

Alfa Laval

Energy savings for sustainable caustic evaporation in existing and new plants



CloroSur
2022

COSTA DO SAÚPE

Classified by Alfa Laval as: [D1201145](#)

An underwater photograph showing two dolphins swimming in clear blue water. The larger dolphin is in the foreground, swimming towards the right, while a smaller one is slightly behind and to the left. Sunlight filters down from the surface, creating a bright, ethereal atmosphere.

“We exist to accelerate
success for our customers,
people and planet”



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- 35 major production units*
- More than 100 service centres
- Sales companies in 55 countries
- Other sales representation in 45 countries

* Plus a number of minor production and assembling units



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Biofuels
 Biotech and pharmaceutical
 Chemicals
 Crude oil refinery
 Engine and transport
 Fluid power
 Food and beverages
 HVAC
 Industrial fermentation
 Latex
 Machinery



Marine and diesel
 Metal working
 Mining and mineral processing
 Oil and gas
 Power
 Pulp and paper
 Refrigeration and air-conditioning
 Semiconductor systems
 Steel and coke oven gas
 Sugar
 Wastewater treatment



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Alfa Laval's new revolutionary 4 effect system

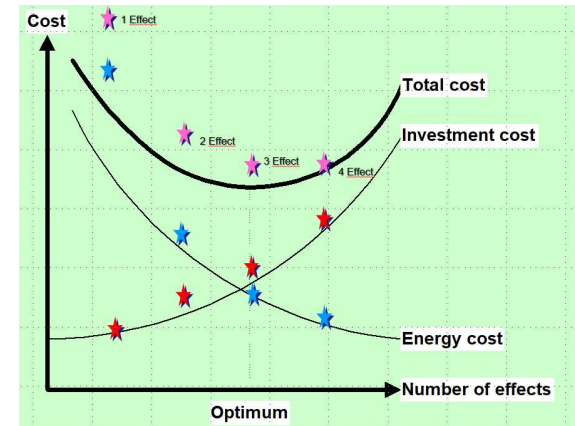
***reduces steam energy by
20% compared to 3 effect***

