Water – Product – CIP recovery

Enhancing sustainable production

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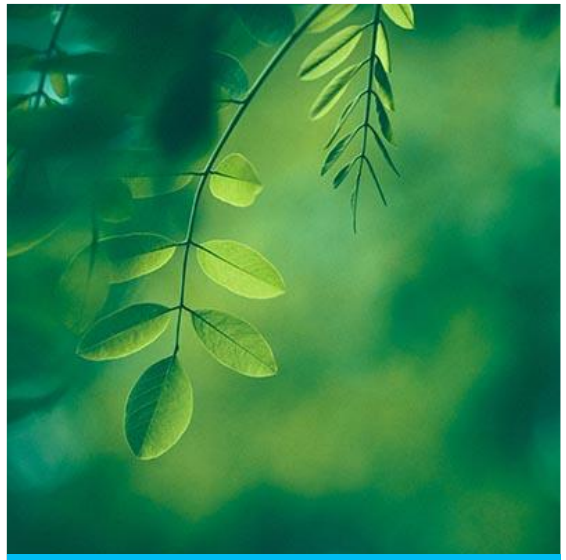
Tetra Pak®
PROTECTS WHAT'S GOOD

Sustainability

An integrated part of your filtration solution

Water recovery

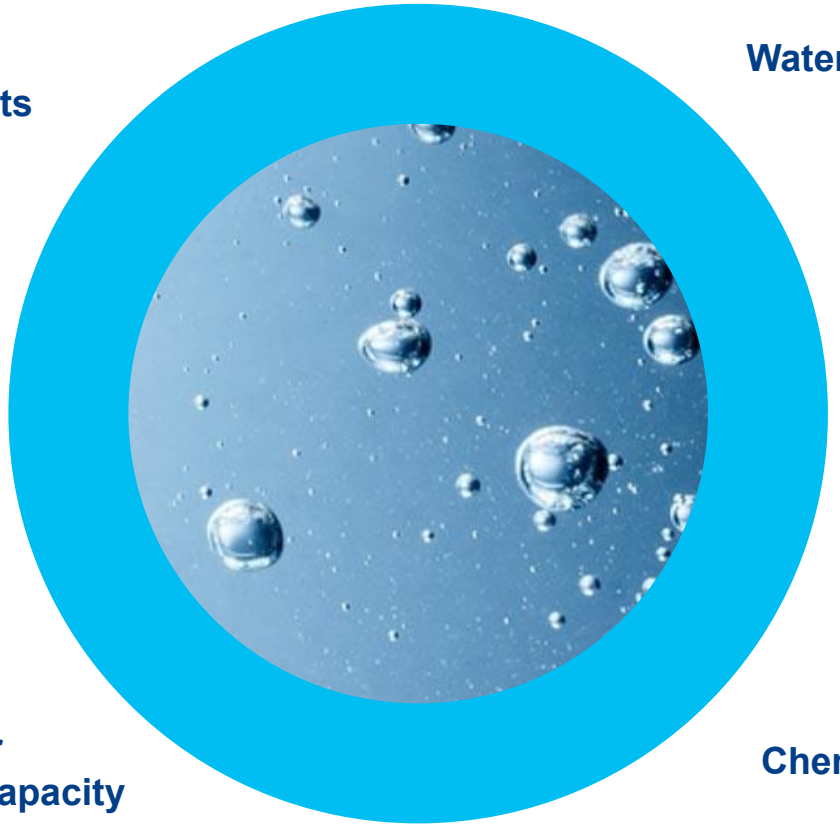
Product recovery



CIP recovery

Drivers and push backs?

