

### Session 3

# A brand new solution for cleaning membrane systems processing Plant Based Products

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REALZYME

The logo for Membrane Technology Forum, featuring a stylized 'M' icon composed of horizontal bars of varying lengths, followed by the text 'Membrane' in a large, bold, blue font, and 'TECHNOLOGY FORUM®' in a smaller, blue, all-caps font below it.

#MembraneForum

# Why focus on plant based products

- The plant-based foods market could make up to 7.7% of the global protein market by 2030, with a value of over \$162 billion, up from \$29.4 billion in 2020, according to a new report by Bloomberg Intelligence (BI).
- The emergence of plant based products is pushing the limit of current cleaning solutions.
- Plants are gaining momentum and are becoming present in more diverse applications :
  - > Prepared meals
  - > Meat alternatives
  - > Cheese
  - > Milk

Sources: [Mintel Global New Products Database \(GNPD\)](https://www.bloomberg.com/company/press/plant-based-foods-market-to-hit-162-billion-in-next-decade-projects-bloomberg-intelligence/)  
<https://www.bloomberg.com/company/press/plant-based-foods-market-to-hit-162-billion-in-next-decade-projects-bloomberg-intelligence/>



# Agenda

FLASHBACK MTF 2019

- Performance Optimisation Program

BUSINESS CASES

- Target > Potential fouling
- Analysis > Adapted POP audit
- Observation > Significant changes
- Recommendation > Cleaning procedure

TAKE HOME MESSAGE

# Flashback to MTF 2019: Performance Optimisation Program

POP is a non-destructive procedure to assess membrane organic, inorganic or biofilm fouling present in membrane filtration equipment.

POP will result in the recommendation of the most effective cleaning procedure to :

- Optimize filtration process
- Guarantee productivity
- Prevent microbiological contamination
- Maximize membrane life

**Efficient cleaning is key !**



# Flashback to MTF 2019: Performance Optimisation Program

Monitored values :

- Turbidity/ATP/pH of the retentate side solution
- All pressure and flow rates

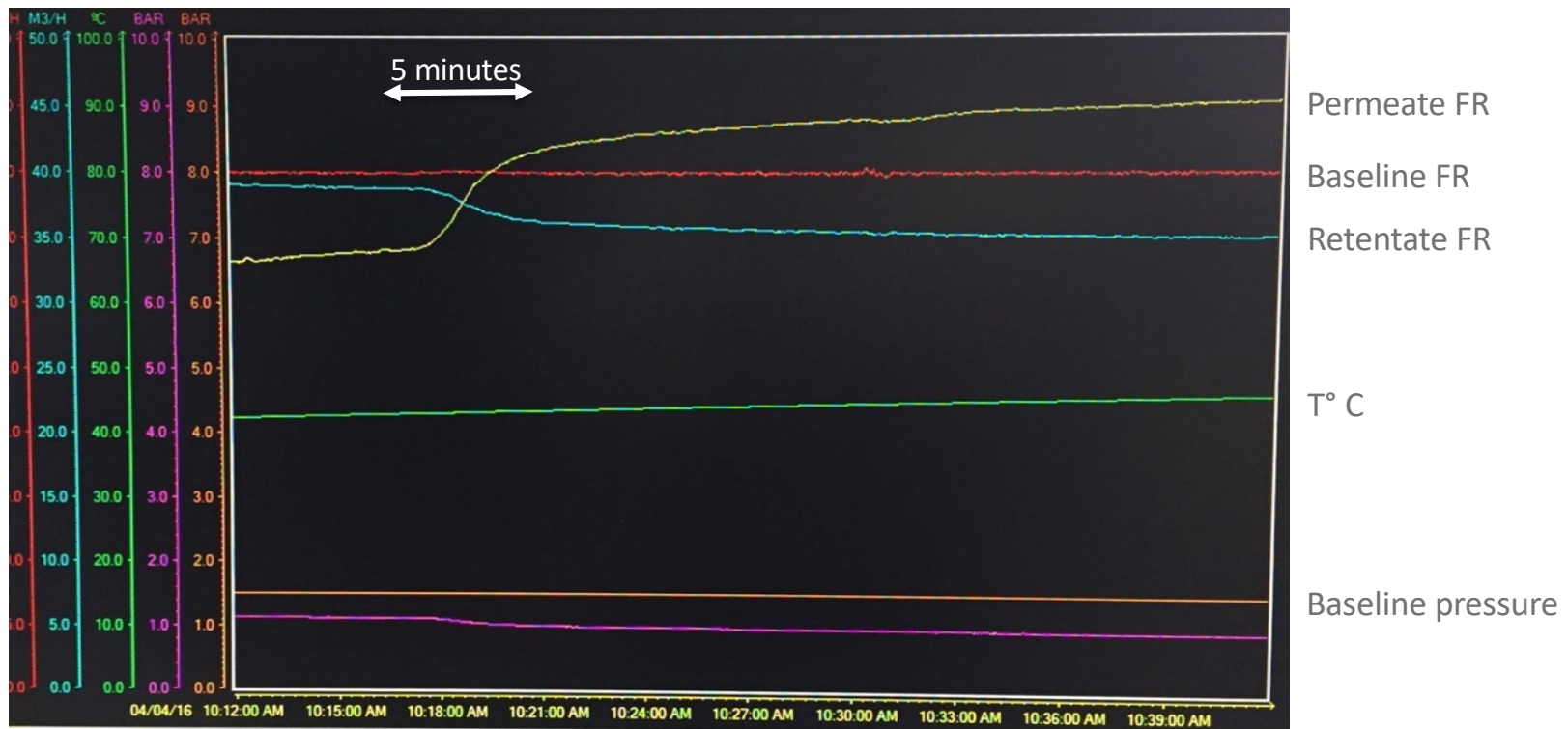
Tailor-made service :

