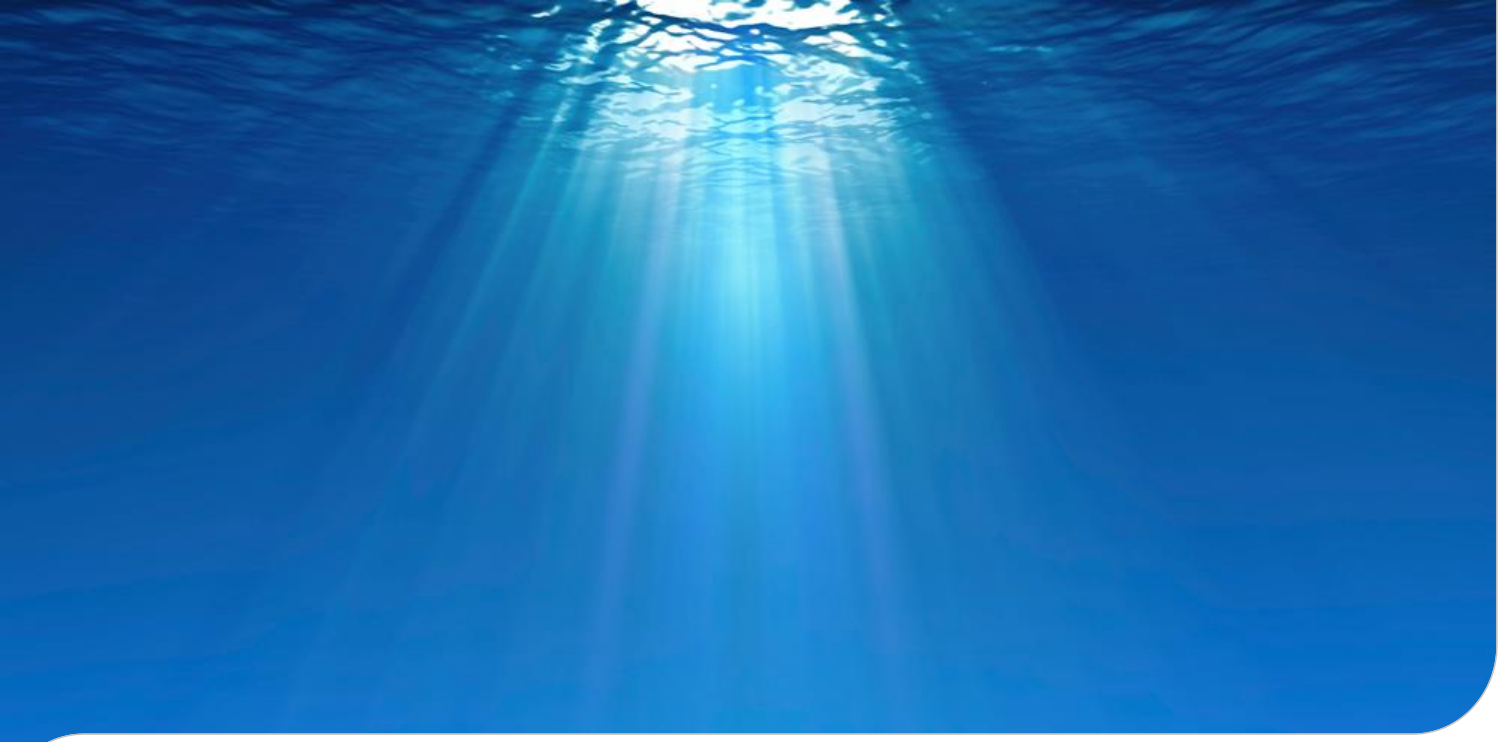


Go clear with AlfaFlash ZLD

– Custom solutions for zero liquid discharge

Patrick Horner
Process Specialist
Waste Evaporation and ZLD
BU Food Systems Evaporation

Our purpose

– Advancing better™

What we'll talk about today

– Agenda

- Identify how ZLD may benefit your specific application
- Overview of Alfa Laval ZLD technology
- Example case studies

What are you interested in learning today?

Wastewater industries

− Which industries are the most water-intensive industries you know?

Starch

- Corn steep liquor
- Ion exchange
- Anaerobic digestion

Sugar

- Decolourization

Beverage

- Water intake treatment

Pharmaceuticals

- Cleaning-in-Place (CIP) waste
- Biowaste

Dairy

- CIP waste
- Mixed waste
- Milk water

Protein

- Vegetable
- Fish
- Poultry

Municipal waste management

- Landfill leachate

Meat processing

- Hide curing

Biochemicals

- Bioethanol (pharma)
- Fermentation
- Distillation

Edible oils

- Vegetable oils
- Palm oil

Phosphorus recovery

- H_3PO_4 concentration

Canned food

- Cooking waste

Wastewater industries

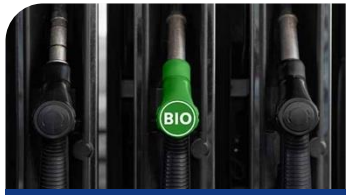
− How do industiries in your region align themselves with water?

