

CIP with Acid to remove soft scale

CIP = Clean In Place

- Soft scaling is removed by acid cleaning with an Inhibited Sulfamic Acid solution of 4-6% at 50°C (eg. SAF ACID) mix with clean fresh water to pH $\approx 1,1$
- The Sulfamic Acid must be inhibited *) to avoid corrosion damages
Stronger Acids should NOT be used

*) Inhibited Sulfamic Acid is an acidic powder with a sulfamic acid base and a corrosion inhibitor which protects the metal surfaces from corrosion during the acid cleaning process.



Alpacon[®] Altreat 400

Features & benefits

- Highly concentrated liquid
- Based on polymaleic acid
- Environmentally friendly
- Highly effective
- No transport restrictions
- Not aggressive to heat exchanger tubes, plates, gaskets or glue
- Certified for drinking water by NSF and Kiwa
- Available in 25 l cans and 200 l drums





Comparison Table: PHE-MED vs. S&T MSF

Item	MED (Plate Type)	MSF and MED (Shell & Tube Type)	Remark
Capital investment	20%~30% Lower than MSF Similar to MED depending on MED materials	Base	Comparable design, e.g. evaporator material with sea water must be titanium and Vessel in Duplex steel
Operating Cost	40% Lower than MSF 10-20% lower than MED depending on MED matr.	Base	MED plate type has more than 25 years operation
Electrical power consumption	Lower (app. 50% lower than MSF)	Base	
Start up time to 100% capacity	1-1½ hour	MSF: 7 -10 hours MED: 1½ - 3 hours	


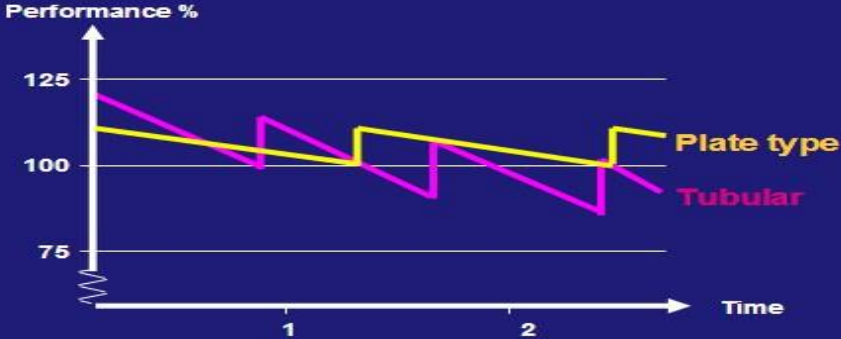
Comparison Table 2: PHE vs. MSF & MED S&T

Item	MED (Plate Type)	MSF and MED (Shell & Tube Type)	Remark
Response to load changes during operation	Fast response 5-15 min.	Long response time e.g. 30-90 min. (possible need for manual balance between effects)	Response time depend on the size of change in capacity
Contamination of distillate	No Leakage if a small hole in the evaporator surface, as the distillate channels has higher pressure than the sea water channels	Leakage when small hole in sea water pipes in a MSF unit, the sea water will contaminate the distillate due to the higher pressure on the sea water side	
Residences time of the media	Shorter : Faster process response, reduced scaling formation	Base	
Experience, service and liability	MED Plate type is a proven solution with experience for installation, commissioning, operation and world wide service	Base	

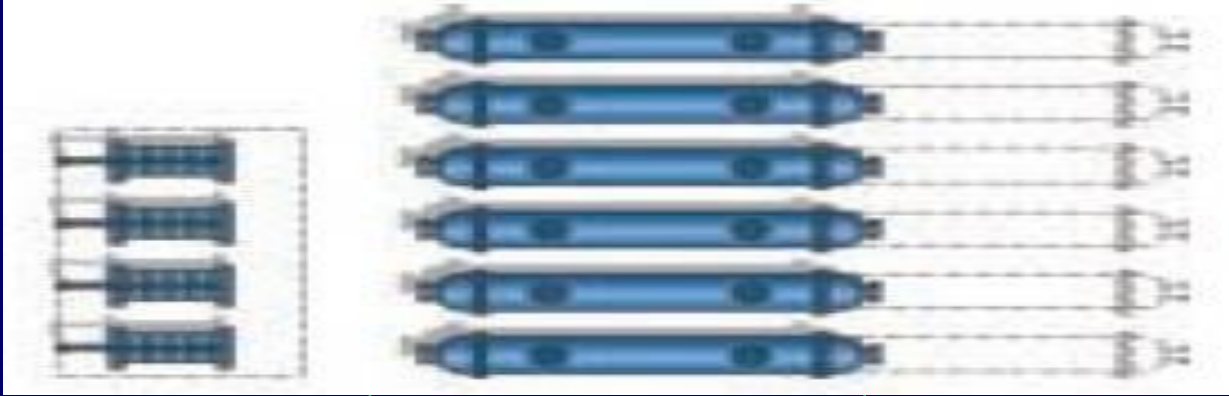
Comparison Table 3: PHE vs. MSF & MED S&T