- Troubleshooting
- Membrane system optimization

STEP	SOLUTION	TIME
A. ORGANIC FOULING AUDIT	Organic Fouling 1	20 min
	Organic Fouling 2	20 min
	Organic Fouling 3	20 min
	Organic Fouling 4	20 min
<i>Rinsing</i>	<i>Water</i>	
B. INORGANIC FOULING AUDIT	Inorganic Fouling A4	20 min
<i>Rinsing</i>	<i>Water</i>	
C. BIOFILM AUDIT	Biofilm Fouling A1 Biofilm Fouling 10	45 min
<i>Rinsing</i>	<i>Water</i>	

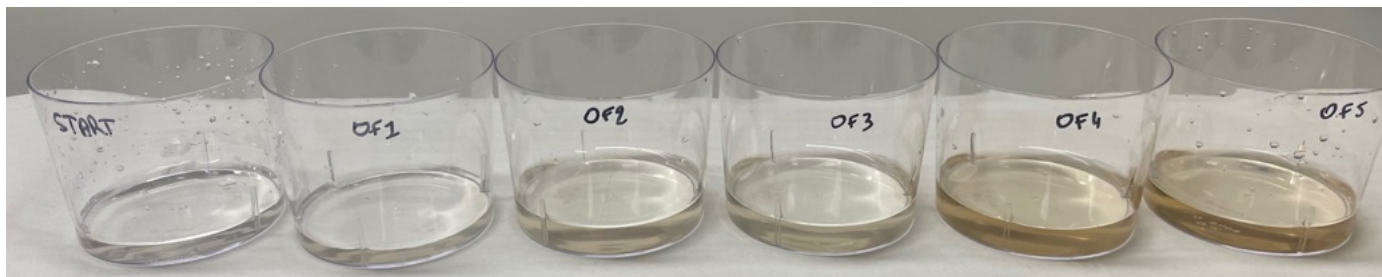
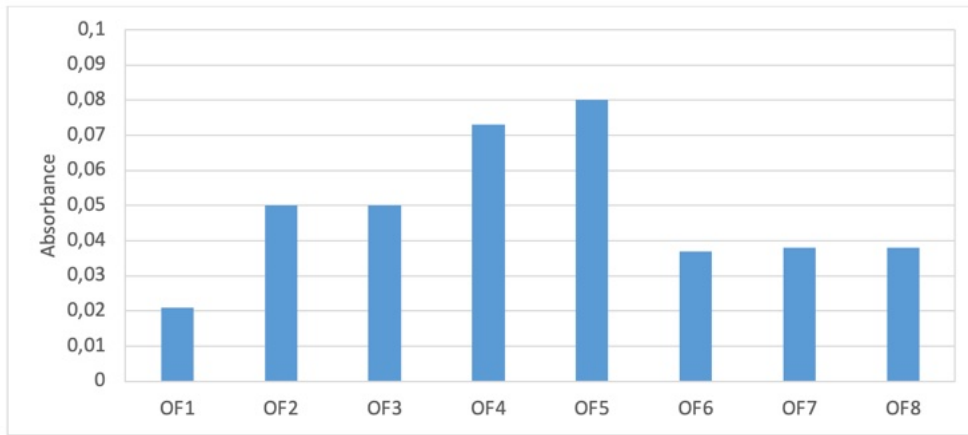
# Flashback to MTF 2019: Performance Optimisation Program