Mining

- Solution mining
- Tailings
- Storage cavern development

Oil and gas

- Produced water
- Shale gas
- Steam-assisted gravity drainage



Biofuels

- Biodiesel
- Hydrotreated vegetable oil (HVO)
- Bioethanol (fuel)

Inorganic chemicals

- Potash

Waste to energy

- Biogas production

Electronics

- Chip washing

Textiles

- Desizing
- Bleaching
- Dyeing
- Finishing

Industrial recycling

- Battery recycling
- Electronics recycling

Power generation

- Flue gas treatment
- Cooling tower blowdown
- Concentrated solar

Pulp and paper

- Debarking
- Pulp washing
- Bleaching
- Medium-density fibre-board manufacturing

Refinery and petrochemical

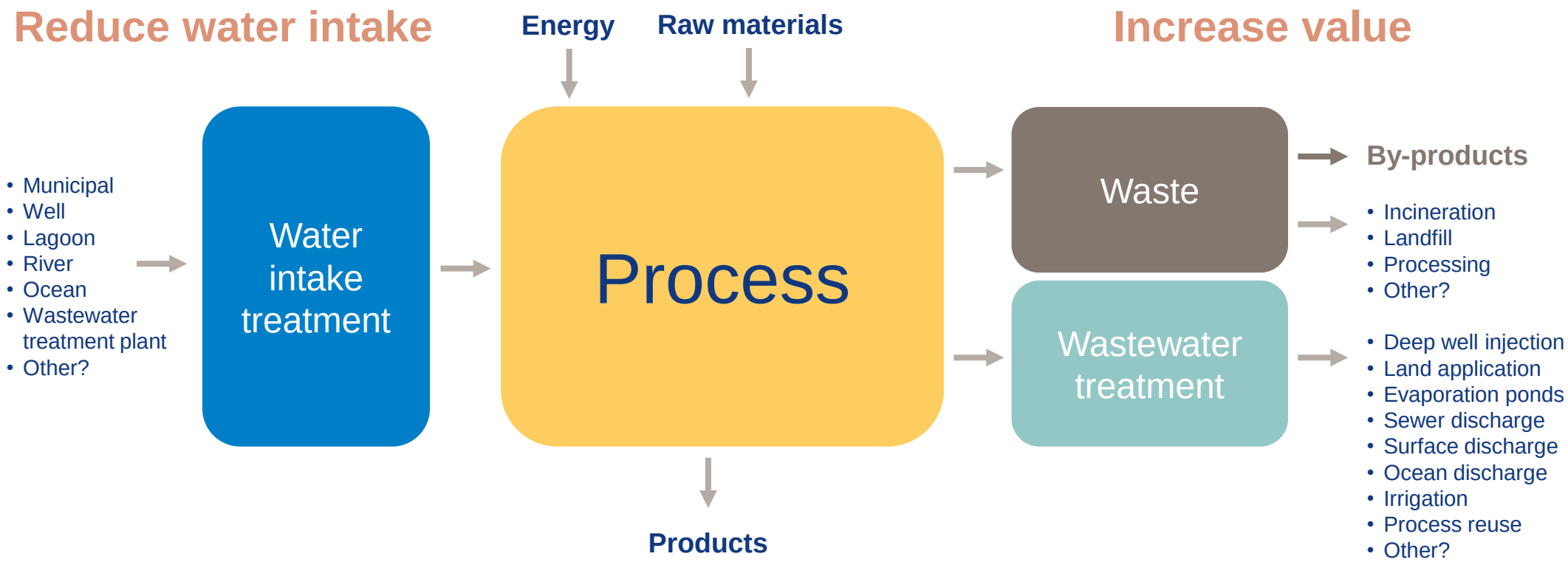
- Desalter effluent
- Sour water
- Tank bottoms
- Spent chemicals

Manufacturing

- Part washing
- Cutting and machine

Why waste evaporation and ZLD?

– Can you map how water moves through your process?



Industrial wastewater-generating processes

− What are the water-intensive processes in your industry?

