SUIKER UNIE
A ROYAL COSUN COMPANY



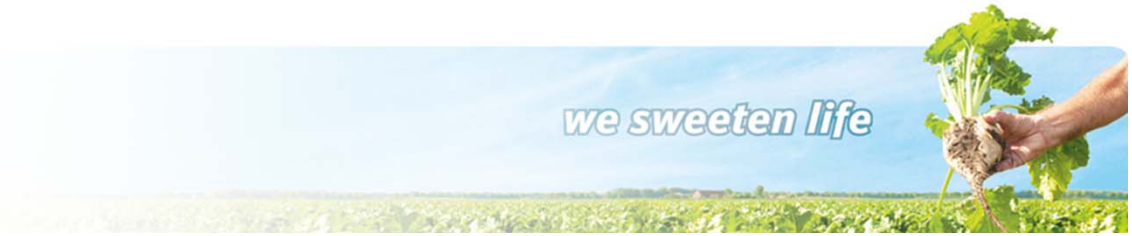
Transforming evaporators from 'Robert' to falling film plate by Retrofit

A. van Belzen
M. Roukema

ISSCT Aug 2014

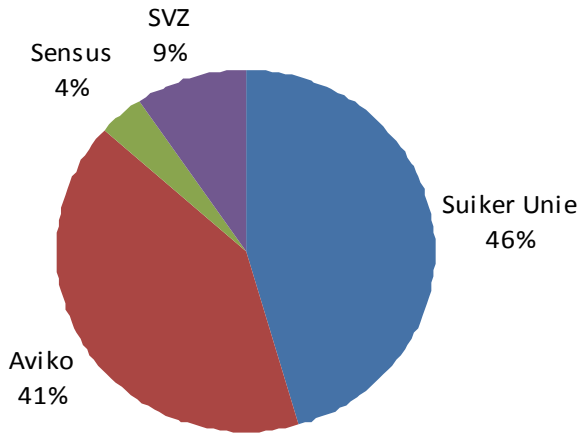
Contens

- Cosun - Suiker Unie
- Principle Robert / Retrofit
- Retrofit in practice
- Attention points



Royal Cosun

- Agro industrial company
- Cooperative of 9.300 sugarbeetgrowers
- Approx. 3500 FTE
- Turnover € 2,2 billion (2013)



Suiker Unie



Suiker products

Aviko



Potato products

Sensus



Inuline products

SVZ

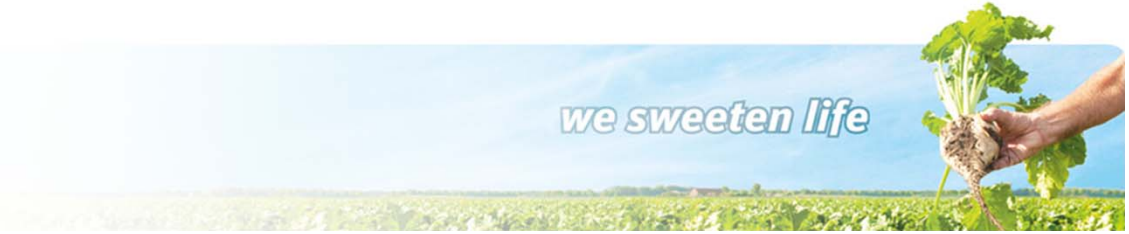


Fruit products

Duynie



Cattlefeed



SUIKER UNIE

A ROYAL COSUN COMPANY

Groningen
- Sugar factory
- Green Gas Plant
- Sugar terminal

Anklam
- Sugar factory
- Bio-ethanol
- Green Gas Plant



Puttershoek,
Roosendaal
- Sugar specialities

Dinteloord
- Sugar factory
- Green Gas Plant
- Central Office

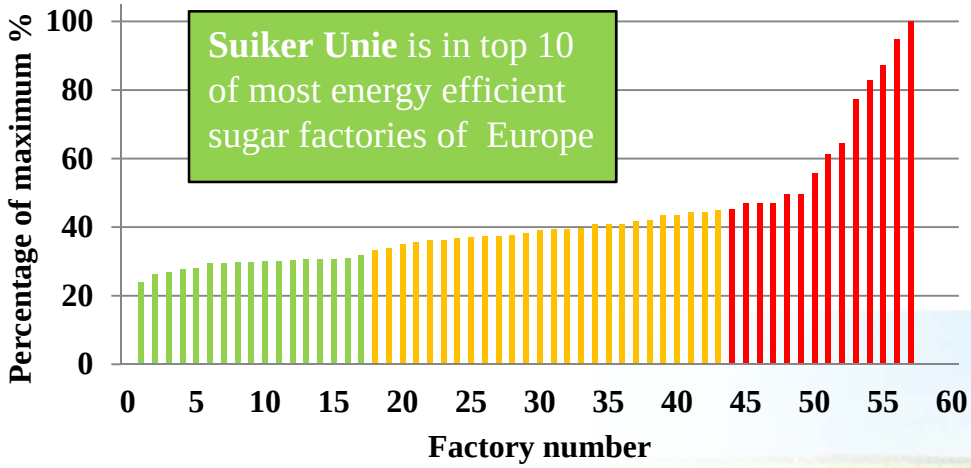


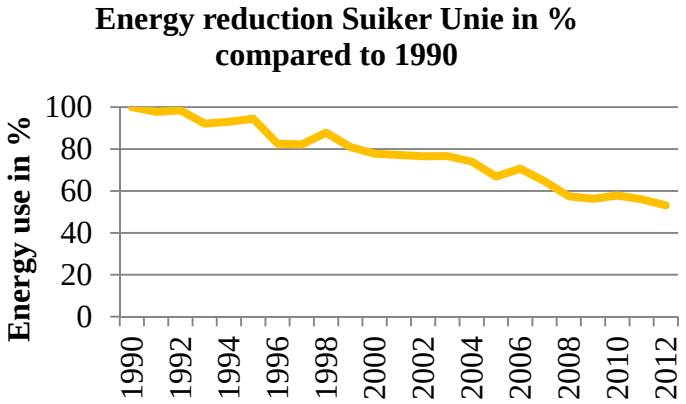
SUIKER UNIE
A ROYAL COSUN COMPANY

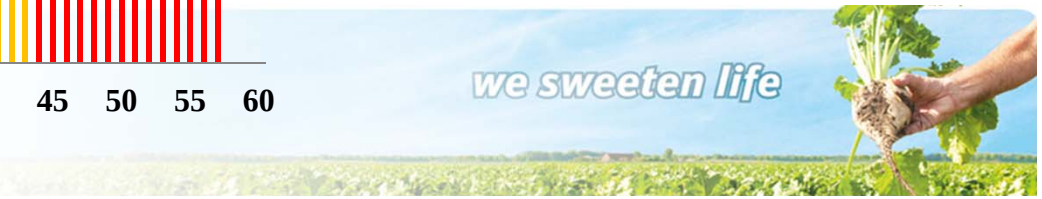
Main facts

- 3 sugar beet factories
- Campaign 135 days (September/January)
  Thick juice processing 30 days (March/May)
	Slicing capacity	White sugar
NL: **2** x	22.000 t/d	4.000 t/d
GE: 1 x	12.000 t/d	1.200 t/d
- Total sugar beet: 7,5 million ton/yr
  White sugar: 1,2 million ton/yr
  Raw cane sugar refining: 200.000 ton/yr
  Ethanol: 70.000 m3/yr
  Green gas (digesters): 30 million m3/yr