Pressure & flow rate monitoring



# Flashback to MTF 2019: Performance Optimisation Program

Turbidity trend monitoring



# RECOMMENDATION

We select the *perfect blend* for your equipment

Range	Type of product	References	
ENZY+ CLASSIC	Fully formulated products	Filzym 230	<b>Filzym 250</b>
		Filzym 231	
ENZY+ SILVER	Fully formulated products	Filzym 110	Filzym 111
		Filzym 130	<b>Filzym 131</b>
		<b>Filzym 150</b>	<b>Filzym 161</b>
		<b>Filzym 120</b>	
ENZY+ GOLD	Concentrated products	Filzym 10	Filzym 11
		<b>Filzym 21</b>	Filzym 30
		Filzym 31	<b>Filzym 35</b>
		Filzym 50	Filzym 60
		Filzym 70	





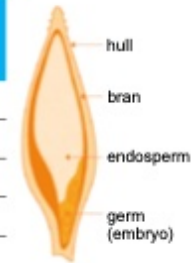
# Case #1 ▪ Plant based Oat-milk product

## Potential fouling characterisation



Table 1. Oat composition (source USDA)

	WHOLE OAT FLOUR, g/100g	OAT FLOUR (PARTIALLY DEBRANNED), g/100g
Protein	17	15
Fat	7	9
Carbohydrates	66	66
Of which total fibres	11	7
Of which $\beta$ -glucan (soluble fibre)	4	2



Oat is a nutritional and healthy grain crop, whether whole or partially debranned, as Table 1 shows.

- It has a relatively high protein content.
- It is high in soluble fibres, especially  $\beta$ -glucan, which is good for lowering cholesterol
- It is naturally free from gluten
- It has a high polyunsaturated fatty acid content



## Case #1 ▪ Plant based Oat-milk product

Adapted POP audit

STEP	SOLUTION	TIME
1. ORGANIC FOULING AUDIT	Organic Fouling 1	20 min
	Organic Fouling 2	20 min
	Organic Fouling 3	20 min
	Organic Fouling 4	20 min
<i>Rinsing</i>		
2. INORGANIC FOULING AUDIT	Inorganic Fouling A4	20 min
<i>Rinsing</i>		



## Case #1 ▪ Plant based Oat-milk product

Significant changes during the audit

### Before

- Previous cleaning procedures were not effective
- Significantly reduced membrane life due to falling fluxes

### After

- Fluxes rates recovered on already installed membranes
- New membranes maintained fluxes and performances

# Case #1 ▪ Plant based Oat-milk product

Implemented daily cleaning procedure



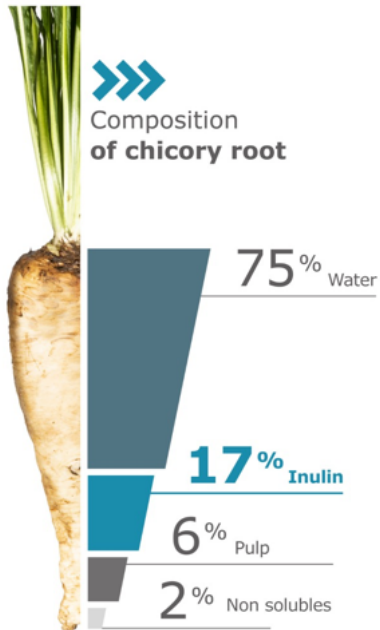
DAILY CLEANING PROCEDURE	SOLUTION	TIME
<i>Initial Rinsing</i>		
1. ENZYMATIC RECIRCULATION	Filzym 120	30-40 min
<i>Intermediate Rinsing</i>		
2. ACID RECIRCULATION	Filzym D2	20-30 min
<i>Intermediate Rinsing</i>		
3. ALKALINE RECIRCULATION	Filzym K2	20-30 min
<i>Final Rinsing</i>		