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4 Effect system

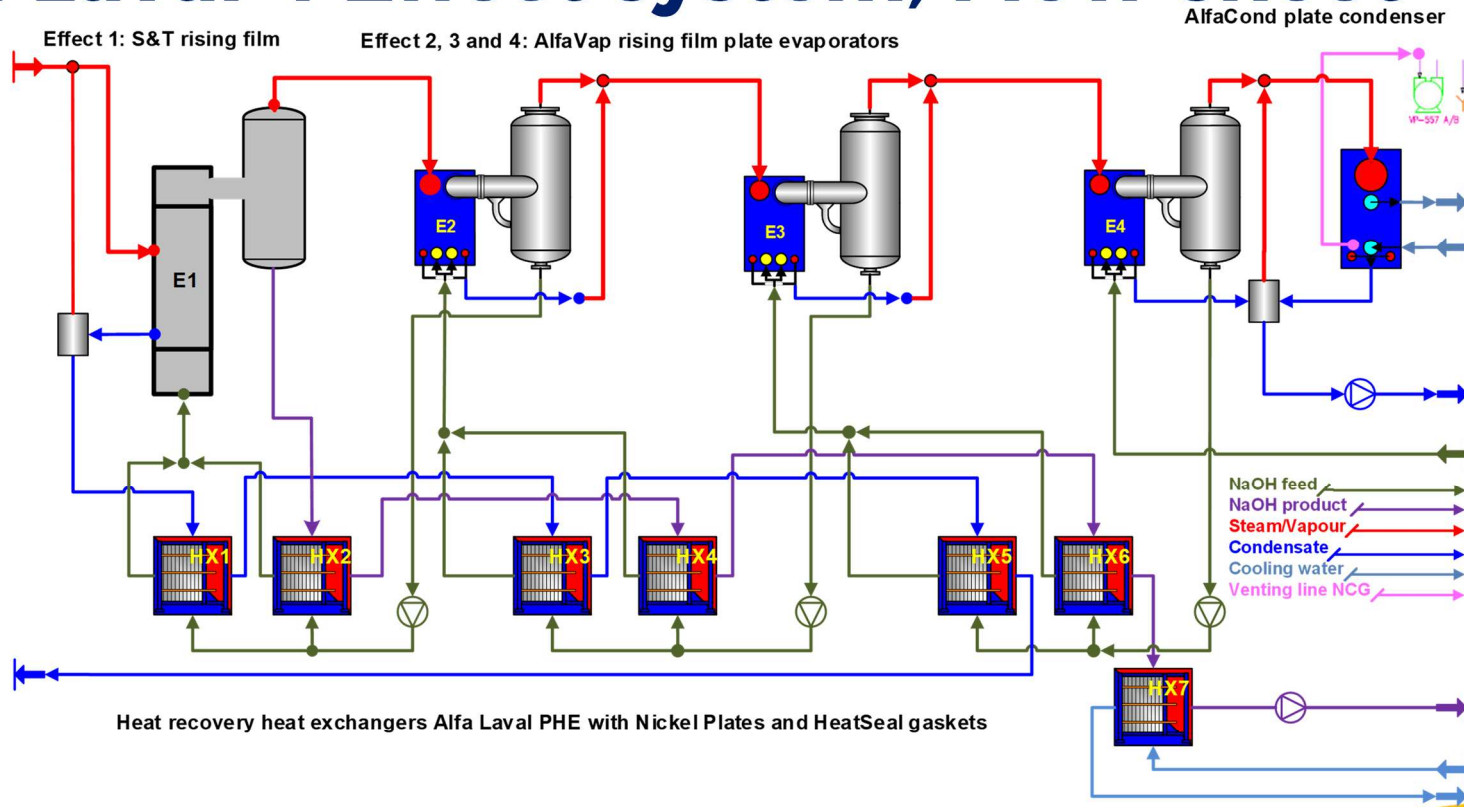
- **Possible by combining the best of two worlds:**
 - **Tubular evaporator in first effect**
 - **Alfa Laval, AlfaVap, evaporators in effect 2, 3 and 4**
- **First and only system implemented by Alfa Laval**
- **Financial viable with the AlfaLaval concept, based on present high energy prices**
- **20 % steam saving compared to 3 effect (400 kg steam per ton NaOH)**



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Alfa Laval 4 Effect system, Flow sheet



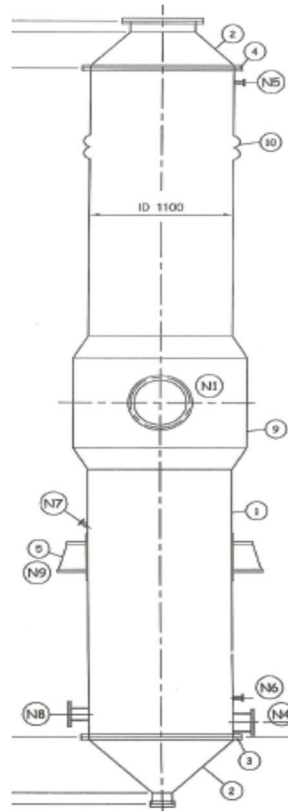
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Alfa Laval 4 Effect system

Combining benefits of S&T and AlfaVap™

S&T rising film
used for
1st effect



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- Able to operate at high temperatures up to 200 °C steam
- Once through
- No gaskets
- High grade materials in accordance with the requirements of the process