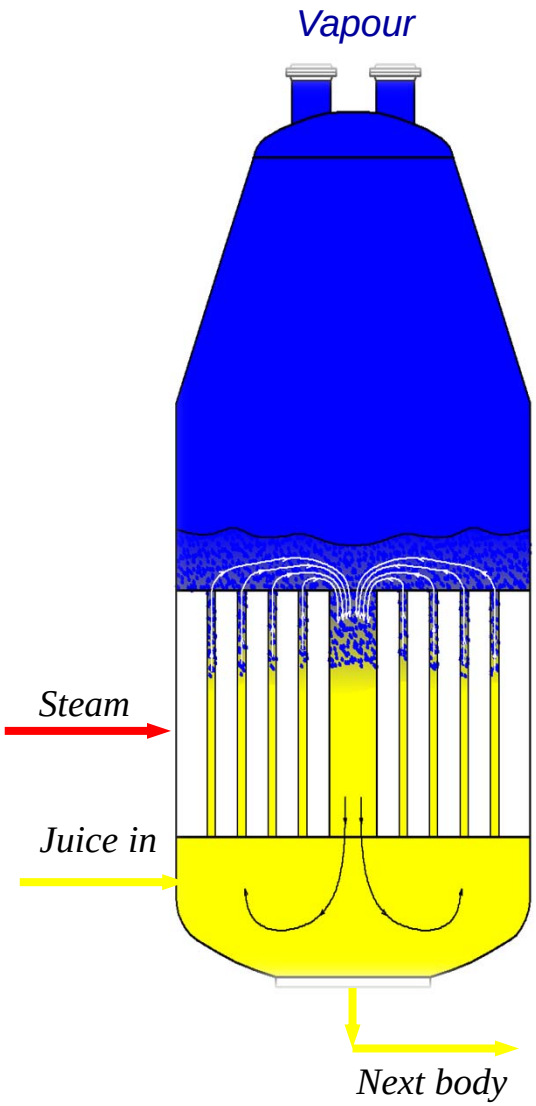


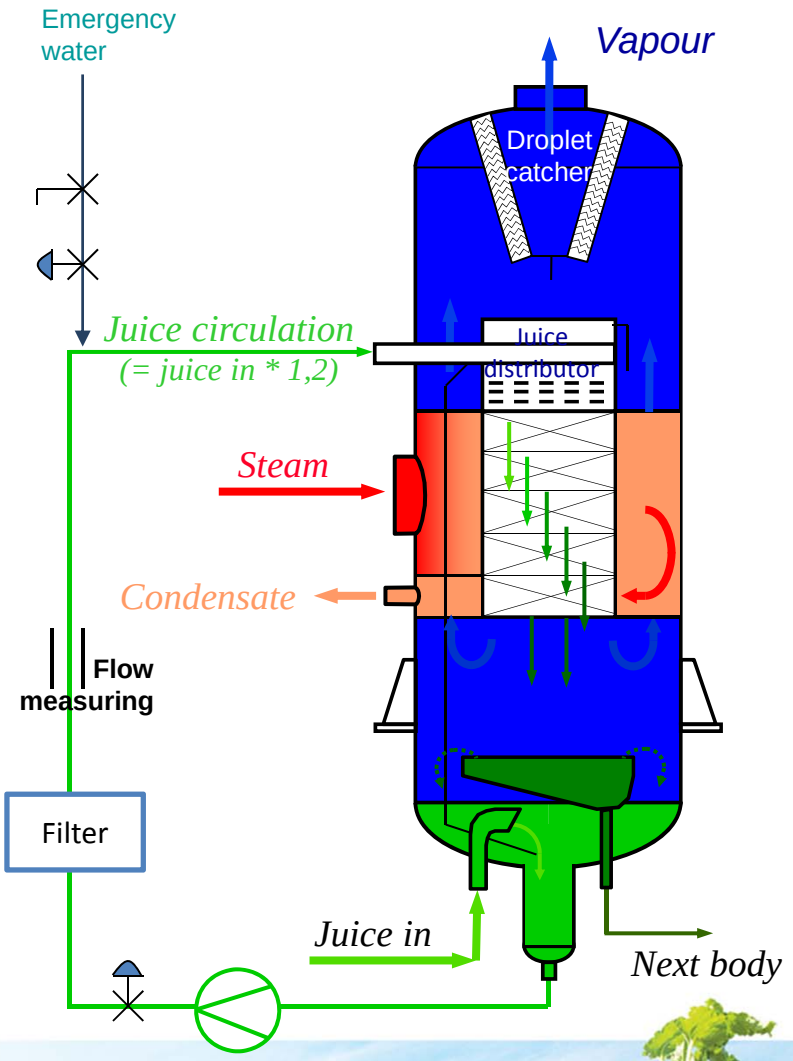




SUIKER UNIE

Classic 'Robert'