Item	MED (Plate Type)	MSF and MED (Shell & Tube Type)	Remark
<p>Cleaning</p>	<p>Easy by CIP cleaning. 100% by CIP or manually if necessary.</p> 	<p>100% not possible by CIP cleaning. Manually: Not full access to the evaporation surfaces</p> 	
<p>Thermal Efficiency</p>	<p>Better : The higher flow turbulence on the plate design results in higher heat transfer and thereby less heat transfer area</p>	<p>Base</p>	

Comparison Table 4: PHE vs. MSF & MED S&T

Item	MED (Plate Type)	MSF and MED (Shell & Tube Type)	Remark
Design Capacity and Efficiency	<p>PHE design will keep capacity and energy efficiency (GOR value) over time, as it can be cleaned 100% with CIP (and manually if needed)</p> <div style="background-color: #e0e0e0; padding: 10px; border: 1px solid #ccc;"> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p style="color: #e67e22;">Alfa Laval Plate type evaporators can be cleaned 100%</p> <p style="color: #e91e63;">Tubular gradual decreased performance because of "irreversible" fouling/scaling</p> </div> </div> <div style="margin-top: 10px;"> <p>Performance %</p>  <p style="text-align: right;">Time</p> </div> </div>	<p>Due to scaling, tubular unit will loose capacity over time and specific energy consumption will increase, i.e. GOR value is reduced</p>	<p>see also the "cleaning" and "scaling" items</p>
Anti foam	Not necessary	Anti foam needed - increase operational cost	

Comparison Table 5: PHE vs. MSF & MED S&T

Item	MED (Plate Type)	MED and MSF (Shell & Tube Type)	Remark
Size	<p>Smaller</p> 	Base	MED plate type is more compact and need less space for service area
Installation	Less expensive and more easy installation with only few field welding's	Base	
Fouling	Better : The higher wall sheer stress on the plate design results in lower fouling rate on the heat transfer surface	Base	<p style="text-align: right;">www.alfalaval.com</p>

Benefits of the AlfaVap

Compact

- easy and cheap installation
- shorter residence time:
better control, product quality

Flexible

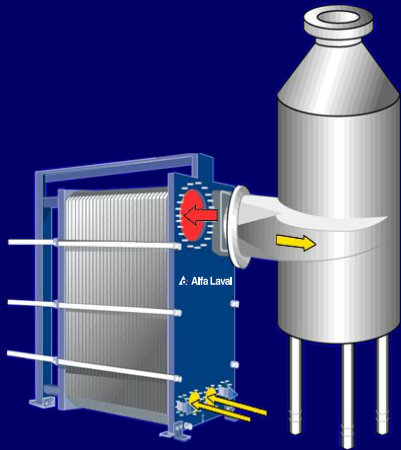
- less CIP-chemicals
- expandable capacity by adding plates

Accessible

- easier maintenance

High thermal efficiency

- perfect for viscous liquids
- plate pattern result in less fouling
- less area: ideal for exotic materials



AlfaVap in Malaysian sugar refinery

2 effects + TVR taking sugar from 59 to 75 Bx



Same plant extended by 67%



Indonesia case: Kaltim sea water desalination 3 x TVC-3-1680 (3 x 1,680 m³/day)



Experience from Indonesia

Case: Kaltim Fertilizer - Indonesia

3 x MED-TVC_PHE-3-1680 (3 x 1,680 m³/day)



Desalination units installed at Kaltim:

- MSF units, S&T type
- MED-TVC units, PHE type
- RO

Case: Pupuk Kaltim fertilizer, East Kalimantan PKT 1 - 4

Sea Water Desalination units installed at Kaltim:

- PKT-1 1979: 2? x MSF_S&T
- PKT-2 1984: 3 x MSF_S&T, 70 t/h each
- PKT-3 1988: 2 x MSF_S&T, 70 t/h each
- PKT-4 2002: 2 x MED-TVC_PHE, 70 t/h each