Storage

- Evaporation ponds
- Tailings ponds
- Cavern storage

Ion exchange

- Ion exchange (IX) regen waste

Reverse osmosis

- Reverse osmosis (RO) reject

Heating

- Boiler blowdown

Cooling

- Cooling tower blowdown

Scrubbing

- Flue gas desulphurization
- Wet electrostatic precipitator

Cleaning and washing

- CIP waste
- Waste wash water

Fermentation

- Stillage
- Vinasse

Distillation

- Stillage
- Spent wash
- Tower bottoms

Curing / brining / cooking

- Spent brine
- Hide brine
- Cooking water

Separation and dewatering

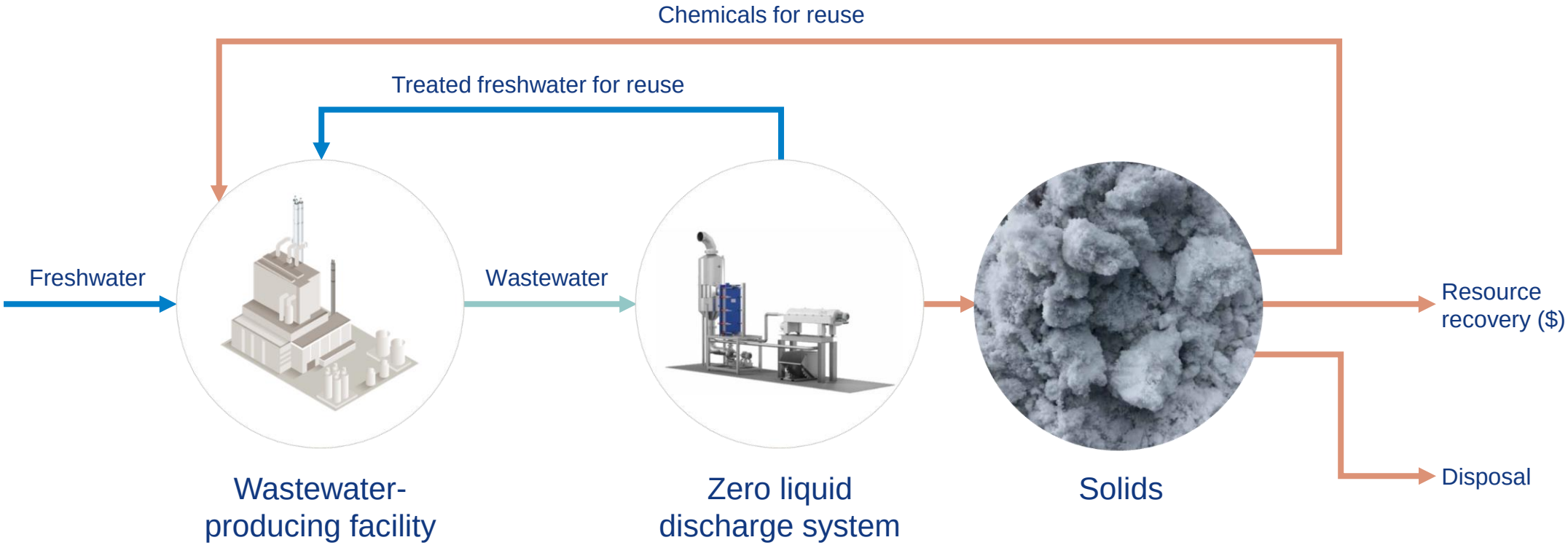
- Black water

Anaerobic digestion

- Anaerobic digestion reject

Waste evaporation and ZLD

− How could a ZLD system benefit your facility?



Impact factors

– What water factors impact your business the most?

- Water availability?
- Disposal costs?
- Regulations?
- Risk tolerance?
- Demand for sustainable products?

ZLD drivers

− What is driving you towards ZLD?

Reduce intake

Beneficial reuse

Eliminate storage

Minimize waste

Sustainability

Regulations

Recover products

Recover energy

Solid waste

Reduce risk

Your journey towards ZLD

− What can Alfa Laval help you with?

Testing and piloting

Pre-assembly

Start-up
commissioning support

Performance audits

Components
and engineering

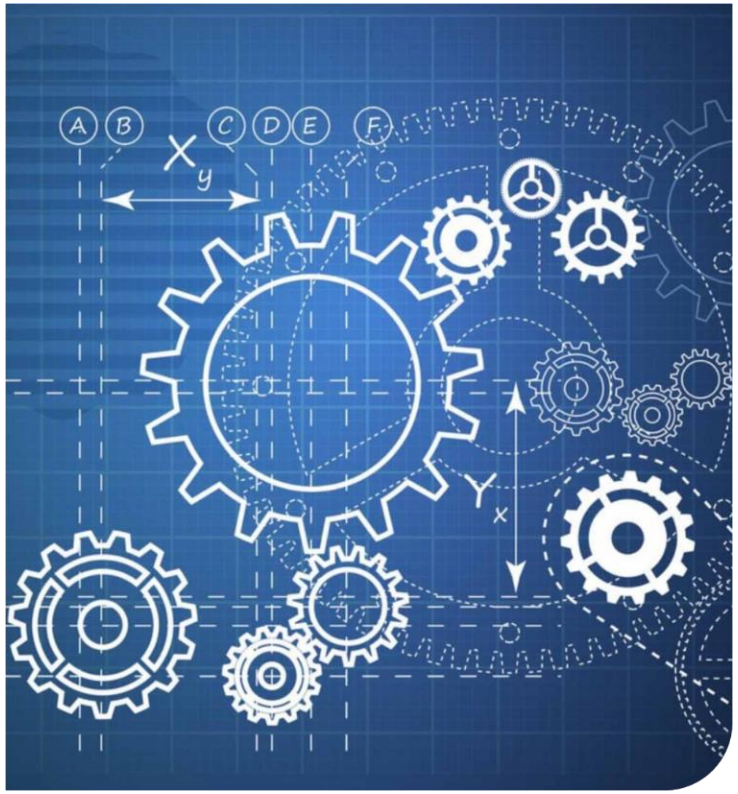
Installation support

Connected services

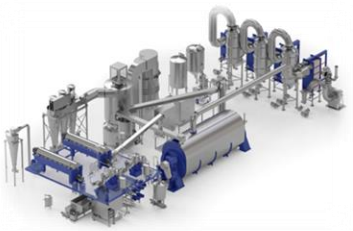
Service

Integrated systems

− Custom system solutions for specific applications



- Diverse technology
- Optimized process
- Flexible configuration
- Adaptive design