Water and CIP recovery

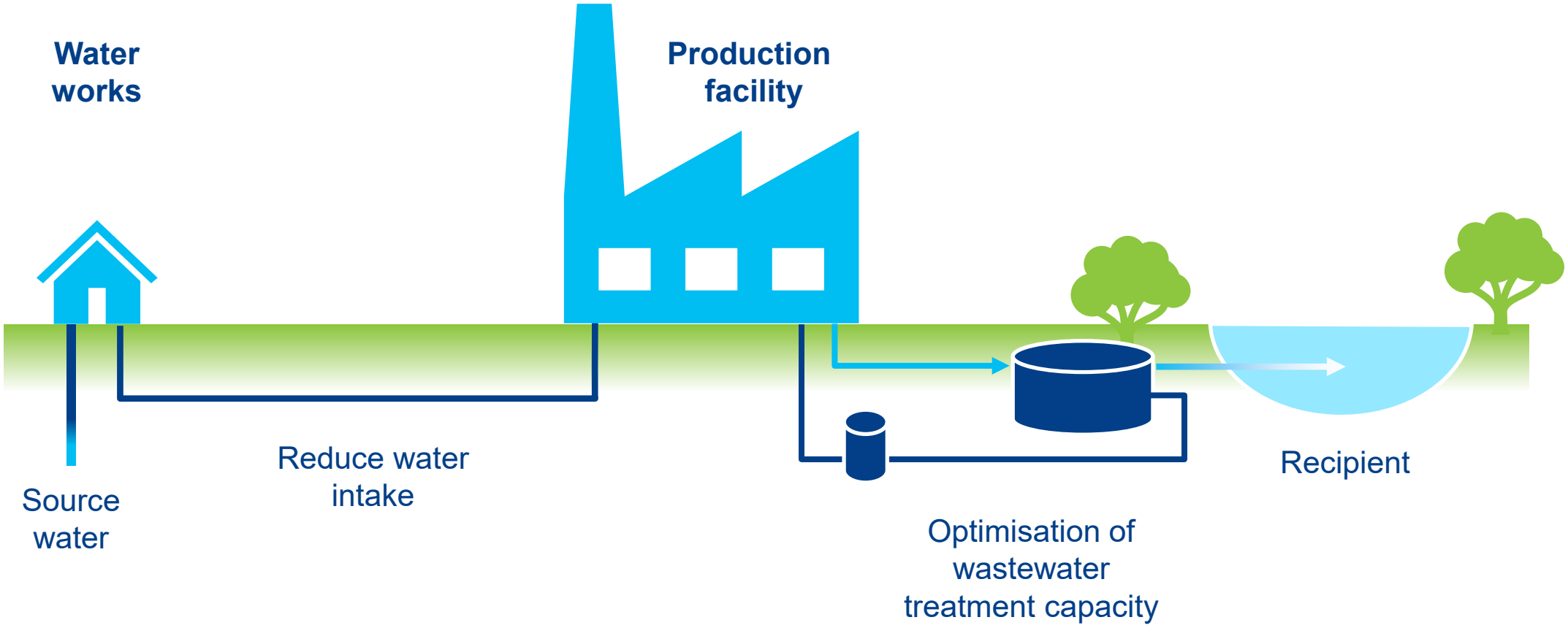


Water recovery – minimize water footprint

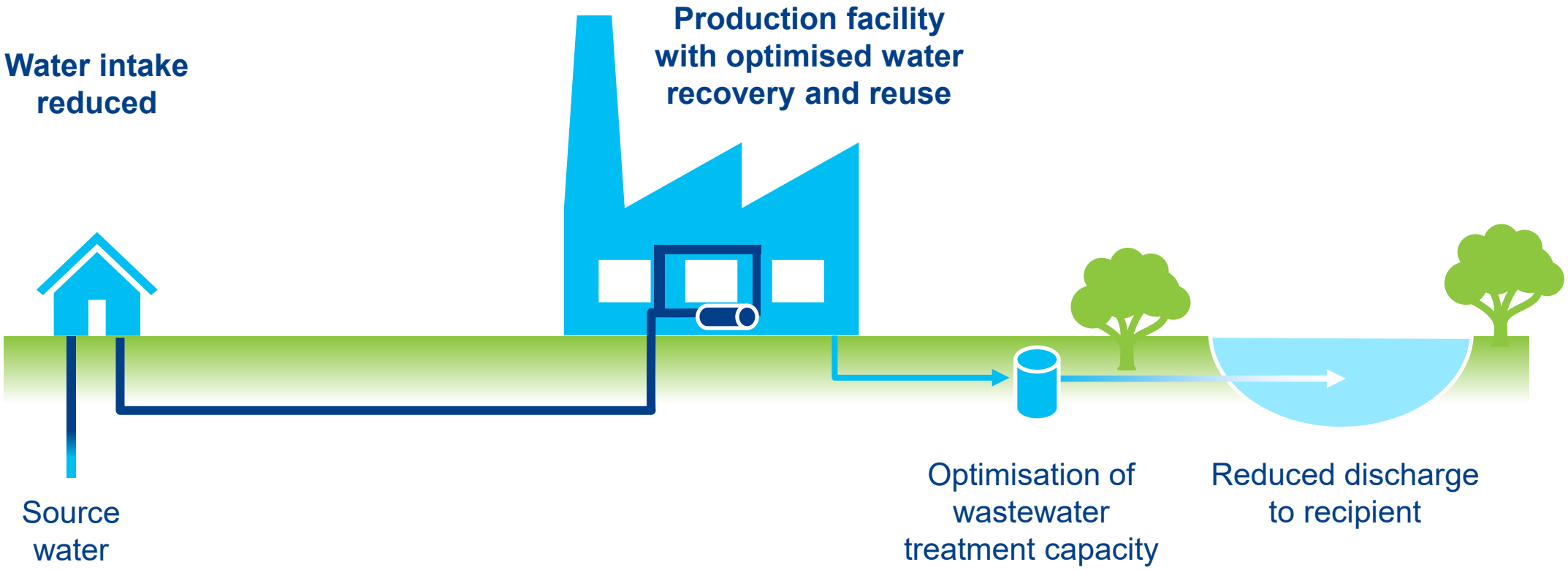

PROTECTS
Tetra Pak
WHAT'S GOOD
DON'T LOOSE
what you can
USE
Treated excess water can be used in processing, as its quality is often better than the existing tap water