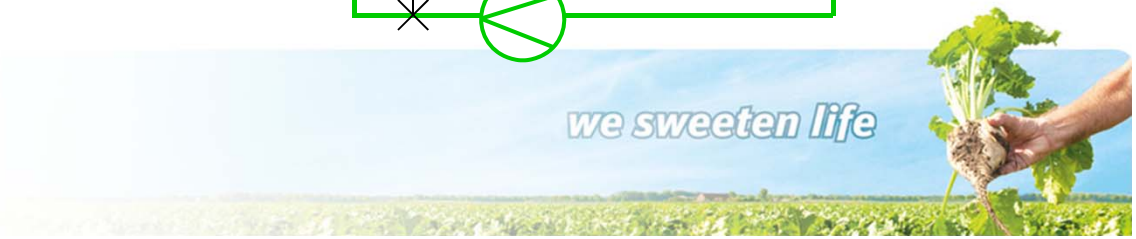
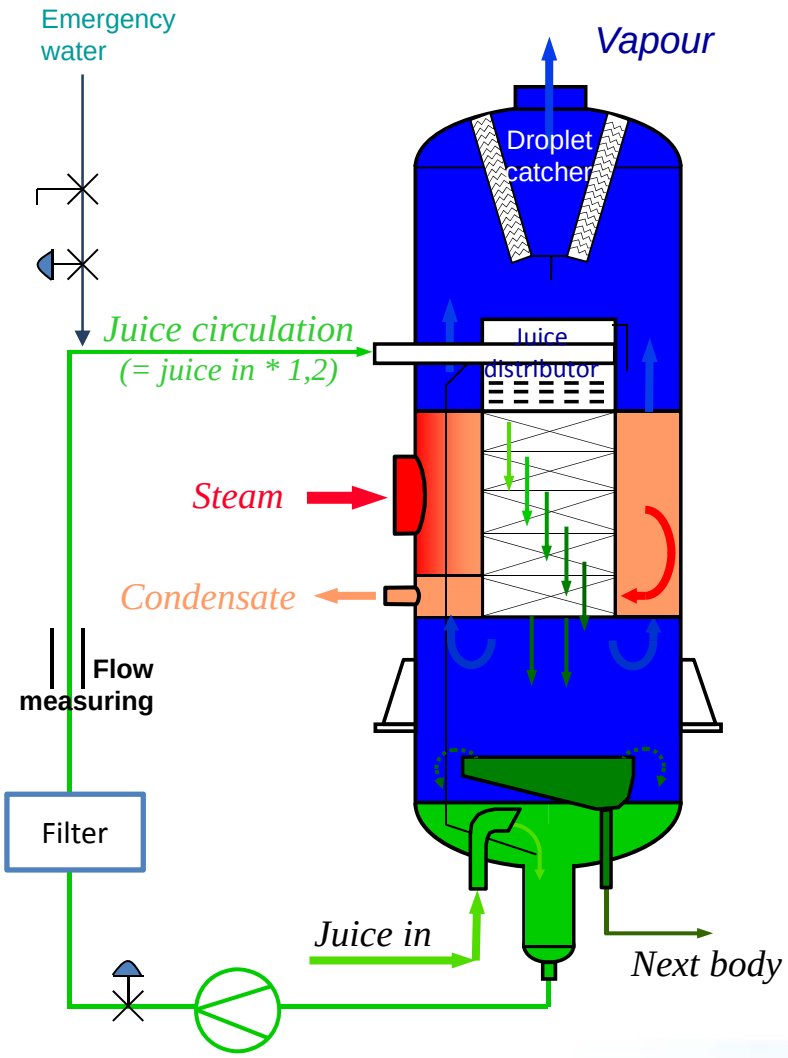
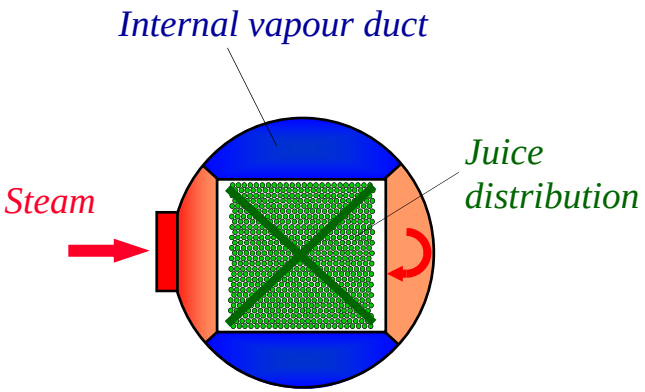
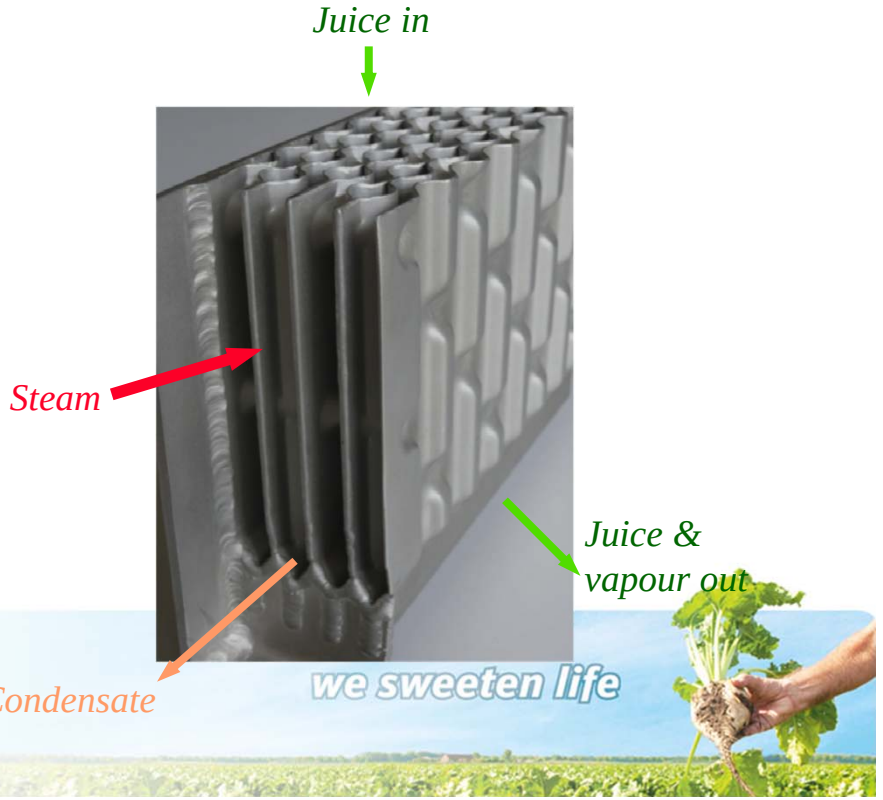
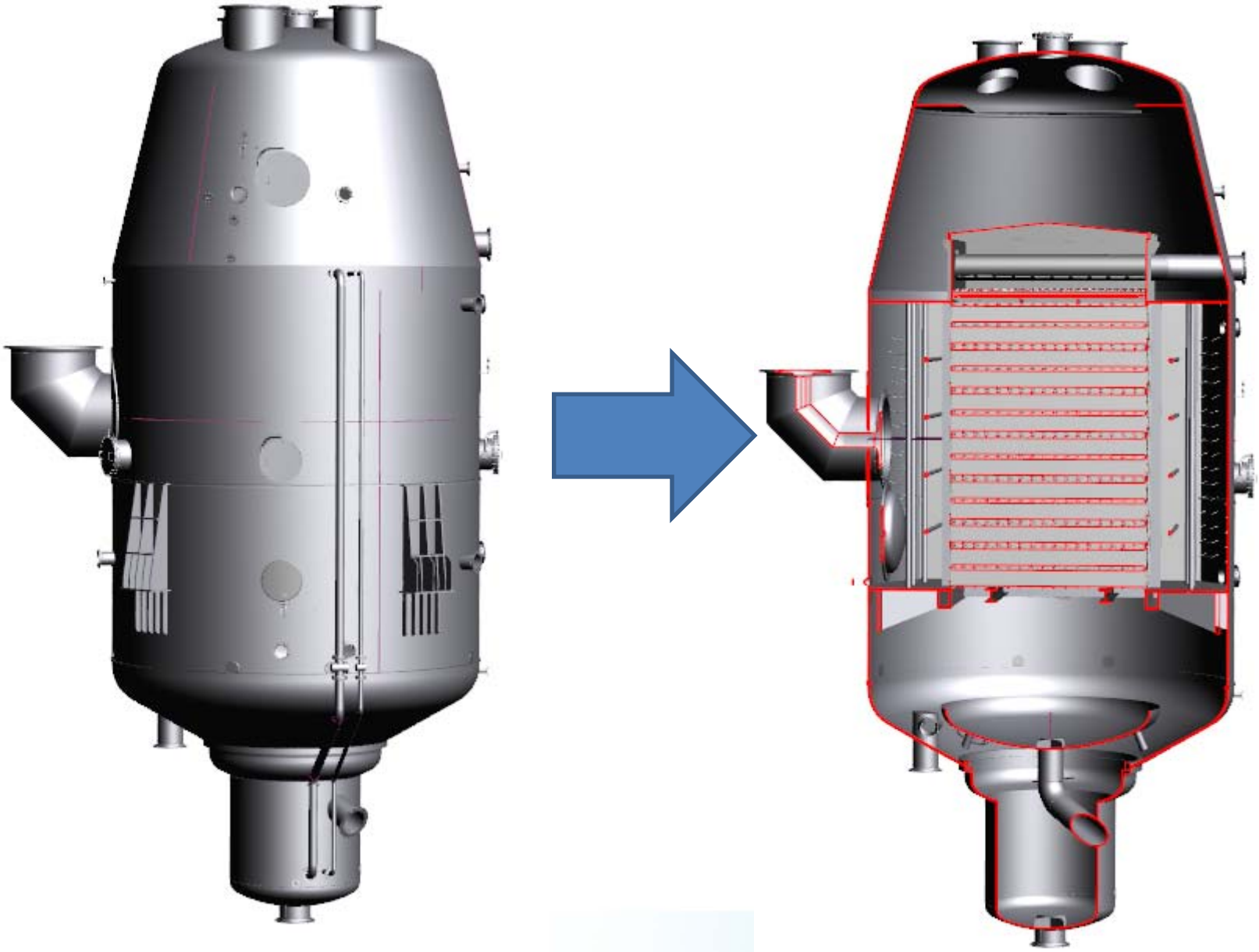


