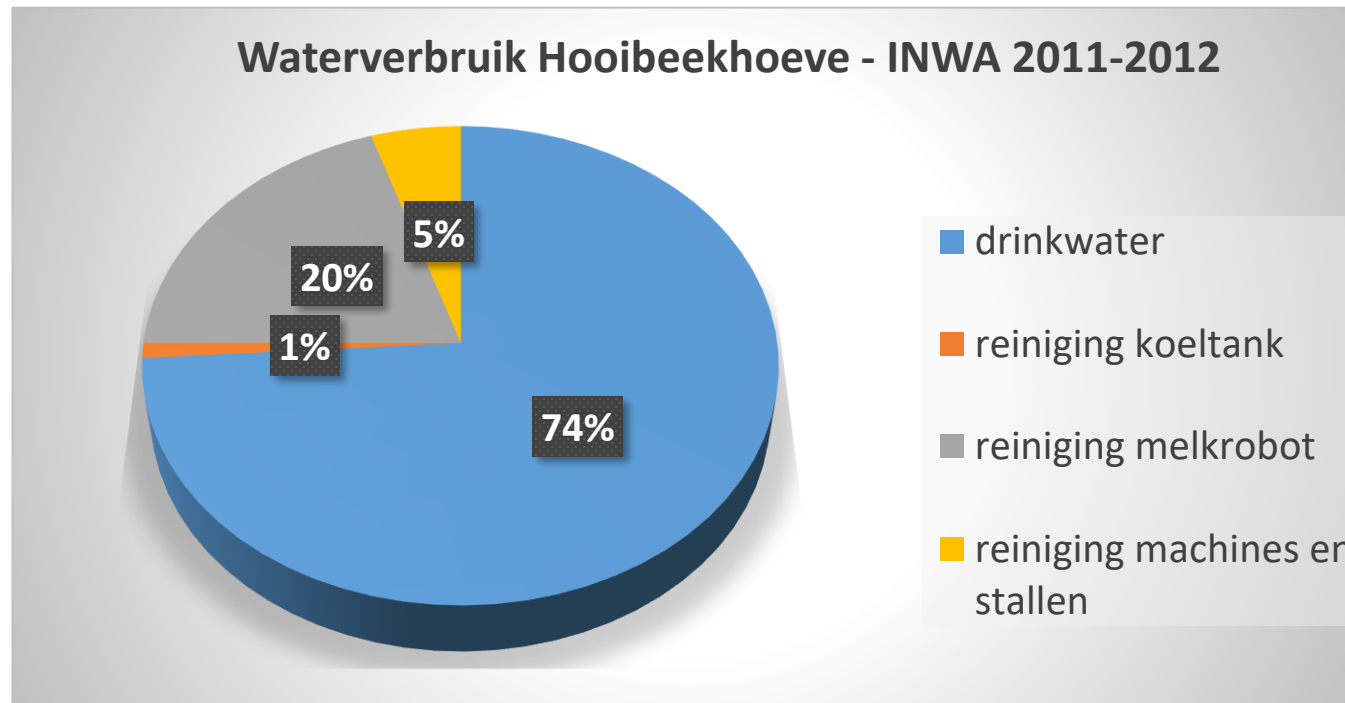
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Verbruik van water in Vlaamse melkveesector

Project 'Interactief Waterbeheer' (2008-2012)

Deelproject 'Waterhergebruik en -zuivering op melkveebedrijven' –
samenwerking Hooibeeekhoeve, PVL Bocholt, Innovatiesteunpunt



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Gebruik van regenwater als drinkwater op een melkveebedrijf Case Hooibeeekhoeve



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Regenwater behandelen met ECA