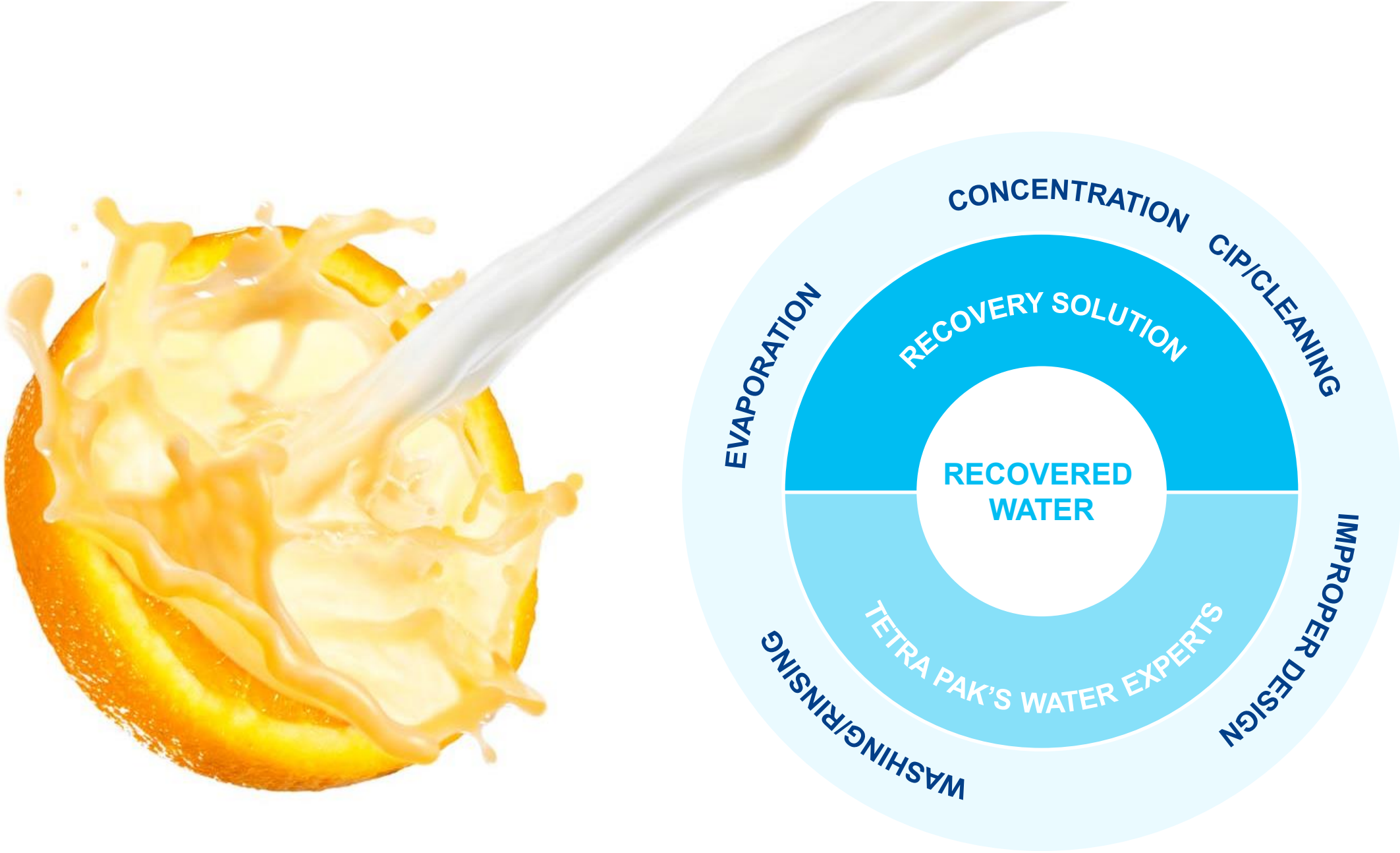
Legislation on water

Drinking water guidelines → Food production legislation → Wastewater discharge requirements