Plate evaporator









Principe



Retrofit experiences

Factory Groningen:
Retrofits 1999, 2000, 2003.

Factory Vierverlaten

2013 Retrofit bodies 4&5
2008 Retrofit bodies 6&7

Factory Dinteloord

2015 Retrofit bodies 1
2016 Retrofit bodies 2A-2B

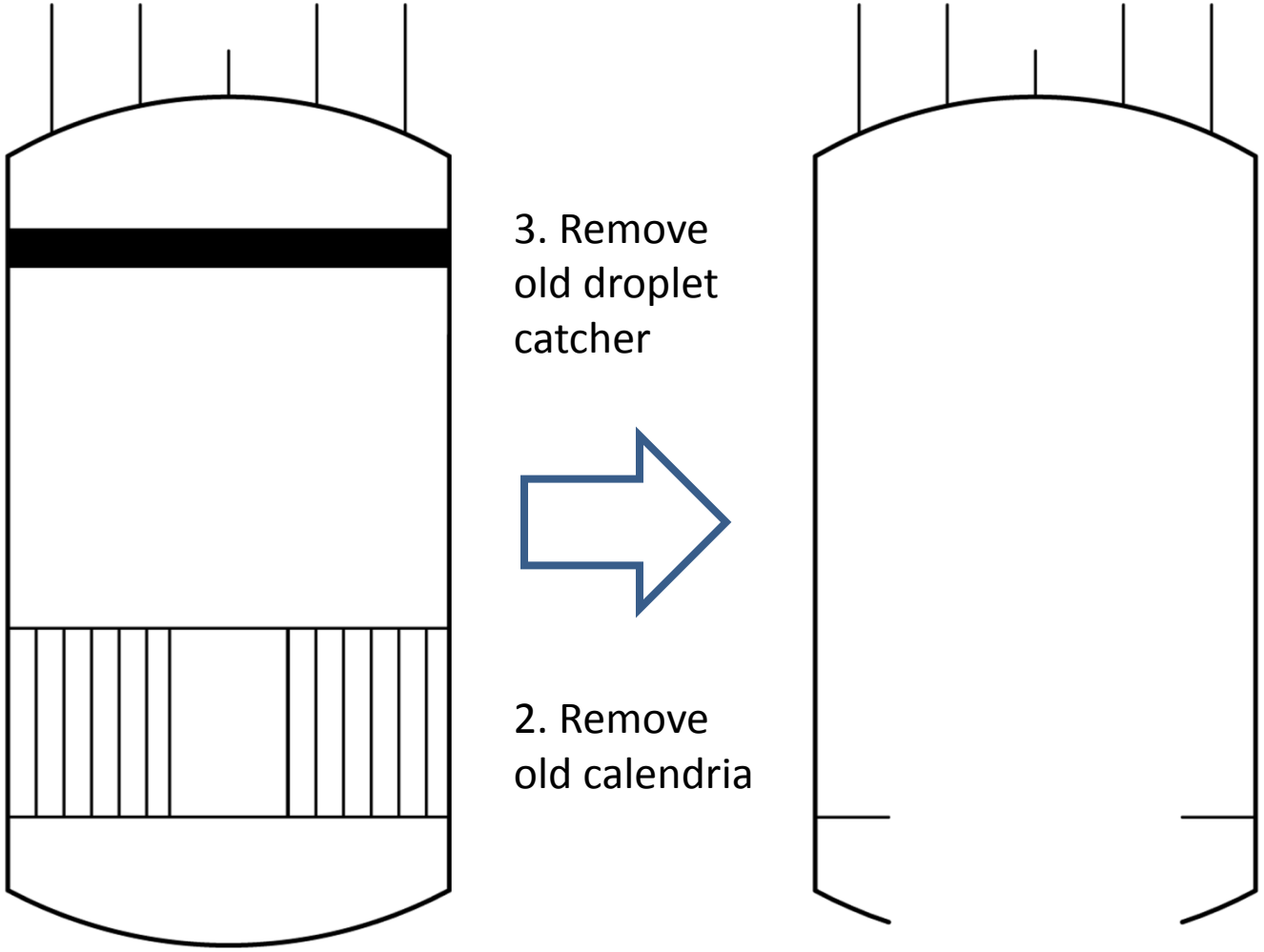
Factory Vierverlaten

2018 Retrofit bodies 3A-3B, and split into 8-Effect evaporation



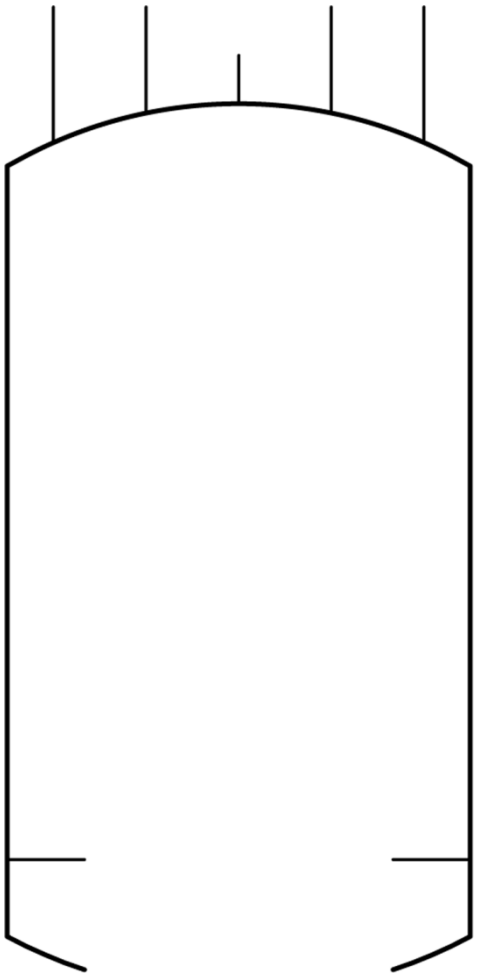
Retrofit stepwise

Step 1; empty out old body



Retrofit stepwise

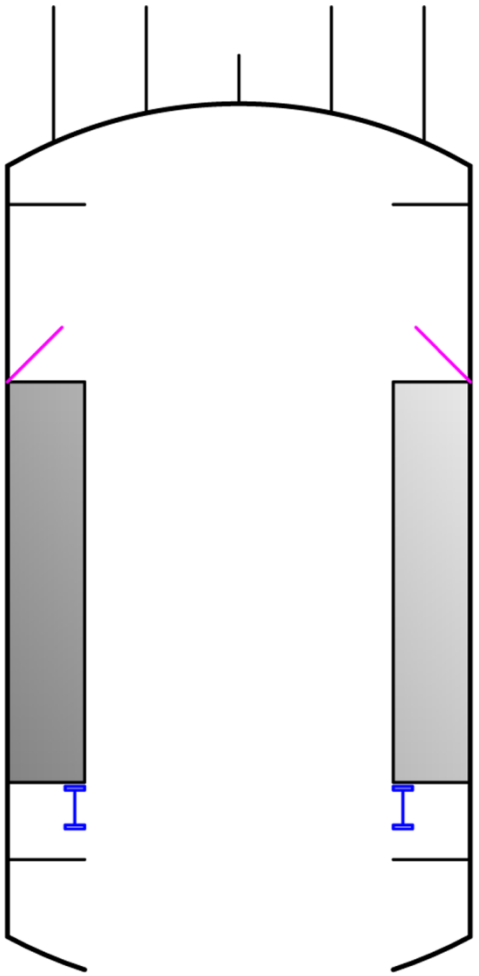