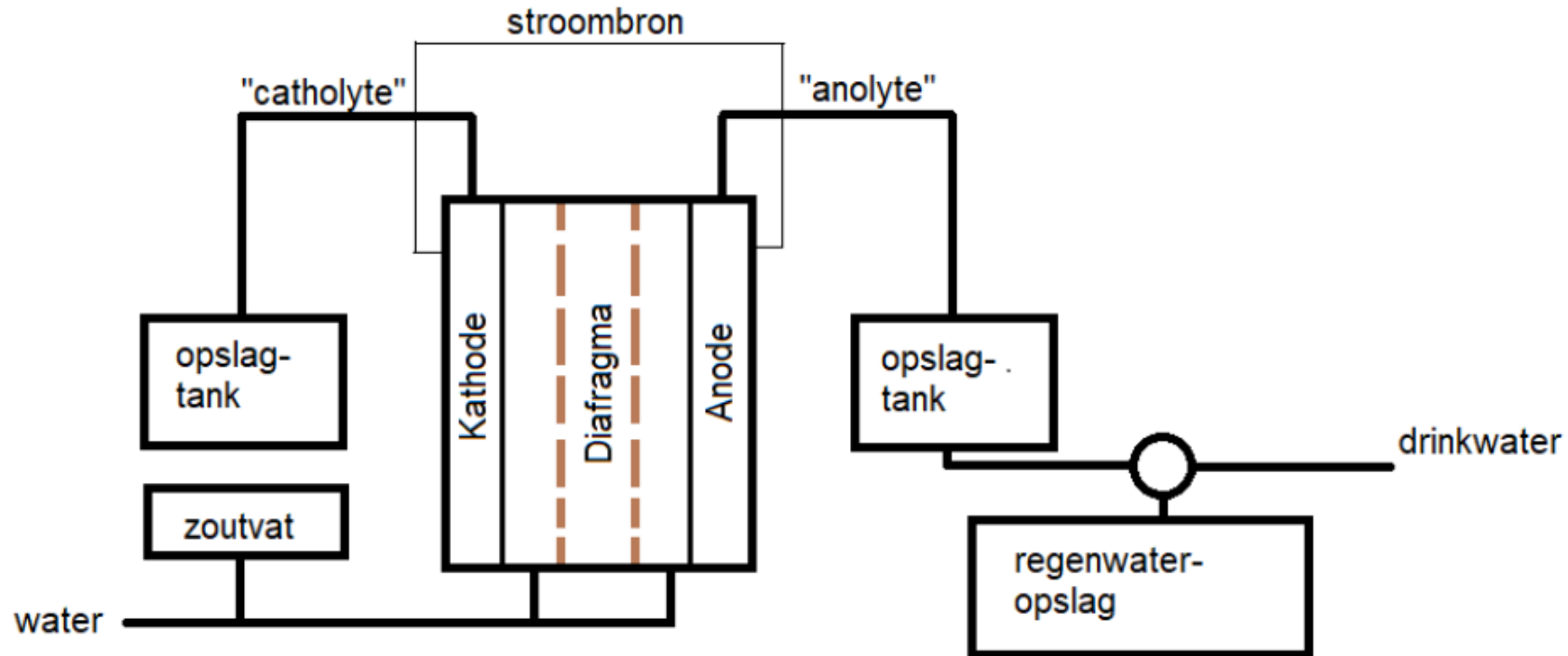
- **ECA = Elektrochemische activatie**
- Toestel aangekocht 2012
 - Methode inactieveert pathogene micro-organismen en zorgt voor de verwijdering van biofilms
 - Milieuvriendelijk