AlfaFlash

− Forced circulation flash evaporation system

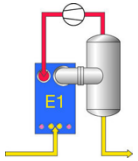
Key benefits

- Compact
- Self cleaning
- Easy to maintain

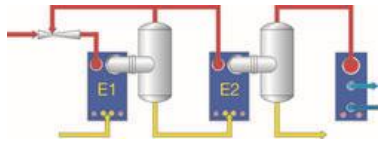
Ideal for concentrating:

- Fouling fluids
- Corrosive fluids
- Viscous fluids

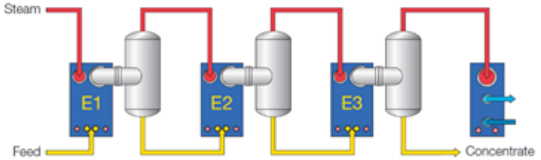
Mechanical vapour recompression – electrical power



Thermal vapour recompression – medium-pressure steam

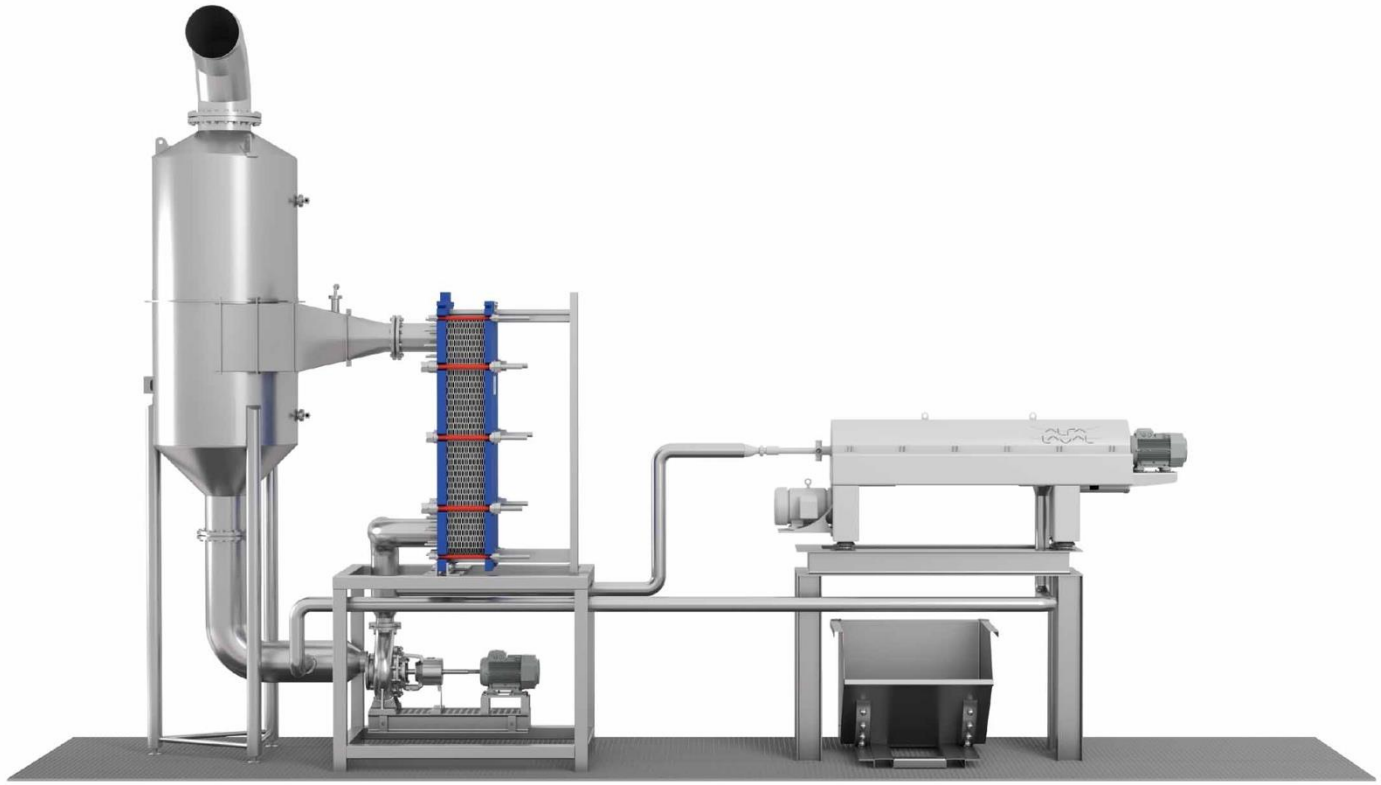


Multi-effect distillation – low-pressure steam and hot water



AlfaFlash ZLD

− Forced circulation flash evaporation (concentration) and decanter centrifuge (dewatering)