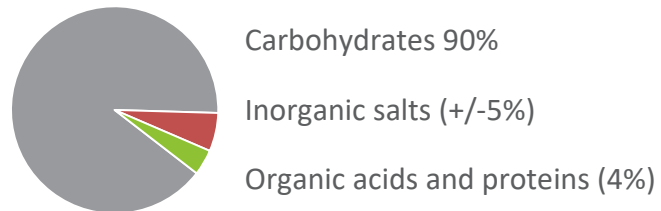
TARGET

## Case #2 ▪ Plant based market ▪ Chicory root extract

### Potential fouling characterisation



Chicory-extract, 10 to 15% dry matter (Brix)



Sources: <https://www.cosucra.com/natural-raw-material/about-chicory-root/>  
<https://www.socode-warcoing.be/inulin-and-dried-chicory-root/>

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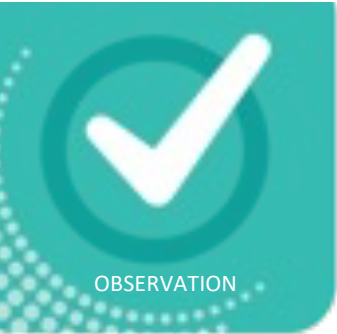
**REALCO**  
ENZYMES FOR LIFE



# Case #1 ▪ Plant based market Chicory root extract

Adapted POP procedure

STEP	SOLUTION	TIME
1. ORGANIC FOULING AUDIT	Organic Fouling 1	20 min
	Organic Fouling 2	20 min
	Organic Fouling 3	20 min
	Organic Fouling 4	20 min
<i>Rinsing</i>		
2. INORGANIC FOULING AUDIT	Inorganic Fouling A4	20 min
<i>Rinsing</i>		



# Case #2 ▪ Plant based market ▪ Chicory root extract

Significant changes during the audit



Results:

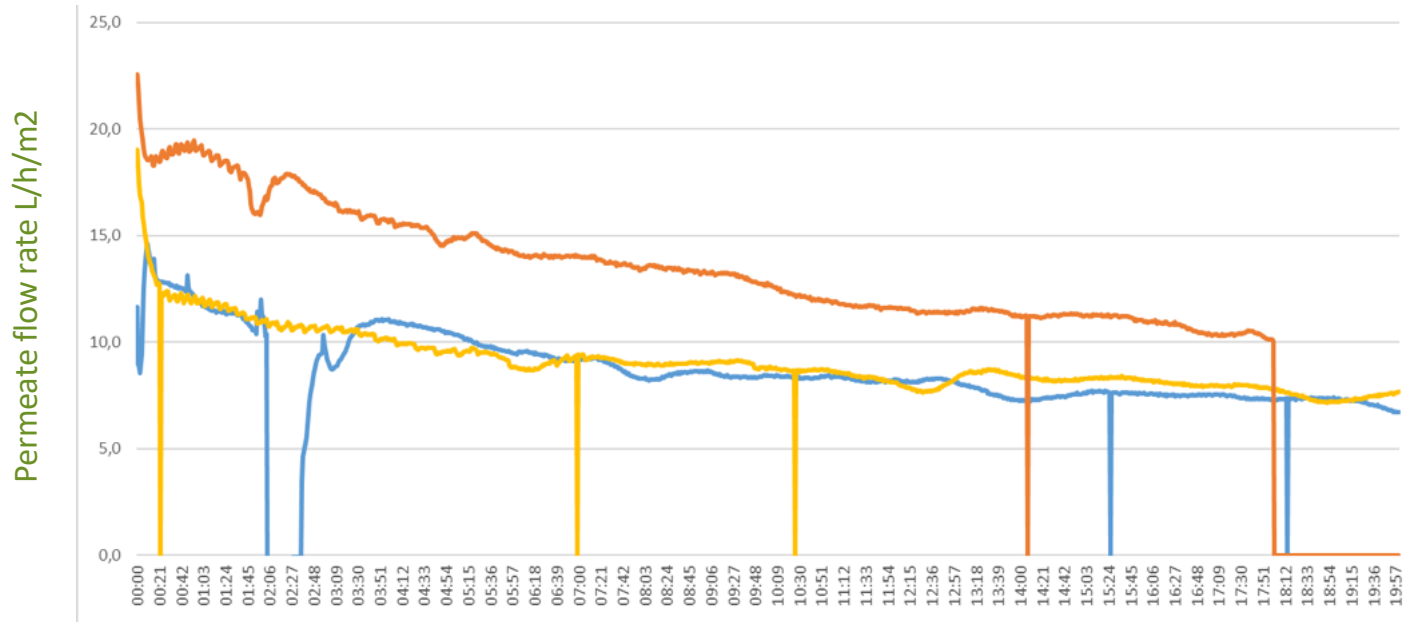
- > water flux before audit: 10 L/h/m<sup>2</sup>
- > water flux after audit: 18 L/h/m<sup>2</sup>