Legislation on water



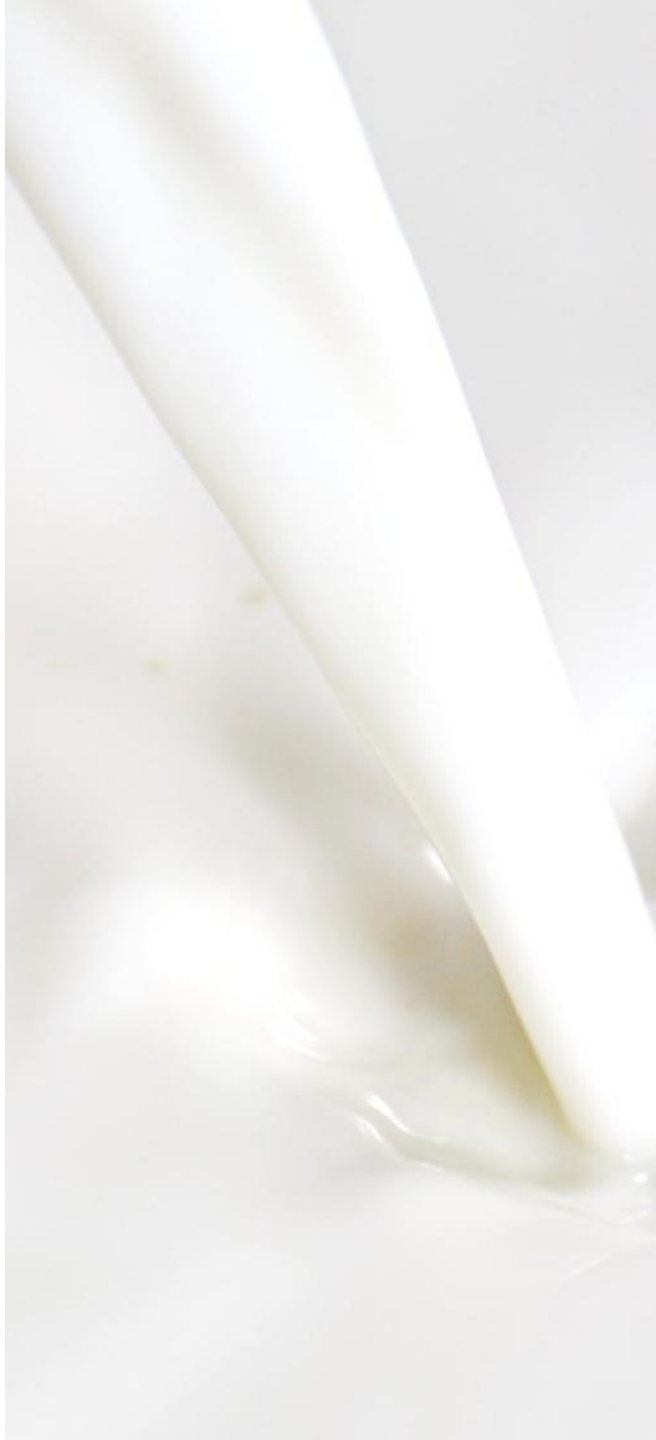

CONCENTRATION
CIP/CLEANING
IMPROPER DESIGN
WASHING/RINSING
EVAPORATION
RECOVERY SOLUTION
RECOVERED WATER
TETRA PAK'S WATER EXPERTS

Major sources

For water recovery in dairies

Reverse Osmosis of…

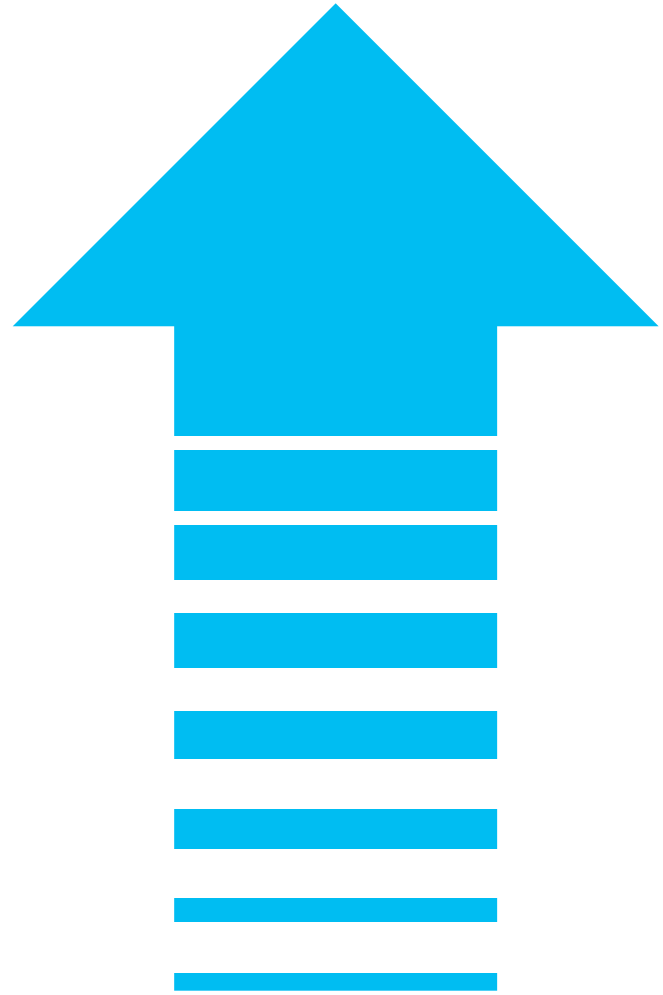
- …whey in cheese production
- …permeate from milk concentration
- …white water in liquid milk processes, oranges or other products
- …evaporator condensate from milk and whey



Recovered water

Where can it be used?