Key benefits

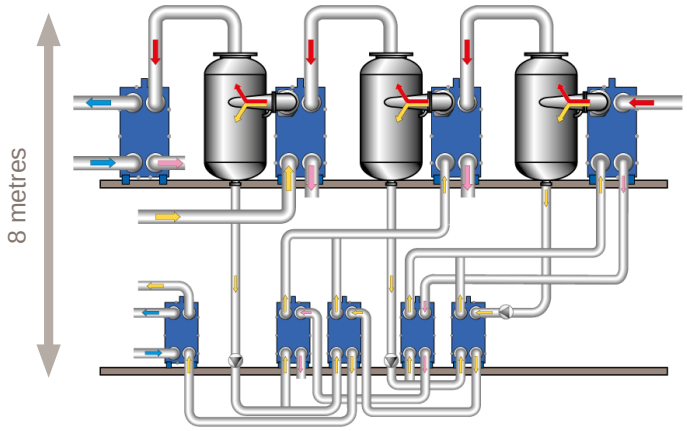
- Maximum recovery
- Minimum waste
- Solid product

Ideal for:

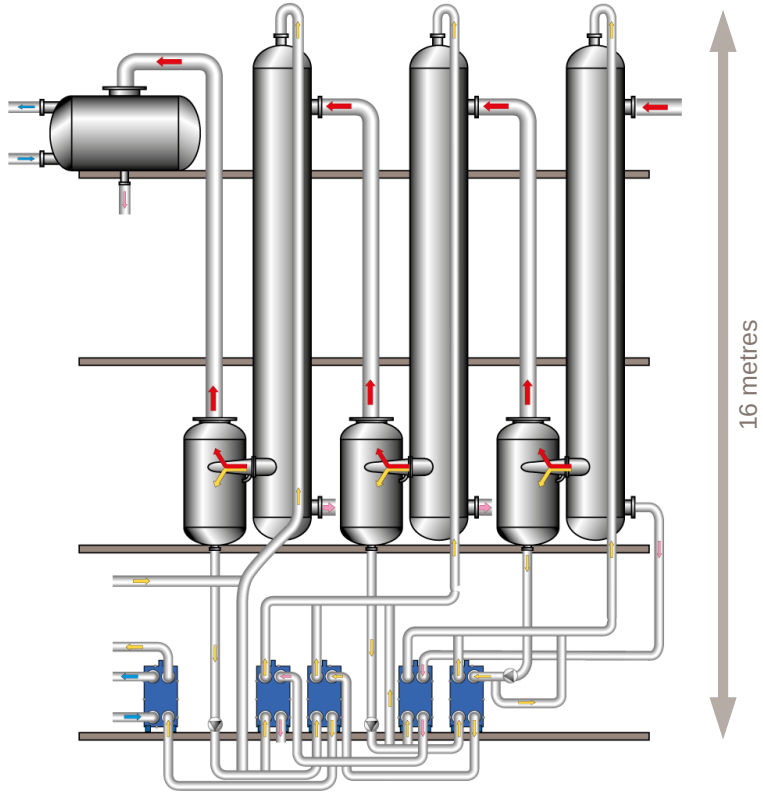
- Water reuse
- High disposal costs
- Changing regulations