## Case #2 ▪ Plant based market ▪ Chicory root extract

Significant changes during the audit

OBSERVATION

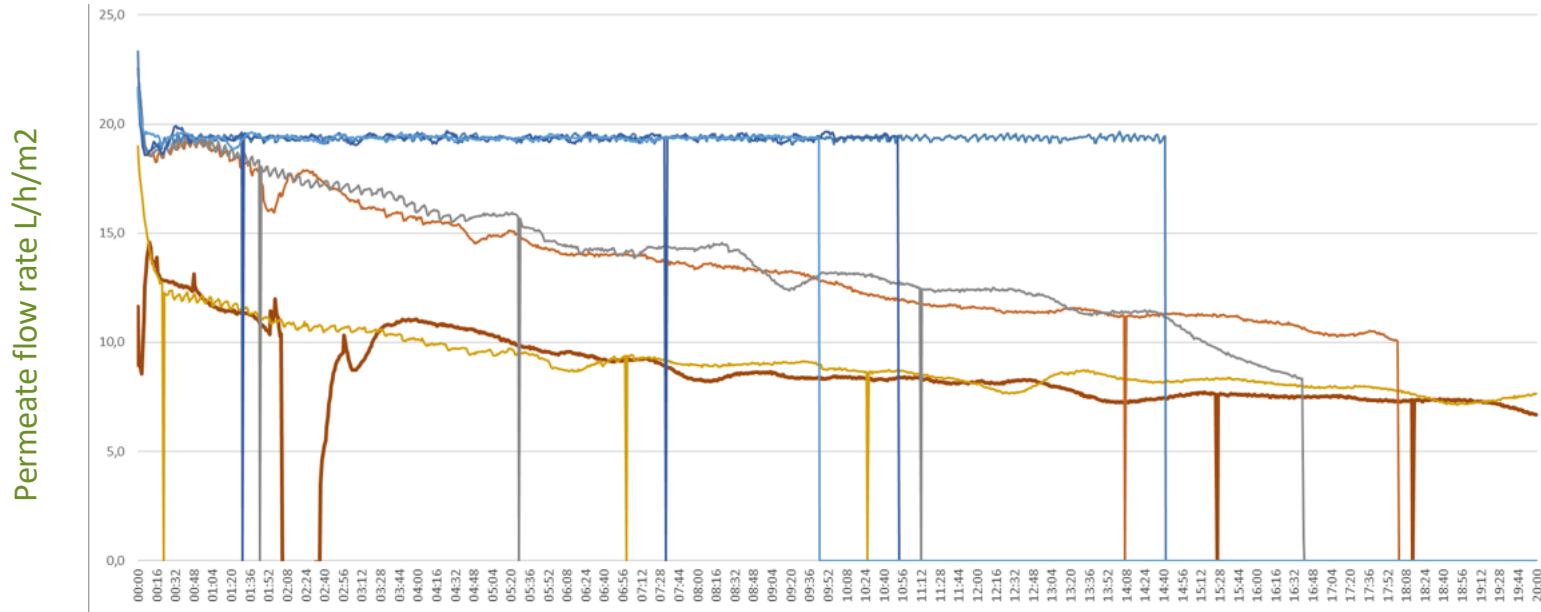
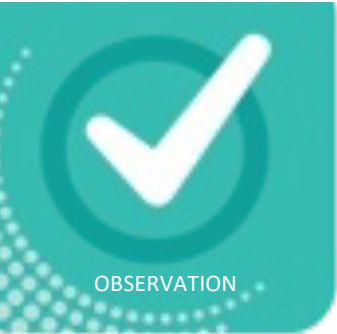


Situation right after the audit



# Case #2 ▪ Plant based market ▪ Chicory root extract

Significant changes during the audit



Situation after 2 weeks





# Case #2 ▪ Plant based market ▪ Chicory root extract

Implemented daily cleaning procedure

DAILY CLEANING PROCEDURE	SOLUTION	TIME
<i>Initial Rinsing</i>		
1. ENZYMATIC RECIRCULATION	Filzym <b>161</b>	30-40 min
<i>Intermediate Rinsing</i>		
2. ACID RECIRCULATION	Filzym <b>D2</b>	20-30 min
<i>Intermediate Rinsing</i>		
3. ALKALINE RECIRCULATION	Filzym <b>K2</b>	20-30 min
<i>Final Rinsing</i>		