- Product contact (highest quality)
  …subject to local legislation
- Boiler water
- Flushing
- Cooling water
- CIP (pre rinse and middle flush)
- Irrigation of crops
- Cleaning of floor and other surfaces (lowest quality)



Water recovery by membrane filtration

Potential reuse of RO water

Non product Contact
Cooling towers
Boiler water
Irrigation of crops

Increasing **Quality** Demands

Product Contact
Product water
CIP/cleaning

Expert assesment

- Assessment of existing processes on site
- Alignment with local legislation
- Suggestions for improvement
- Testing of relevant applications

Application testing

Tetra Pak offers easy-to-use pilot filtration plants for rental

TOGETHER, we test and develop a sustainable solution for water recovery

White water recovery – reduce product and water loss

White water

- White water is the first flush water in connection with cleaning of processing equipment.
- It contains a mixture of milk and water with approx. 1/3 milk and 2/3 water.
- Milk flush water comes from road tankers and milk silos in the form of raw milk, but also as pasteurized milk from pasteurizers, pipes, milk silos, filling machines and filtration systems.
- Should be as fresh as possible and with no additives or foreign particles

Milk solids can be recovered from white water

Are you managing resources?

Recovered milk solids can be used for

- Yogurt
- Ice cream
- Cheese
- Fermented products

…subject to local legislation

EXAMPLE:

1 million liters of milk received per day can generate up to 40 tons of white water
(4% TS) = 1.6 tons milk solids/day

During a year, approximately 560 tons of milk solids

Water can be recovered from white water

Are you managing resources?

Recovered water can be used for:

Highest quality

- Process water ..subject to local legislation
- Boiler water
- Flushing
- CIP
- Cooling water
- Irrigation of crops
- Cleaning of floor and other surfaces

Lowest quality

- Discharge with low COD

EXAMPLE:

1 million liters of milk received per day can generate up to 40 tons of white water = 27,000 liters of water

During a year, approximately 10 million liters of water

2/3

Recovery as water

Filtration technology used for white water recovery

Reverse Osmosis

Reverse osmosis is a high pressure filtration process allowing only water and small amounts of lactic acid and some organic components to pass the membrane.

- Membrane
- Water
- Dissolved salts
- Sugars, amino acids
- Proteins, polysaccharides
- Particulates, colloids, bacteria