More compact

− Reduced size, lower installation costs, smaller building



Alfa Laval plate-and-frame

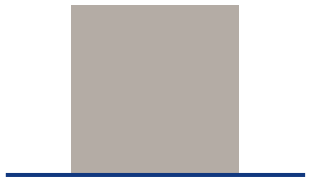


Shell-and-tube falling film

Self-cleaning

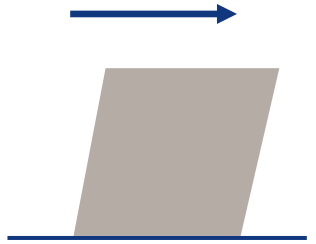
− More uptime and less cleaning

V = 0
τ = 0



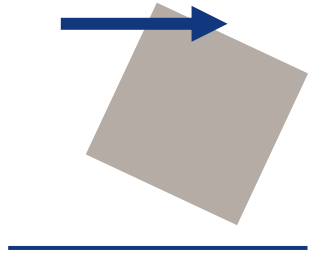
1. No shear

V = low
τ = low



2. Insufficient shear for solids removal

V = high
τ = high

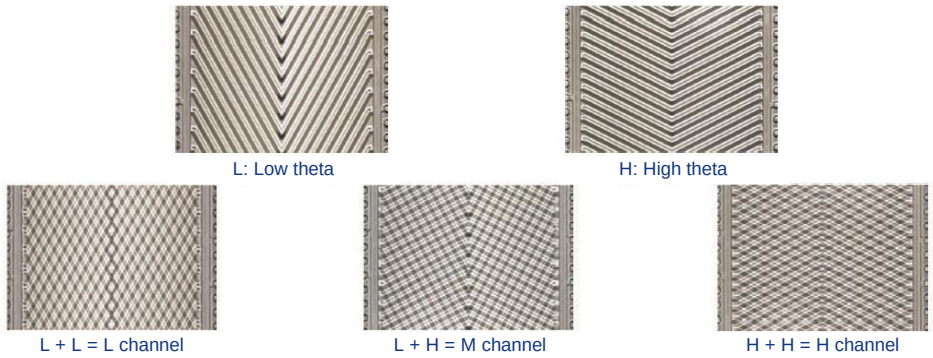


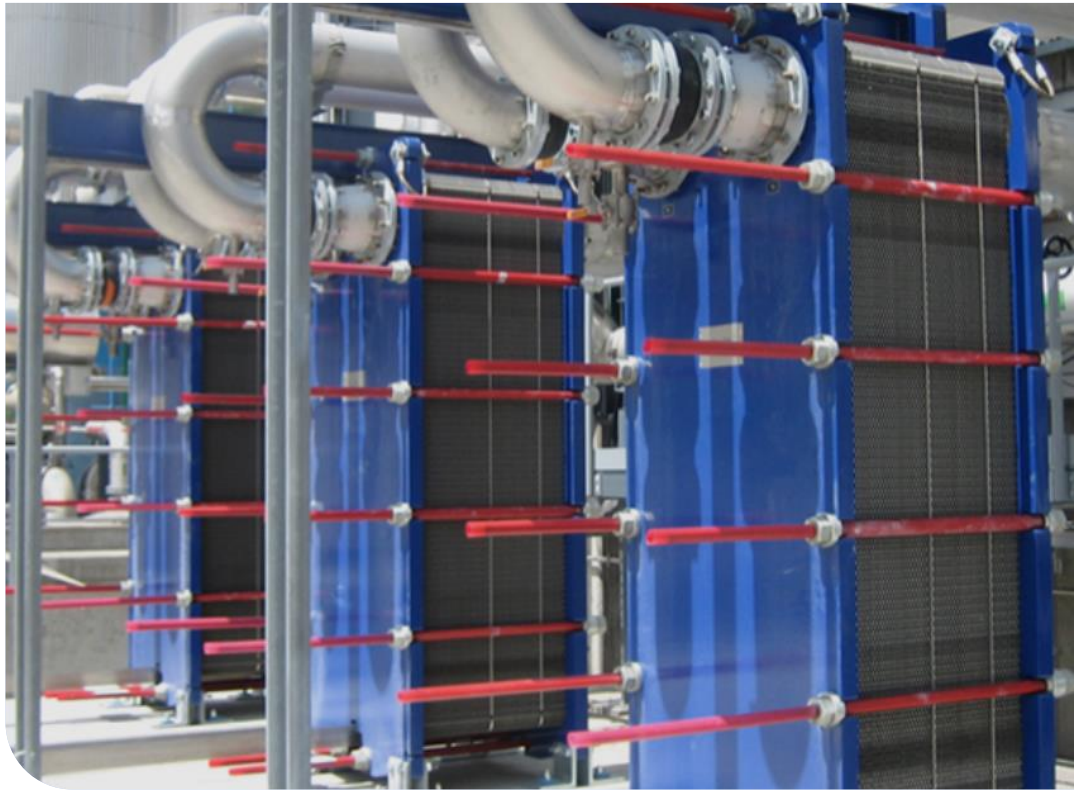
3. Sufficient shear for solids removal (self-cleaning)

Easy to maintain

− Flexible, adaptable and accessible

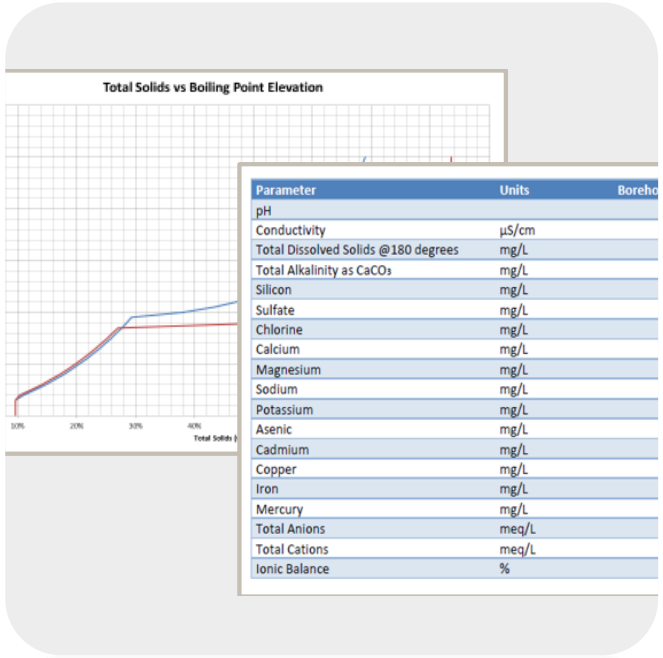
- 100% access to heat exchanger surfaces for cleaning and inspection
- Plates can be added or removed
- Plate geometry can be changed
- Plate material can be changed





Testing options

− Reduce unknowns and risks by learning big on a small scale



Parameter	Units	Boreho
pH		
Conductivity	µS/cm	
Total Dissolved Solids @180 degrees	mg/L	
Total Alkalinity as $CaCO_3$	mg/L	
Silicon	mg/L	
Sulfate	mg/L	
Chlorine	mg/L	
Calcium	mg/L	
Magnesium	mg/L	
Sodium	mg/L	
Potassium	mg/L	
Asenic	mg/L	
Cadmium	mg/L	
Copper	mg/L	
Iron	mg/L	
Mercury	mg/L	
Total Anions	meq/L	
Total Cations	meq/L	
Ionic Balance	%	