Step 2; Prepare Body



Support for droplet catcher

Bring in all plates separating Steam – Vapour compartment (Some 'loose')

Install new top& bottom constructive carrying plates.



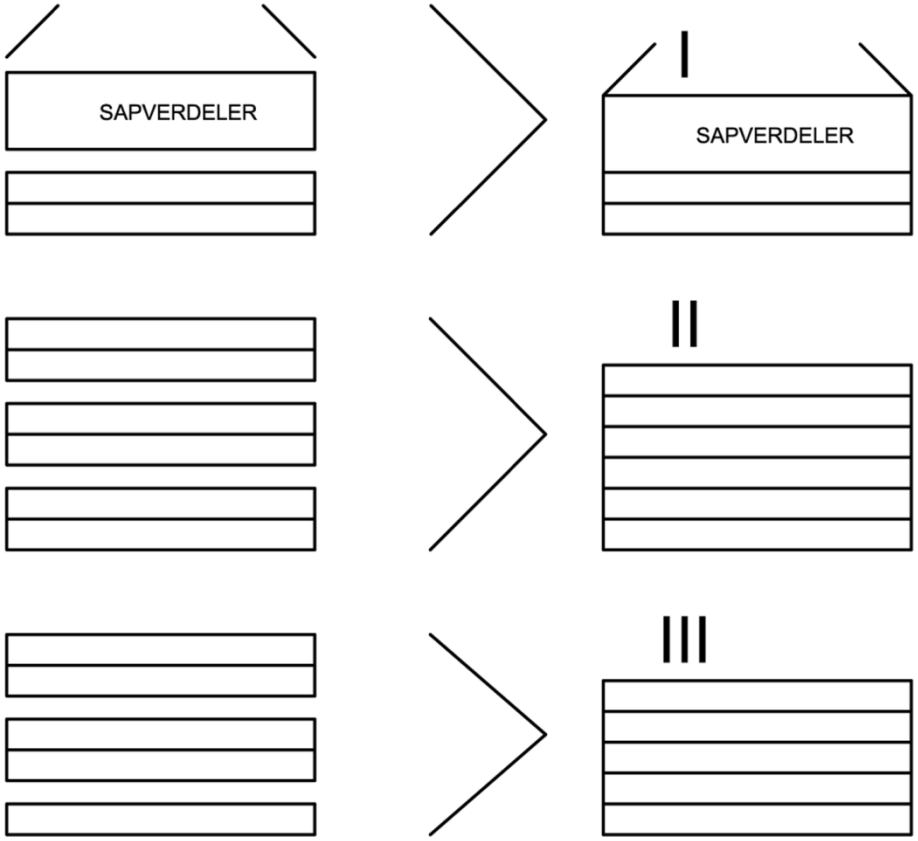
Repair/ strengthen body wall were needed




Principe
Lichaam 4&5
Lichaam 6&7
Vrouwtjes

Retrofit stepwise

Step 0 (Supplier): prepare retrofit in predefined stacks



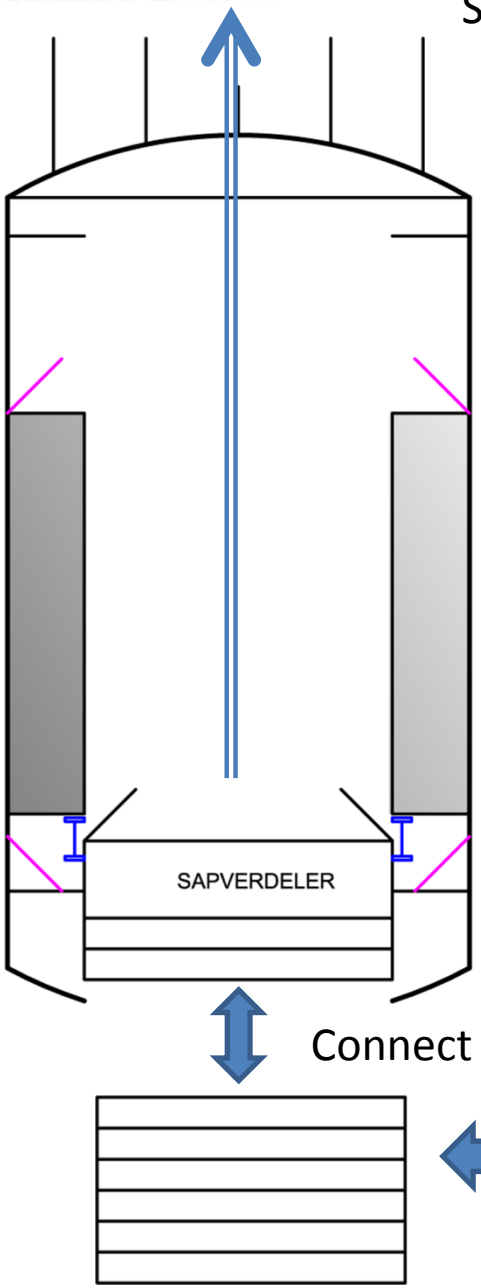
on top (possible) droplet catcher and juice distributor