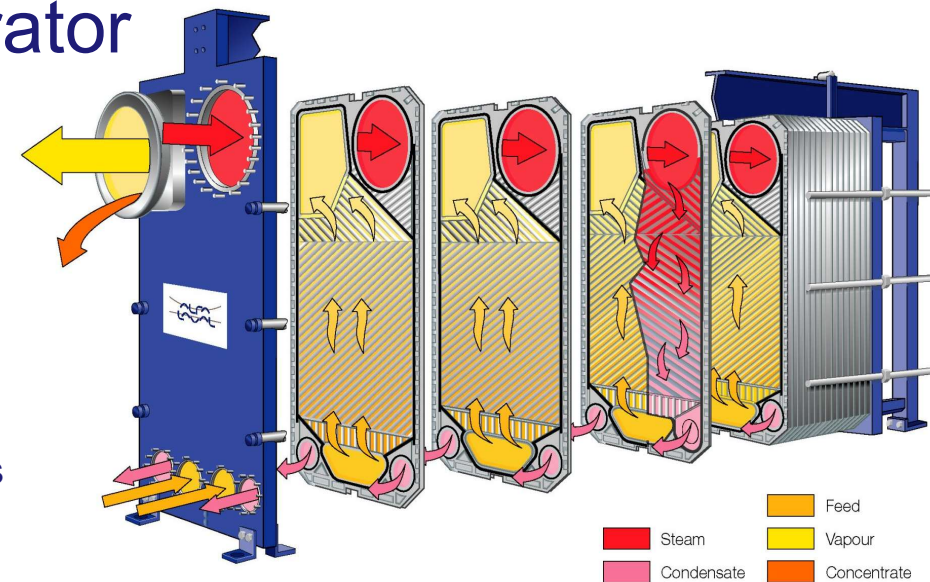


Alfa Laval 4 Effect system

Combining benefits of S&T and AlfaVap™

AlfaVap™ plate evaporator 2nd 3rd 4th effect

- High thermal efficiency
- Operate with narrow temperature difference
- Compact
- Easy maintenance
- Once through
- High temperature HeatSeal™ Clip-on gaskets
- High grade materials for plates



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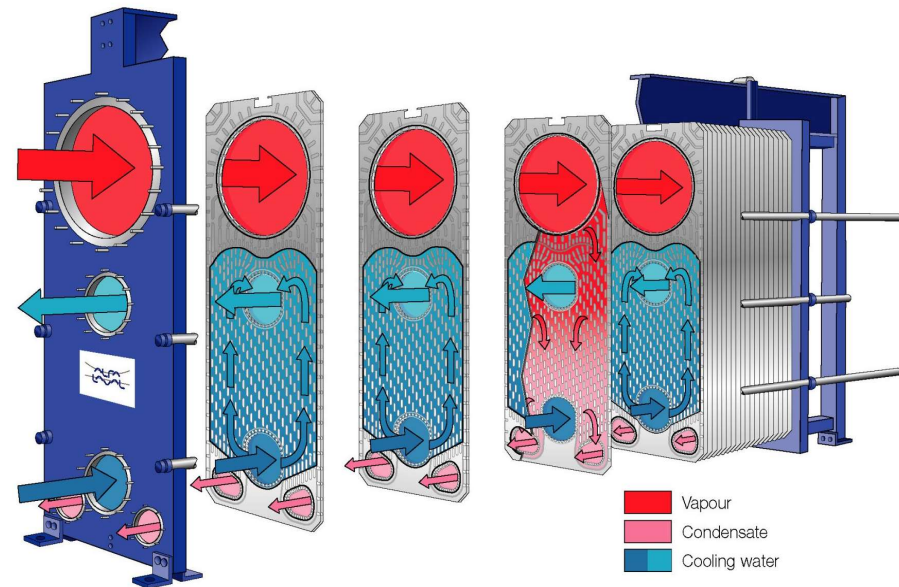


Alfa Laval 4 Effect system

Combining benefits of S&T and AlfaVap™

AlfaCond plate condenser

- Efficient condensation of low low pressure vapor
- Typical @ 0.1 bar / 45 °C
- More efficient than any other type
- Compact
- Easy to maintain
- Glued gaskets on cooling water side
- Welded on vapour side



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Alfa Laval plate heat exchangers as pre-heaters for Caustic evaporation

- Efficient heat transfer
- High heat recovery rate
- Low pressure drop
- Low erosion rate
- Only one pass
- Alfa Laval vast competence
 - thermal design – material selection – hydraulic design – unit specifics
 - design knowledge
- Alfa Laval design achieve
 - 5 time longer life on gaskets
 - 2-3 time longer life on plates



- New HeatSeal™
 - high temperature gasket
 - 5 time the life of EPDM
 - useable to 200 °C
- Also used for AlfaVap plate evaporators