White water recovery

Customised solution

Tailored to specific requirements

Can be prepared for easy extension

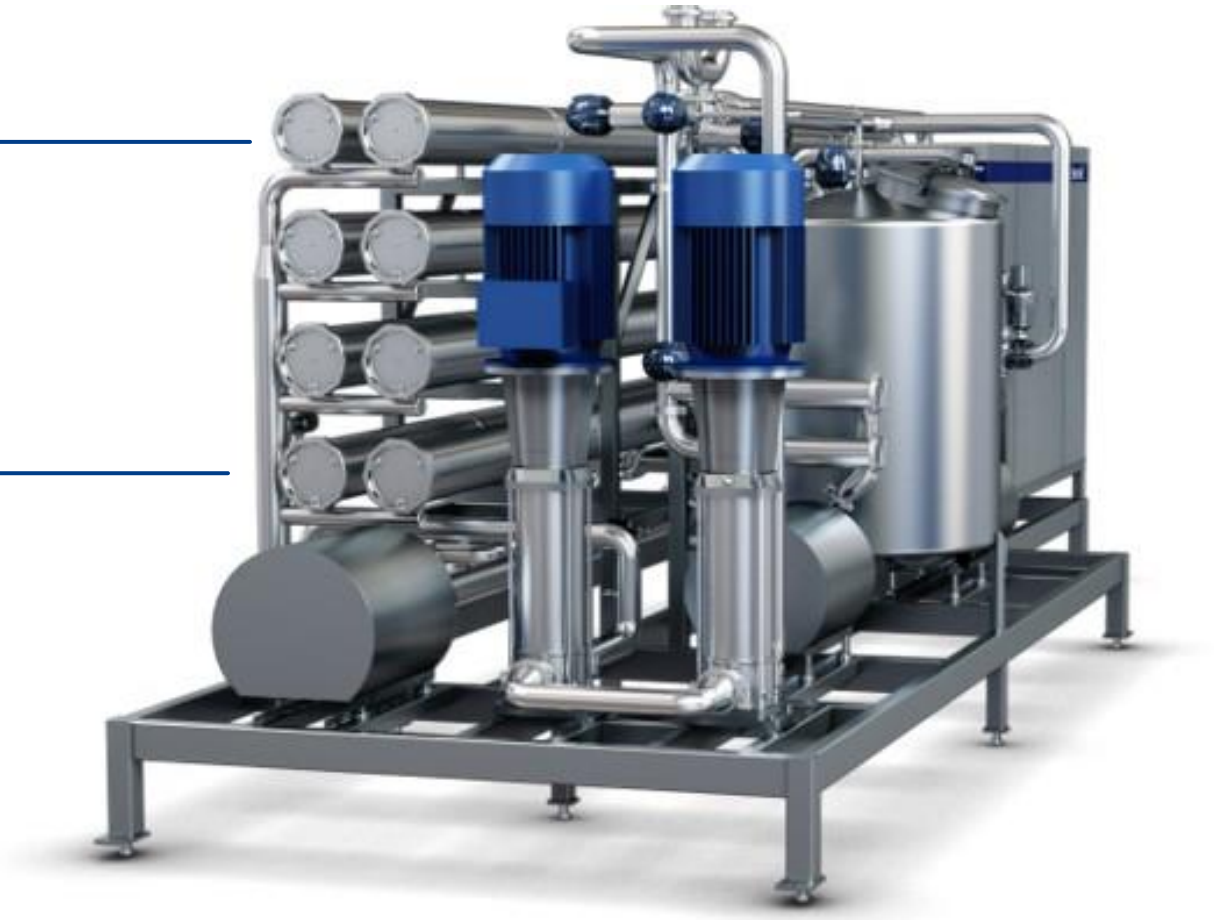
Flexible plant solution

White water with fat

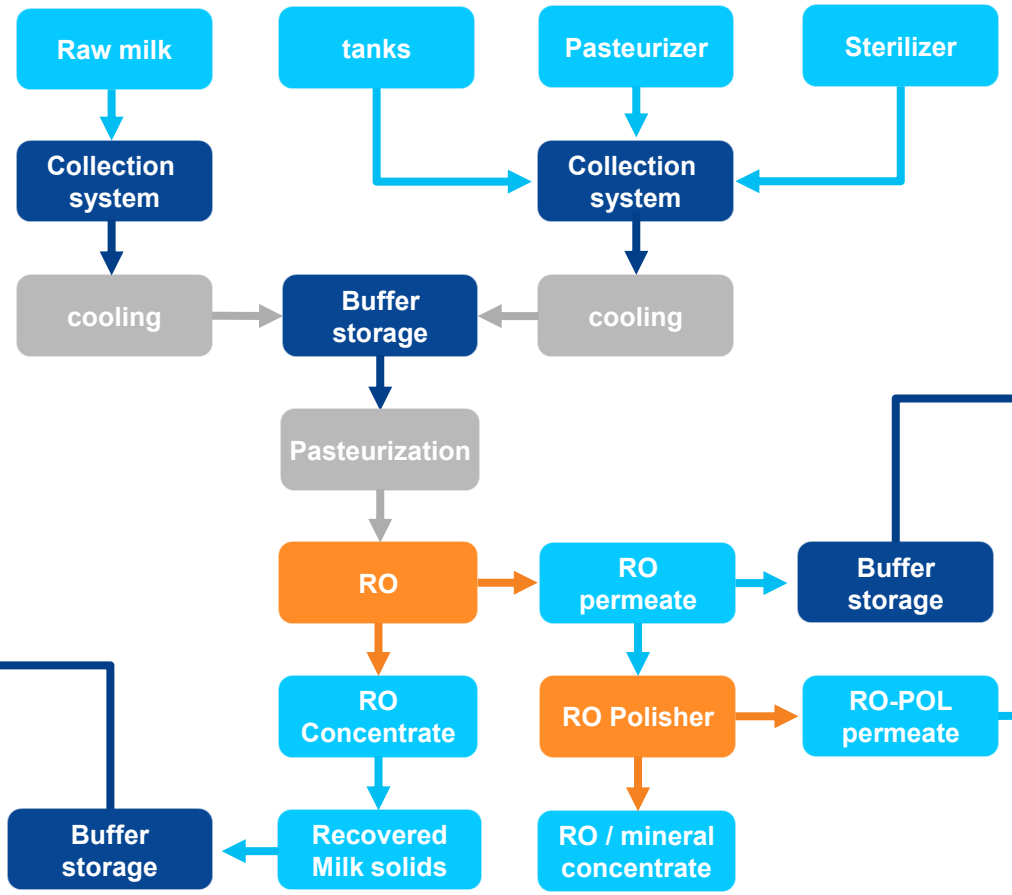
White water without fat

Possible to use the same plant for polishing of RO permeate
COD < 15 ppm

Batch or continuous operation



White water recovery – process possibilities



Utilization possibilities

for flush water

for CIP water

direct to drain

Reutilised into

Yogurt

Fermented products

UHT milk

Ice cream

Further treatment with a RO Polisher

for process water

for portable water

direct to drain

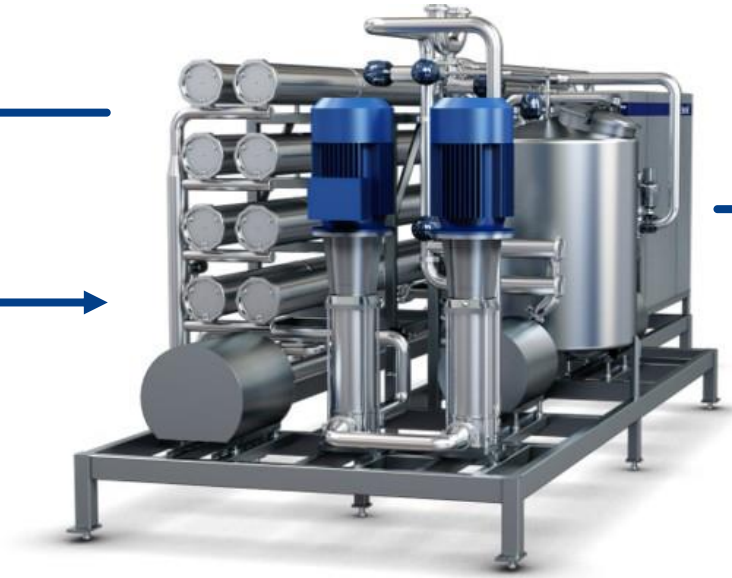
White water recovery

Operating conditions	
Pre-treatment:	Preferably pasteurisation, 72°C / 15 sec Alternatively, filtration is required
Operating time:	Maximum 10 hours between CIP (bacteriology)
Operating mode:	Batch or continuous
Operating temperature:	4-10°C
Concentration factor:	**2 - 8 VCF**

Filtration technology for recovery

Reverse Osmosis

RO plant



Batch concentration

RO permeate: recovered water

Recovered milk solids

White water from dairy processing plant

White water recovery

Typical composition of milk flush water

Typical composition of milk flush water	
Fat-free milk solids	2-6%
Fat	0-6 %

Typical composition of milk flush water permeate	
Total solids	< 0.1%
COD approx.	150 ppm

Typical composition of milk flush water retentate	
Total solids Non-fat	8-10%
Total solids	12-20%

Example – two dairies

	Medium sized dairy processor	Large dairy processor
Milk received per day, liters	**500,000**	**1,000.000**