Retrofit stepwise

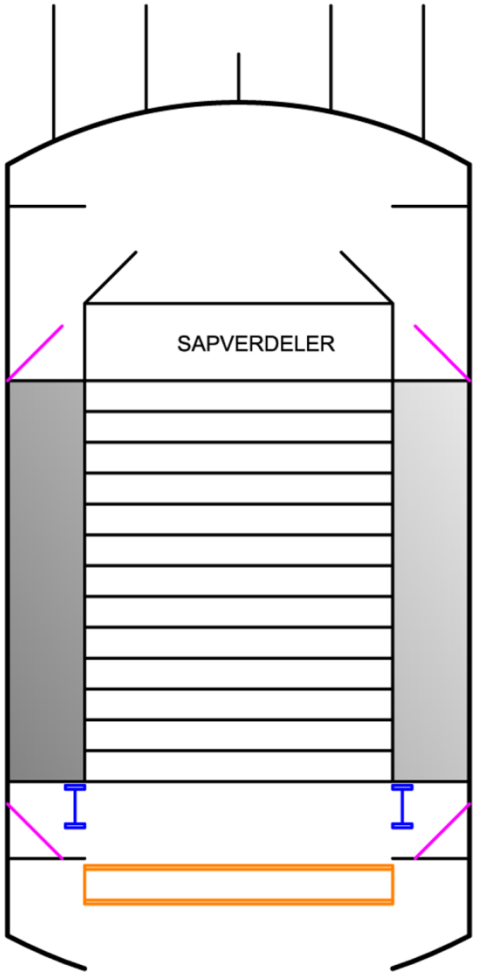
Step3: stepwise hoist of stacks





Retrofit stepwise

Step4: Finishing



Position droplet catcher

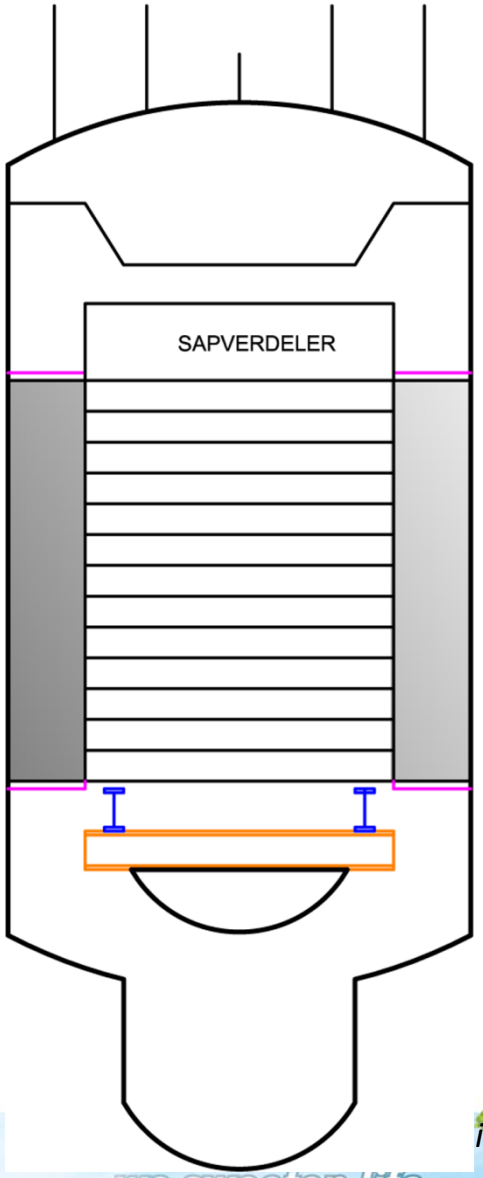
Weld in place plates separating Steam – Vapour compartment

Finalise constructive supports for plate package

If needed; anti-corrosion measures

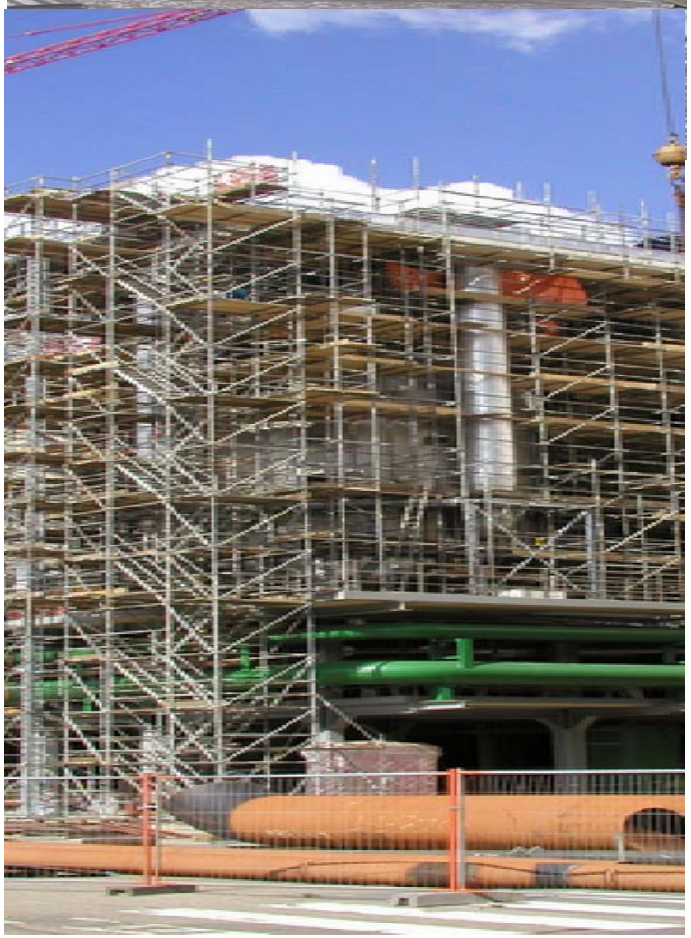
Juice catching ‘bowl’