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Werking ECA





Displays pH-meters, ORP en bedieningsp

Reactor en doseerpomp

Opslag anolyte en catholyte

Zoutvat met filter en pekelaanmaak

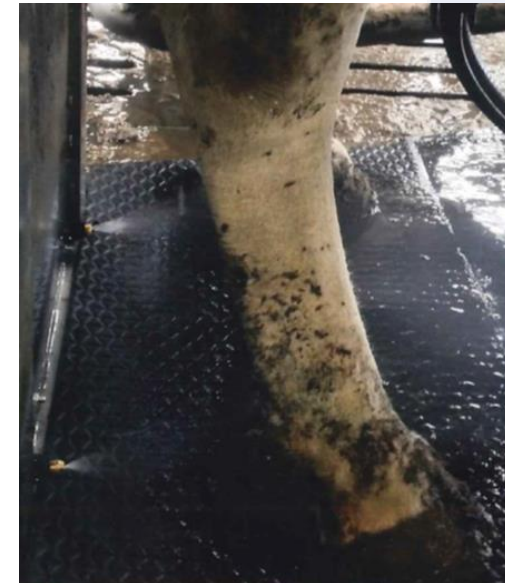


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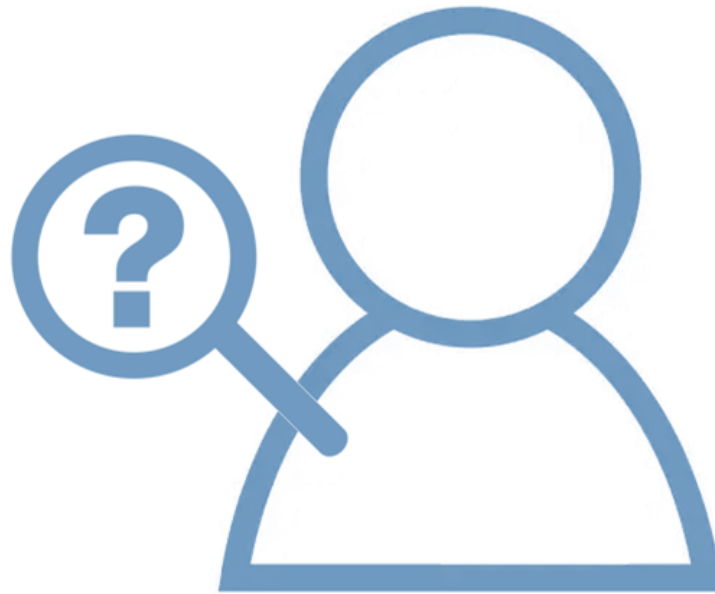
ECA

- Eigenschappen Anolyte:
 - Gematigd zuur (pH 6-7)
 - 500 mg oxidanten/liter
 - 70-95% Waterstofhypochloriet (HClO)
 - Redoxpotentiaal 850 mV (650 mV dood alle pathogene micro-organismen)
 - Sterk ontsmettend effect
- Toepassingen HH:
 - Ontsmetting drinkwater (inclusief verwijdering van biofilm in de leidingen en drinkbak)
 - Ontsmetten van de klauwen in de melkrobot met Hoofboy



Waterkwaliteit - onderzoek

- Staalname
 - Opslagput
 - Melk- en jongveestal
- Wateranalyse
- Kwaliteit in opslagput
- Effectiviteit van ontsmetting



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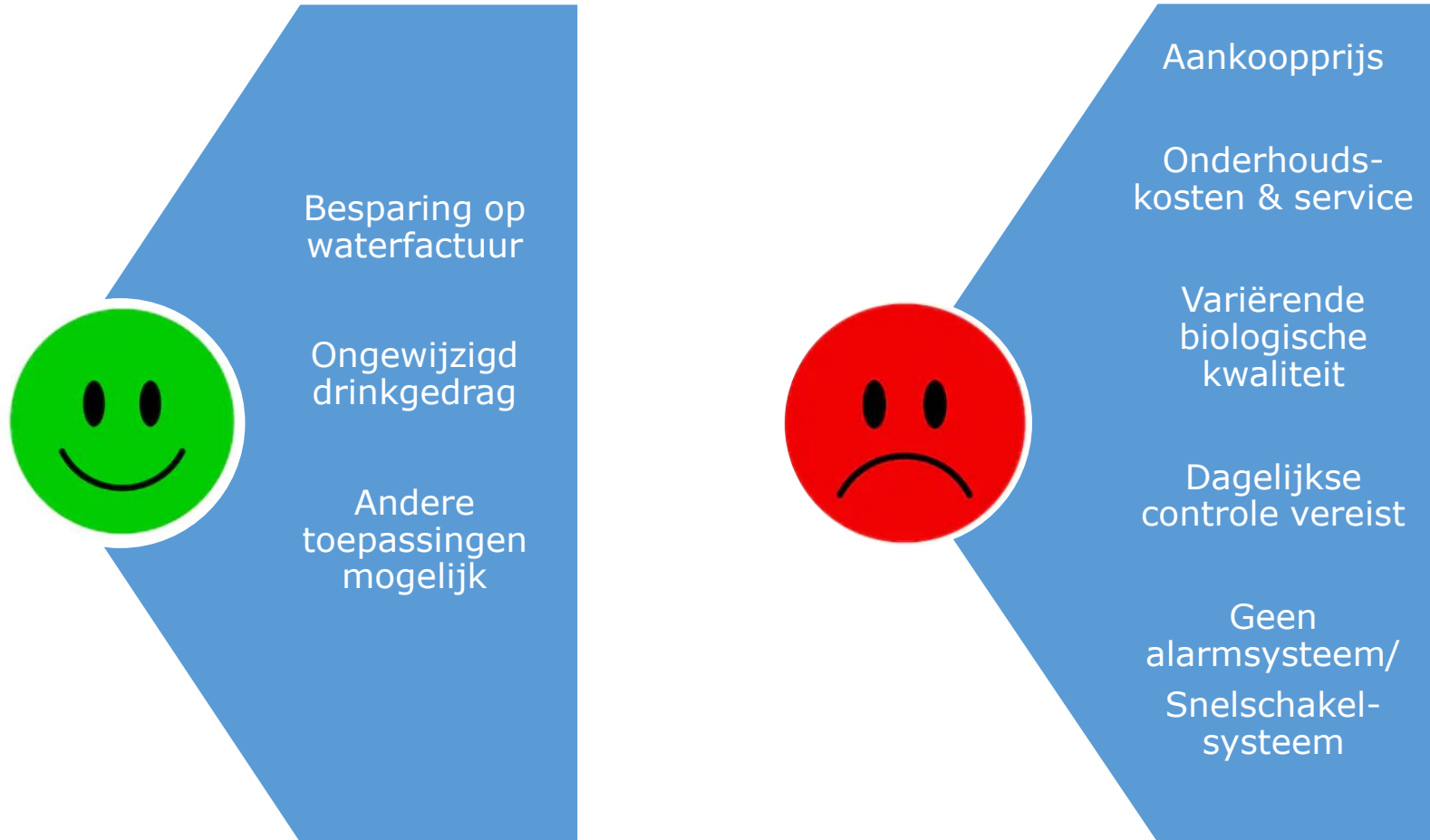
Campus Geel
Ingenieurswetenschappen