Daily volume of white water (liters)	17,000	35,000
Milk solids in feed product (%)	4.0	4.0
Milk solids in retentate (%)	12.24	14.16
Recovered milk/day (kgs)	5,533	9,839
Investment (EUR)	200,000	350,000
Operation and capital cost(EUR)	84,000	146,000
Annual profit (EUR)	555,000	1,059,000
Payback period/ROI	**7 months**	**6 months**
Based on 350 production days and a milk price per kg of	€0.33	€0.35

Benefits of white water recovery

- Eliminates product loss
- Reduces need for water intake
- Reduces effluent
- Reduces operating costs
- Boosts earnings - rapidly
- Reduces environmental footprint

CIP recovery – enhance sustainability profile by minimizing waste using non-formulated CIP chemicals

Where are the opportunities

CIP chemical type

- Pure caustic (NaOH)
- Pure acid (HNO_3)

Type of CIP procedure

- CIP procedures that requires large volumes of CIP liquids
- CIP of 'hot processes' as evaporators, dryers, plate heat exchangers, UHT lines
- Recovery rate may depend on amount of solids in spent liquid (e.g. process performances)
- 65-90 % recovery of total spent CIP liquid

Why recover spent CIP liquids

Costs reduction through minimized...

- CIP liquids usage (caustic / acid)
- Energy consumption (steam)
- Water supply
- Wastewater discharge

Regulations and restrictions to support recovery...

- Required pH neutralization of wastewater
- Wastewater discharge limits
- Lack of water
- Use of pure CIP chemicals to avoid additives causing problem in wastewater

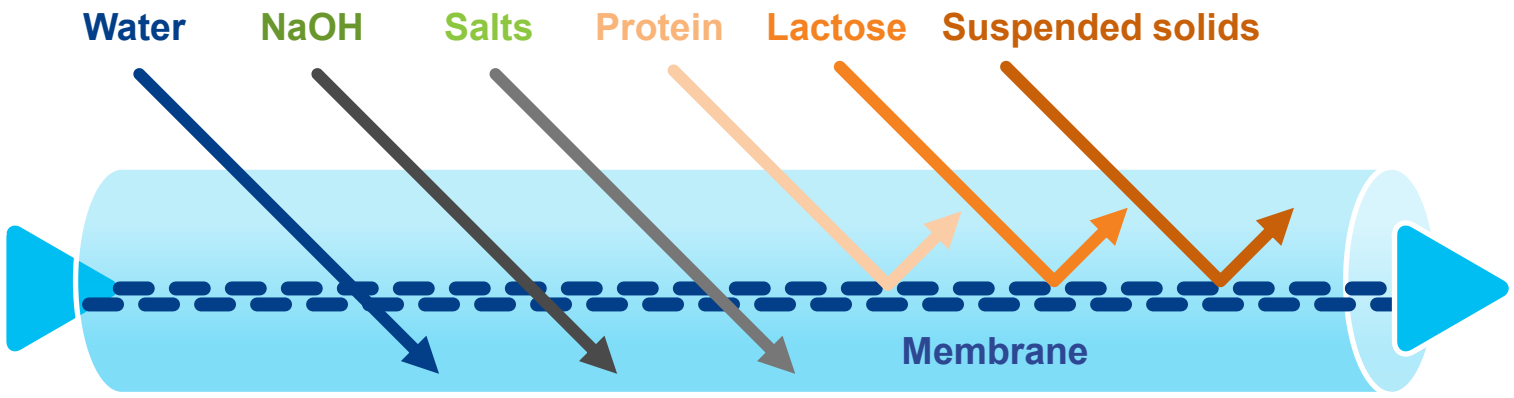
Why recover spent CIP liquids

Environmental benefits through reduction of...