New bottom with volume for level control



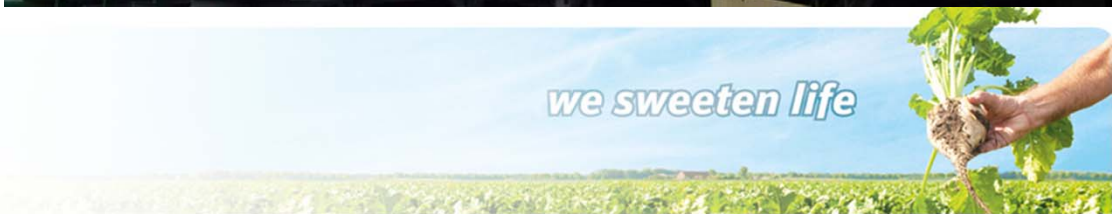
we sweeten life





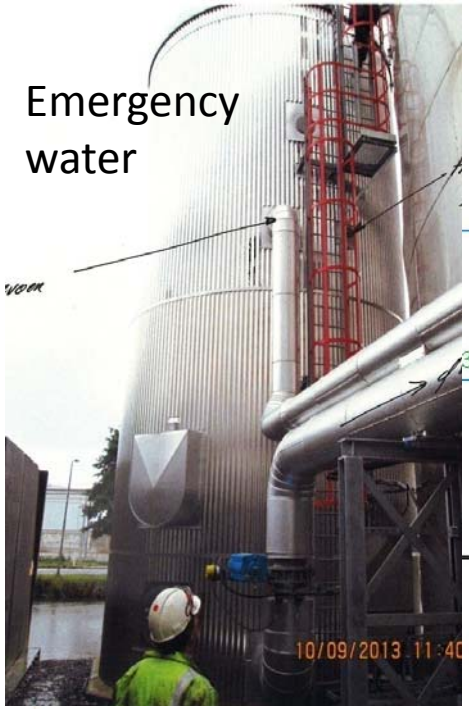
Finish piping

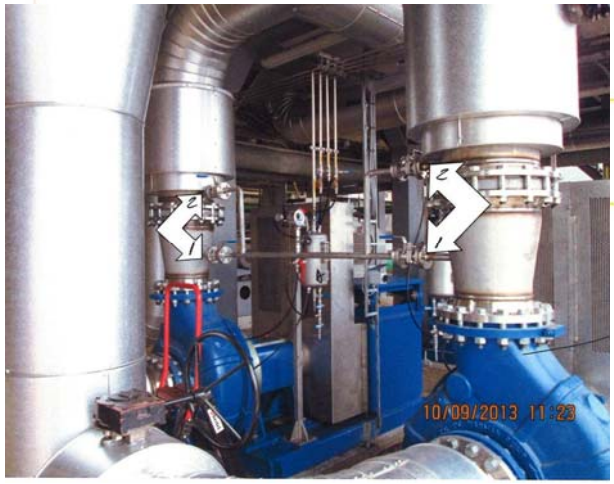


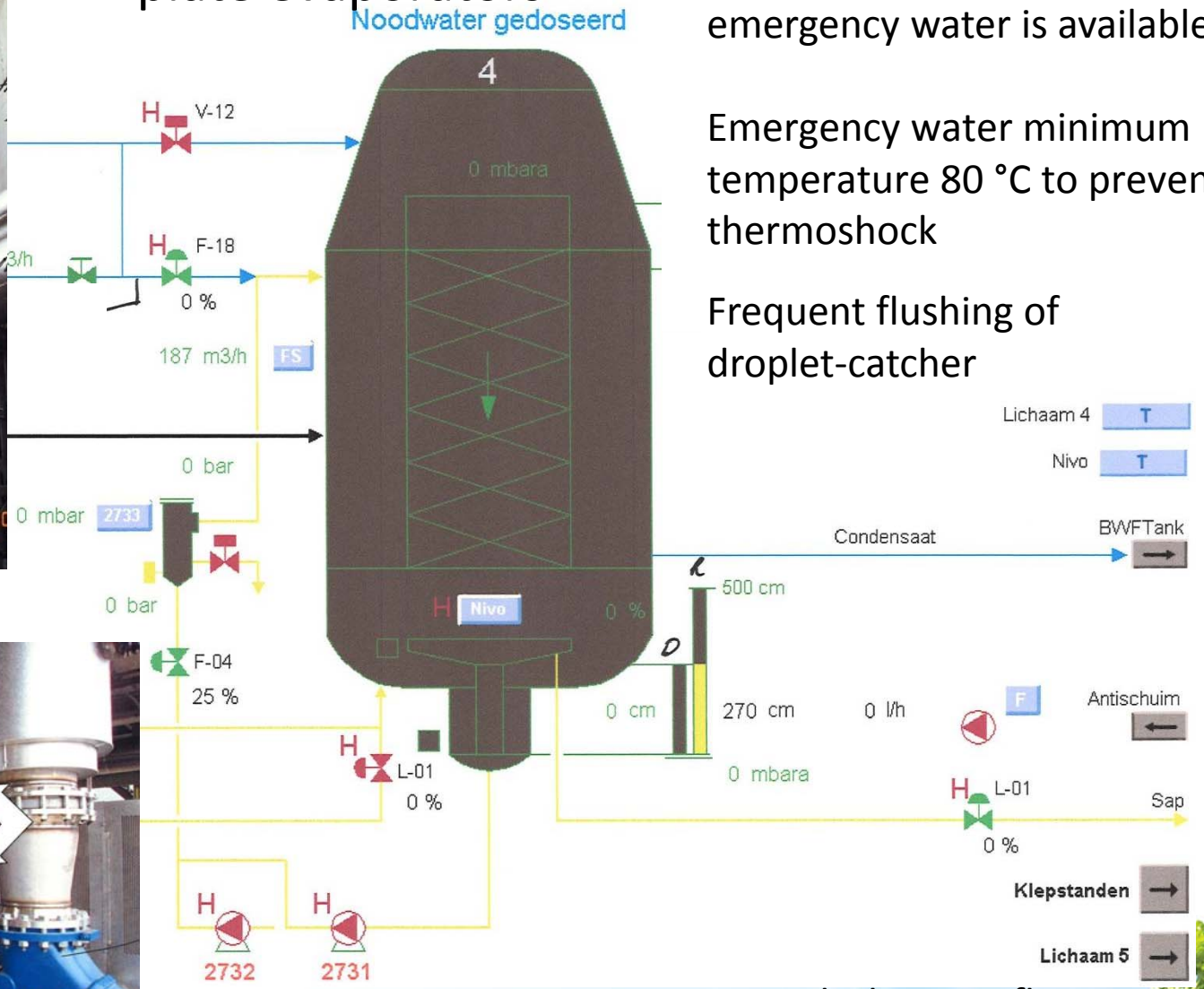


Critical points operating plate evaporators

Emergency water







Operate evaporation **only** when emergency water is available.