Waterkwaliteit - resultaten

Bacteriële verontreiniging	% voldoet aan richtwaarde	
	voor	na
Aantal kiemen (< 100.000 kve/ml)	100	100
Coliformen (< 100 kve/ml)	100	100
<i>Escherichia coli</i> (< 100 kve/ml)	100	100
Enterococcen (< 1 kve/ml)	12	72
<i>Clostridium perfringens</i> (<1 kve/100 ml)	67	71
Sulfietreducerende clostridia (< 1 kve/20 ml)	22	35



Ervaringen Hooibeeekhoeve ECA



Conclusies

- Gebruik van gezuiverd regenwater als drinkwater voor melkvee heeft potentieel maar
 - Regenwater = niet gratis
 - Kosten regenwateropslag
 - Kosten waterbehandeling → naast ECA meer mogelijkheden
 - Wisselende neerslaghoeveelheden
 - Biologische kwaliteit moet gegarandeerd zijn
 - Bij voorkeur alarm en 'slimschakel-systeem'

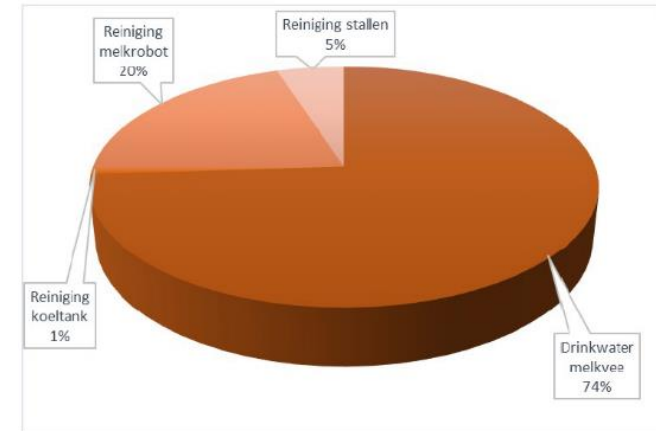
→ **In LIFE ACLIMA**



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Hemelwater opwaarderen tot drinkwater voor melkvee

- Situatie HH: opgevangen hemelwater kan tot 70% van de drinkwaterbehoefte invullen
- 4.000 m³ leidingwater besparen
- **MAAR: chemische en microbiologische waterkwaliteit!**
 - Zuiveringsmethode noodzakelijk: demonstratie **waterbehandeling regenwater (zuiveringstrein)**
- Opvolging drinkwaterkwaliteit, productie- en gezondheidsparameters
- Bedrijfseconomische analyse



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Assuring water Availability in Agriculture under changing CLIMAtē conditions