Water analysis and computer modeling

Bench top tests

Field pilot

Primary risks and the Alfa Laval advantage

− Minimize risk and maximize success

Primary ZLD risks

Corrosion

Fouling

Unknowns

Corrosion resistance

Self cleaning

Experience and testing

Alfa Laval advantages

Olive oil – dewatering centrate black water

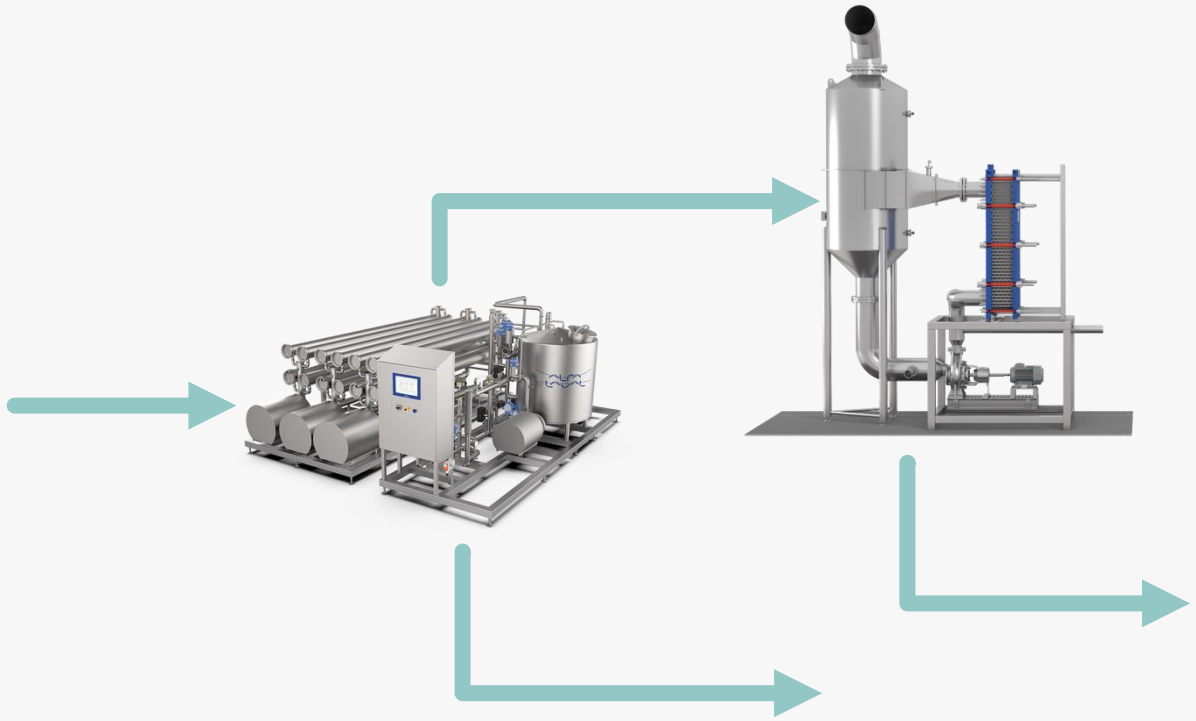
– Medium liquid discharge for husk dewatering