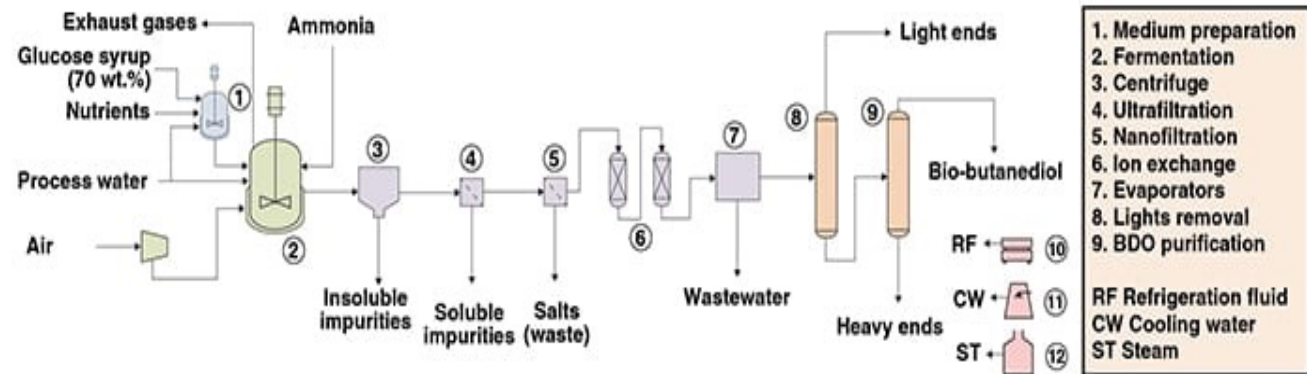


TARGET

## Case #3 ▪ Bioplastic market ▪ BDO application

### Fouling characterisation

- **Bio-BDO (Bio-butanediol)** is a plastic made from renewable resources
- Bio-BDO is 100% bio-based and biodegradable
- The main plastic applications are packaging, shopping bags and tableware



Sources: <https://bioplasticsnews.com>  
<https://www.chemengonline.com/bio-butanediol-production-glucose/>

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enzymes for Life

**REALCO**  
ENZYMES FOR LIFE

# Case #3 ▪ Bioplastic market ▪ BDO application

Adapted POP procedure

STEP	SOLUTION	TIME
1. ORGANIC FOULING AUDIT	Organic Fouling 1	20 min
	Organic Fouling 2	20 min
	Organic Fouling 3	20 min
	Organic Fouling 4	20 min
<i>Rinsing</i>		
2. INORGANIC FOULING AUDIT	Inorganic Fouling A4	20 min
<i>Rinsing</i>		

## Case #3 ▪ Bioplastic market BDO application

Significant changes during the audit

OBSERVATION

### Before

- Previous enzymatic cleaners were not effective
- Reduced membrane life due to falling fluxes

### After

- Fluxes rates recovered on already installed membranes
- New membranes maintained fluxes and performances



## Case #3 ▪ Bioplastic market ▪ BDO application

Implemented daily cleaning procedure



DAILY CLEANING PROCEDURE	SOLUTION	TIME
<i>Initial Rinsing</i>		
1. ENZYMATIC RECIRCULATION	Filzym <b>161</b>	30-40 min
<i>Intermediate Rinsing</i>		
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<i>Intermediate Rinsing</i>		
3. ALKALINE RECIRCULATION	Filzym <b>K2</b>	20-30 min
<i>Final Rinsing</i>		



# Benefits to use enzymes in filtration plants



Reduce cleaning time



Increase production rates



Extend membrane life



Save water & energy



Reduce production costs



With sustainable products



# RECOMMENDATION

We select the *perfect blend* for your equipment

Range	Type of product	References	
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		Filzym 31	<b>Filzym 35</b>
		Filzym 50	Filzym 60
		Filzym 70	







## Take home messages

- Thanks to its non-destructive POP audit designed for each industrial segment, Realco is able to clearly identify the nature of residues that may reduce equipment efficiency.
- The full analysis of this audit will result in the recommendation of the most effective cleaning procedure to remove all residual fouling which may consist of organic, inorganic or biofilm compounds.
- To optimize filtration process, guarantee productivity, prevent microbiological contamination and ensure equipment life time: **efficient cleaning is key.**

Q&A



# THANK YOU FOR YOUR ATTENTION

& SEE YOU AT OUR BOOTH

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