Emergency water minimum temperature 80 °C to prevent thermoshock

Frequent flushing of droplet-catcher

Circulation flow essential!
Pumps on separated E-rails

Too little or no flow =
Emergency shutdown

we sweeten life

Main points of plate falling film Retrofit:



Benefits:

- Large increase surface area + higher K value
  -> energy efficiency
  -> less color formation
  -> Less invert
  -> Lower pressure drop
- fits within existing structure

Attention points: **e.g. FAILSAFE DESIGN**

- Availability emergency water when power failure

  Warm emergency water delta T < 40 °C

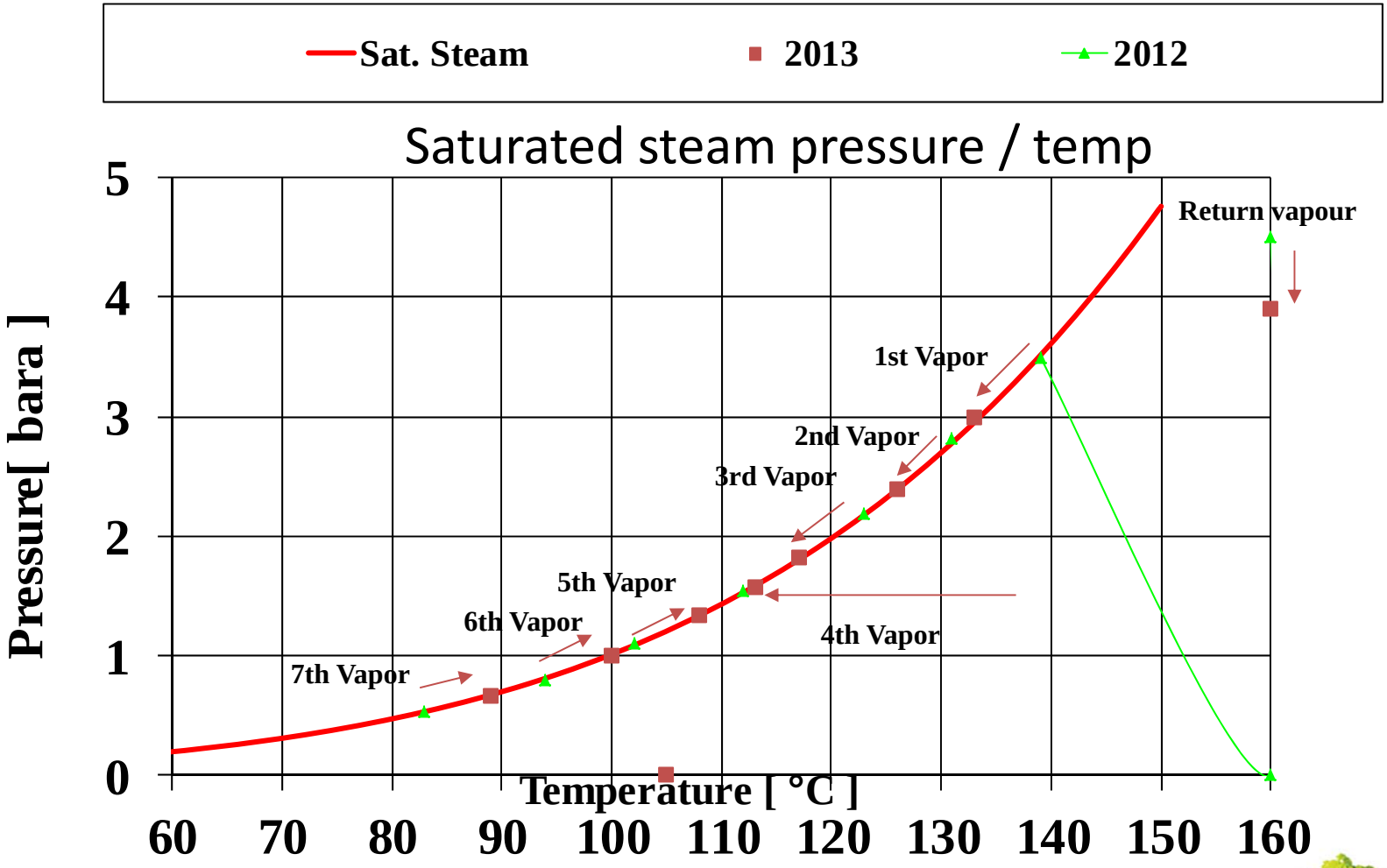
  Operate evaporation only when emergency water is available !

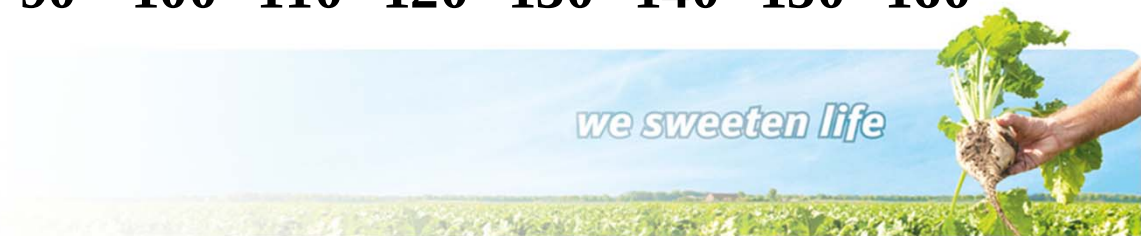
- Importance of guaranteed circulation flow
- After campaign clean-out with soda
- Welding existing carbon- and stainlessteel (difficult, gas formation)
- Strength vessel in relation of large steam inlet-outlet and pressure test.
- Brix control above 50 Bx
- Dual self flushing filters in the juice circulation flow



Advantage Robert -> plate package:

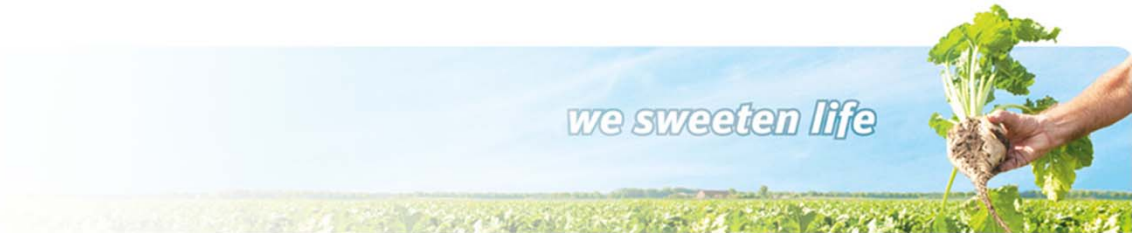
Heating surface: 6000-> 11260 m2 -> ΔP: 0,6 -> 0,3 bar





Conclusions:

- When a fail-safe design (Hazops) is implemented, a failure free operation is possible (with no plate package blockage)
- Using a retrofit can be a cost effective way to improve your evaporation station (e.g. higher throughput or lower energy consumption)
- Energy reduction in our sugar industry is an essential part for sustainable operation for the long run. High energy efficiency/yield in evaporation is a key building block.





Thank you for your attention!