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Alfa Laval 4 Effect system, Reference NaOH-4E-800 tpd, Nobian Frankfurt

- Length: 18 m
- Width: 12 m
- Height: 14 m



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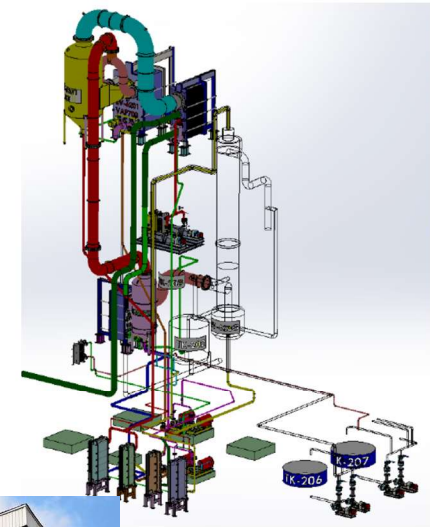
Energy savings and capacity upgrades of existing caustic concentration plants

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Upgrade of existing Evaporation Plants

- Problem lack of capacity increase required !
- Replacement of Effect 2 and 3 evaporators, condenser and preheaters
 - ✓ 35% Increase of capacity
 - ✓ Reduce specific steam consumption by 5%
 - ✓ Obtained at minimum required investment and down time



Increase of capacity 35%
192 to 260 ton per day NaOH 100%

Steam saving 10 %
552 to 494 kg steam per ton NaOH concentrated

**Investment financed by
First 2 years steam saving**



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Upgrade of existing Evaporation Plants

- Existing Falling Film 2-effect Evaporation plant.
Lack of capacity due to expansion of cell room - increase required !
- Replacement of Condenser and Effect 2 evaporator and one preheater
 - ✓ 42% Increase of evaporation capacity
 - ✓ Obtained at minimum required investment and down time



Increase of capacity 30%

111 to 145 ton per day NaOH 100%

Change feed concentration from 33% to 32%

12 % more evaporation

Plant down time 3 days !

By good work planning



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Upgrade of existing Evaporation Plants

- Same plant, upgrade from 2 to 3 effect, more capacity required !
- Replacement of Effect 1 to become effect 2 in upgraded plant. New Effect 1 evaporator , new set of preheaters for first effect
 - ✓ 10% Increase of capacity
 - ✓ Obtained at minimum required investment and down time



Increase of capacity 10%

111 to 145 to 160 ton per day

Reduction in steam consumption of 30%

Annual saving 1 mEUR

Plant down time 3 days !

By good work planning



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Sustainable upgrades of existing Plants

- Upgrade of pre-heaters
 - ✓ Improved heat recovery – potential up to 10 % reduction
 - ✓ Longer gasket life
 - ✓ Longer plate life
 - ✓ Lower maintenance
- Customer in Belgium with non- Alfa Laval plant main problem was pre-heater gasket lifetime of 4 month causing lots of downtime, cost and loss of production. Replaced with 2 new Alfa Laval pre-heaters type TL10P, with HeatSeal gaskets, installed March 2020, have been in continuous service since.
- Expected gasket life 4 years @ 165 °C compared to 4 month of original non Alfa Laval PHE with EPDM gaskets.



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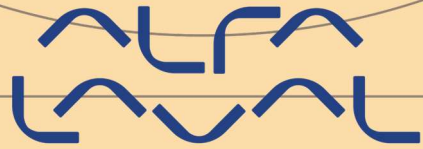
Sustainable upgrades of existing Plants

- Sustainability audits of existing Caustic evaporation plants
 - ✓ Review of plant operation data hunting energy savings
 - ✓ Making proposal for meeting tomorrow demands
 - ✓ Booster: condenser- evaporator
 - ✓ Replacement: condenser epevaporators, preheaters
 - ✓ Addition: extra effect
- Audit offered at a reasonable price - a win-win concept
- Based on availability and provided on a best effort basis
- Audit conducted as a desk job based on your provided documentation and present operating data



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Thank you!

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