Demonstratiecases rundveehouderij

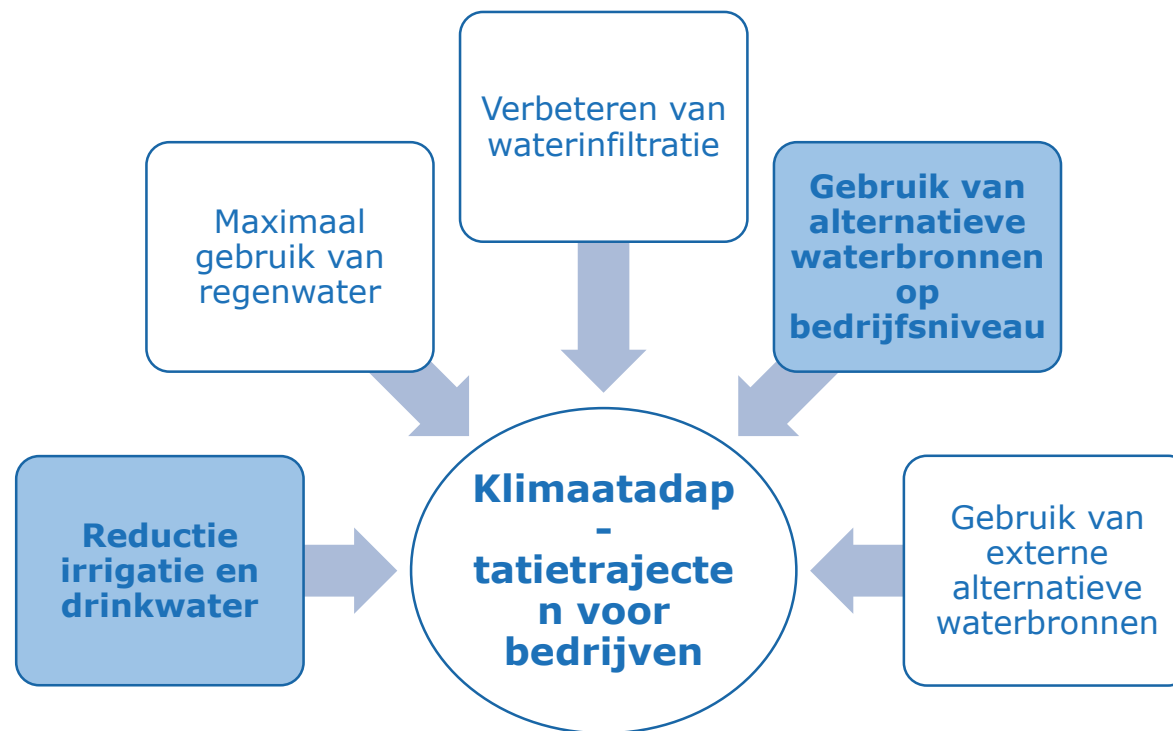
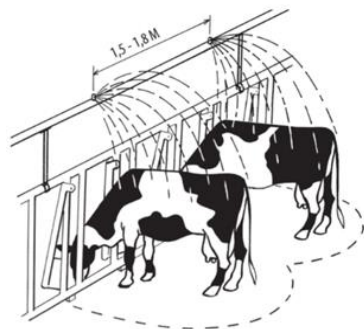
Hooibeekhoeve

Klimaatadaptatietrajecten



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Wat is een klimaatadaptatietraject?

Maatregelen installeren die de **waterbeschikbaarheid** op jouw bedrijf **verhogen**

- ✓ **Gratis advies** over: waterbesparende technieken, waterkwaliteit, subsidiekanalen,...
- ✓ Bedrijfsaudit met **waterpaspoort**: *'waar zitten nog waterwinsten op jouw bedrijf?'*
 - ✓ Reductie irrigatie- en drinkwater
 - ✓ Maximaal gebruik van regenwater
 - ✓ Verbeteren van waterinfiltratie
 - ✓ Gebruik van alternatieve waterbronnen op bedrijfsniveau
 - ✓ Gebruik van externe alternatieve waterbronnen
 - ✓ Gebruik van droogteresistente grasmengels



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Life ACLIMA Klimaatadaptatietraject

Hoe gaan we te werk?

- Schrijf je in via de website van Life ACLIMA.
- Onze onderzoekers nemen contact met je op.
- Tijdens een bedrijfsbezoek stellen we een waterpaspoort op en brengen zo je waterwinsten in kaart.
- Wil je hiermee aan de slag? Ideaal, dan geven we je neutraal en gratis advies en begeleiden we je hoe deze maatregelen of technieken toe te passen op jouw bedrijf.



<https://www.lifeaclima.eu>



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Klimaatadaptatietrajecten

Wil je advies rond duurzaam watergebruik op jouw pluimvee- of rundveebedrijf? Contacteer ons!

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