Key drivers

- Eliminate evaporation pond
- Beneficial reuse

Cane sugar – sugar decolourization

– Medium liquid discharge for ion exchange regeneration brine

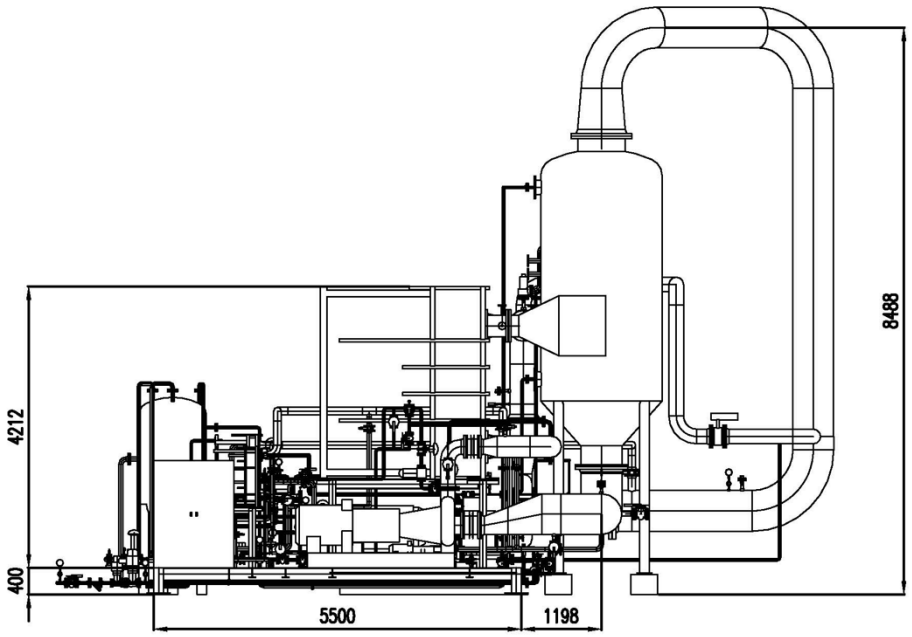


Key drivers

- Brine reuse
- Process reuse

Waste management – landfill leachate treatment

– Zero liquid discharge for reverse osmosis reject



Key drivers

- Minimize waste
- Beneficial reuse

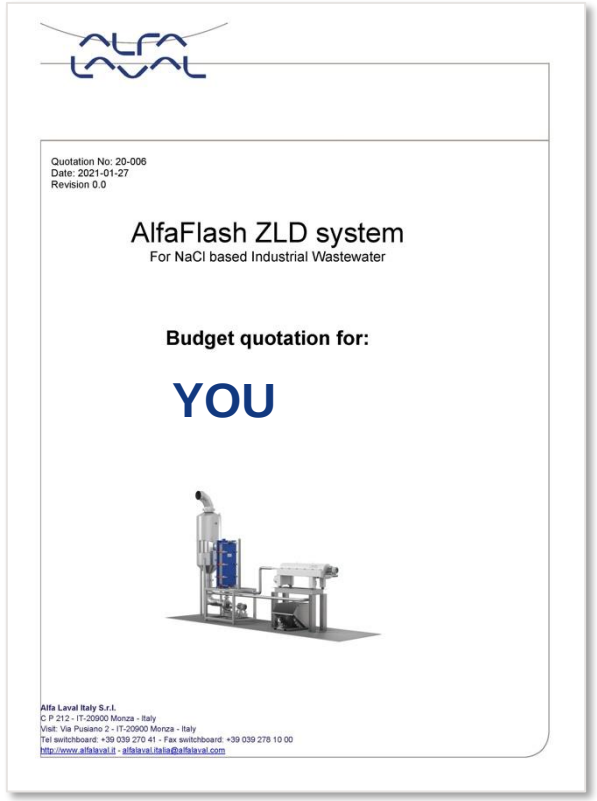
The advantages of zero liquid discharge

– Summary

- Reuse water
- Minimize waste
- Reduce risk
- Exceed regulations
- Improve sustainability

Want to learn more about how ZLD can work for you?

Company name	Who are you?
Location	Where are you?
Industry	What do you make?
Process	How do you make your product?
Application	What type of wastewater do you want to treat?
Capacity	What is the flow rate?
Composition	What are the components and concentration?
Goal	What do you want to accomplish?
Drivers	What factors make ZLD important to you?
Energy	What energy do you have available?


Quotation No: 20-006
Date: 2021-01-27
Revision 0.0

AlfaFlash ZLD system
For NaCl based Industrial Wastewater

Budget quotation for:

YOU

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Any further questions

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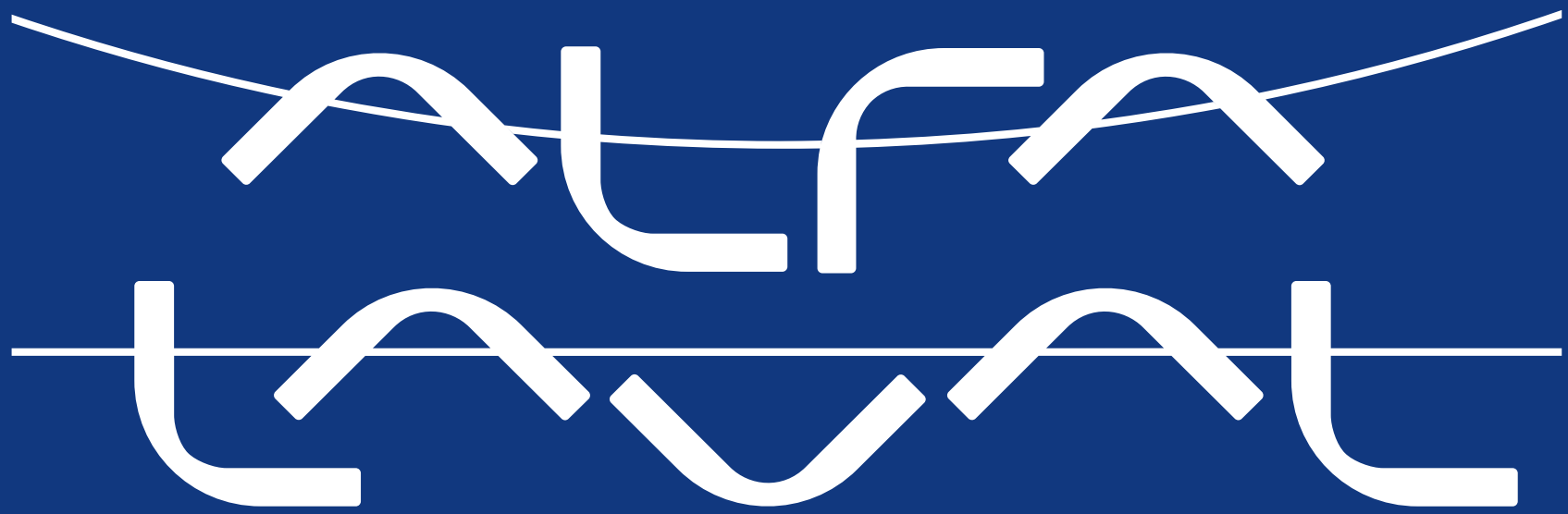
Visit our web page on waste evaporation and ZLD

Q&A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