- Hydraulic load to wastewater treatment plant
- 'Warm' discharge to wastewater treatment plant
- Salt levels in wastewater
- Reduce supply water intake

Principle of CIP recovery

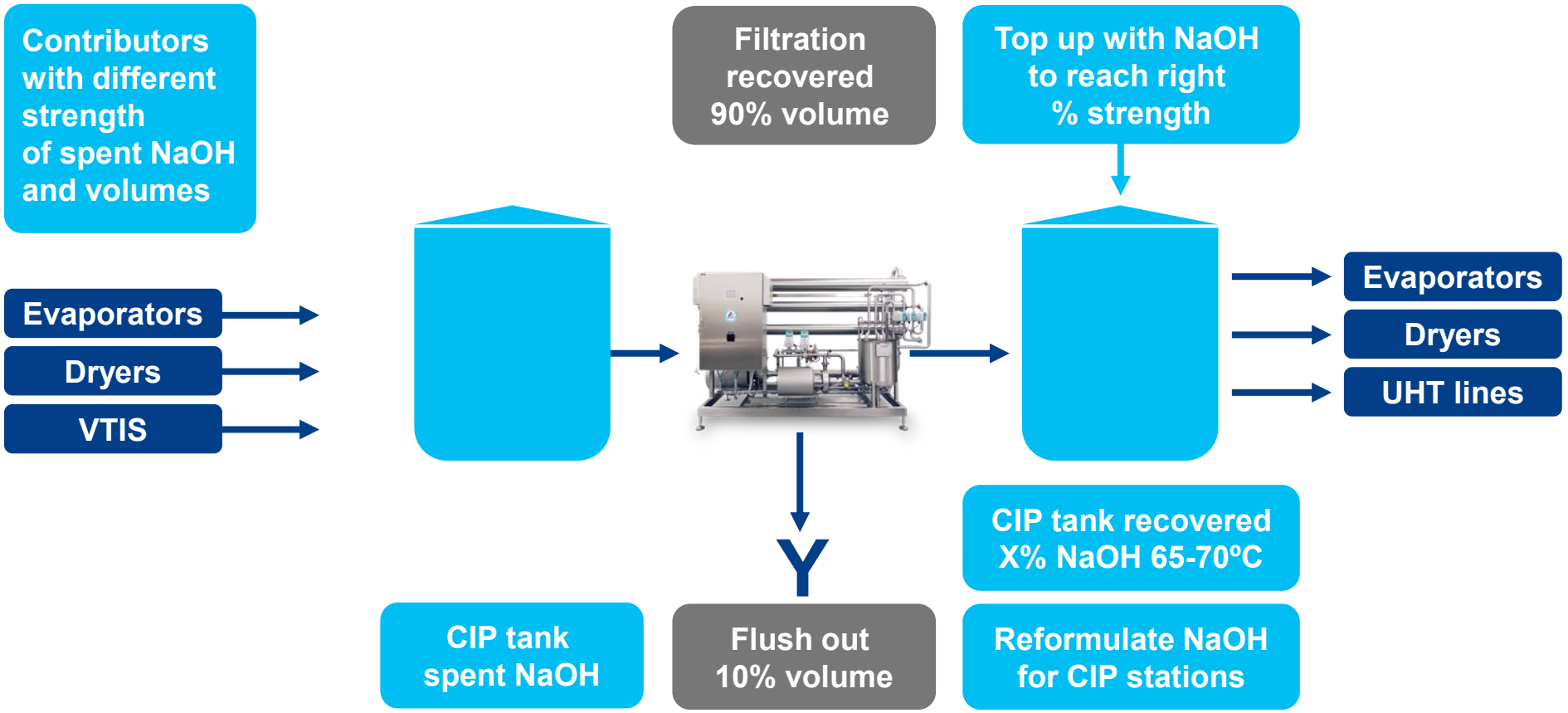
- Protein, fat, lactose and suspended solids are retained and concentrated
- Caustic can pass through the membranes and be recovered



Up to **90%** recovery of total spent CIP liquid

CIP recovery of caustic

Example with NaOH



CIP recovery – pilot trails

Why perform preliminary test or pilot trails

- Understand the composition of spent CIP liquids
- To ensure the correct treatment train for the specific process
- Validate specific parameters relevant to the production
- Optimisation of treatment to local conditions

Quality of recovered CIP liquids

- Experience show close to similar cleaning performance/ability as new liquids
- Minimal loss of cleaning strength
- Easy to boost up CIP liquids to required concentration
- Up to 90% retention of COD and lactose
- Possibility to continuously monitor quality (instrumental/visual)
- Removal of bacteria/spores
- No fat and protein
- Stainless steel design

Our message

Are you managing resources?

- Get more value out of your milk
- Protect the environment and natural resources
- Promote sustainable brand image

Recover your White water!

Tetra Pak Filtration Solutions
filtration.info@tetrapak.com
www.tetrapak.com/membrane-filtration/

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