Case: Pupuk Kaltim fertilizer, East Kalimantan

PKT 1 - 4

Sea Water Desalination units – experience Indonesia

- PKT-1 1979: 2? x MSF_S&T Low capacity -> 2011: replaced by RO
[but RO not in operation high operational cost]
- PKT-2 1984: 3 x MSF_S&T, LOW capacity -> 2002: TVC_PHE added
to increase capacity
- PKT-3 1988: 2 x MSF_S&T, 70 t/h each -> low capacity \approx 40-50%
- PKT-4 2001: 2 x MED-TVC_PHE, 70 t/h -> still 100% capacity



Case Indonesia Conclusion

3 x TVC-3-1680 units still have 100% capacity



Desalination and Power Plant Karachi, Pakistan 13.680 m³/day



2 x MEP-7-6840 and one 60% Dump Condenser Module

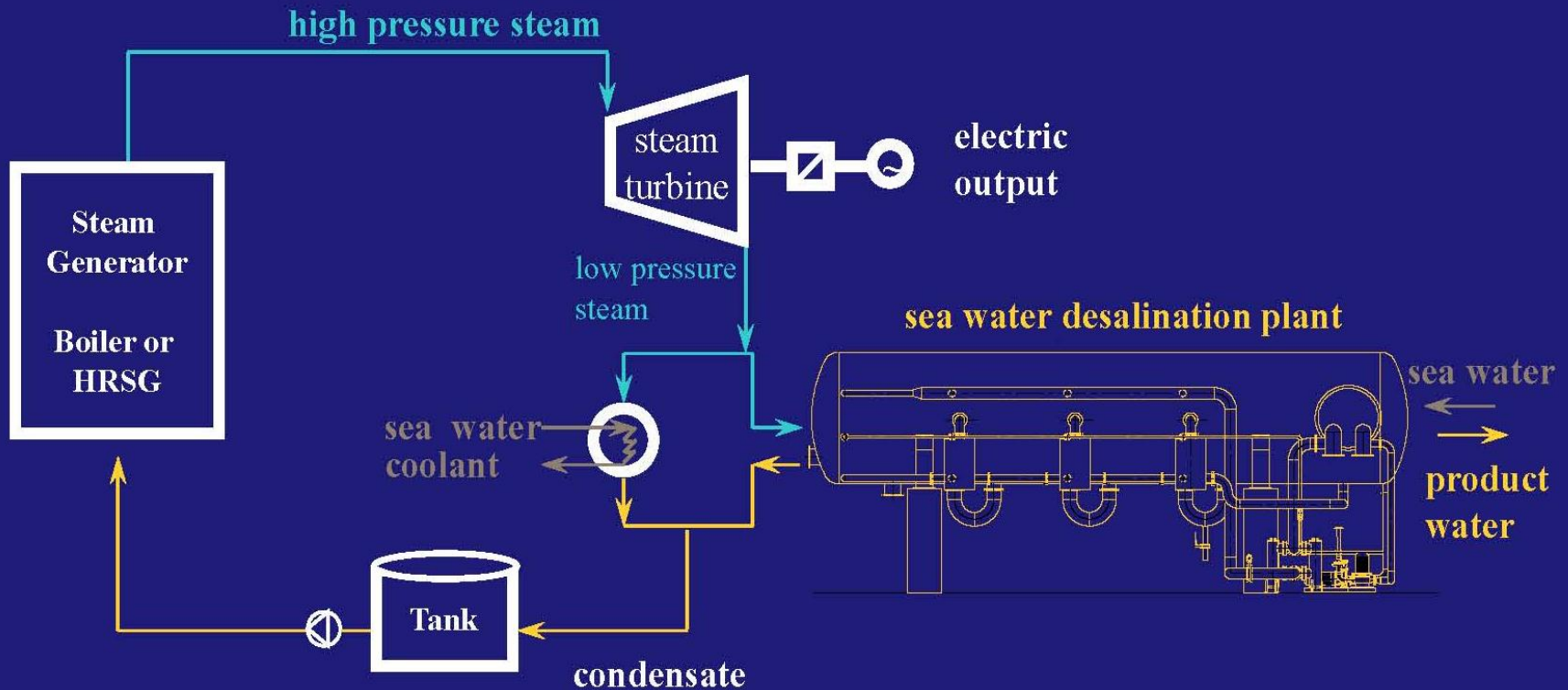
2006

www.alfalaval.com

Sea water desalination

alternative steam turbine condenser

- case story Pakistan



Sea Water
Distillation

Karachi – Pakistan
13.680 m³/day



2 x MEP-7-6840 & 1 x 60% Dump Condenser Module www.alfalaval.com

Dump condenser in Karachi, Pakistan





MULTIPLE EFFECT PLATE DESALINATION INSTALLATION

Side view from Coastal Refinery, Aruba, Dutch Antilles

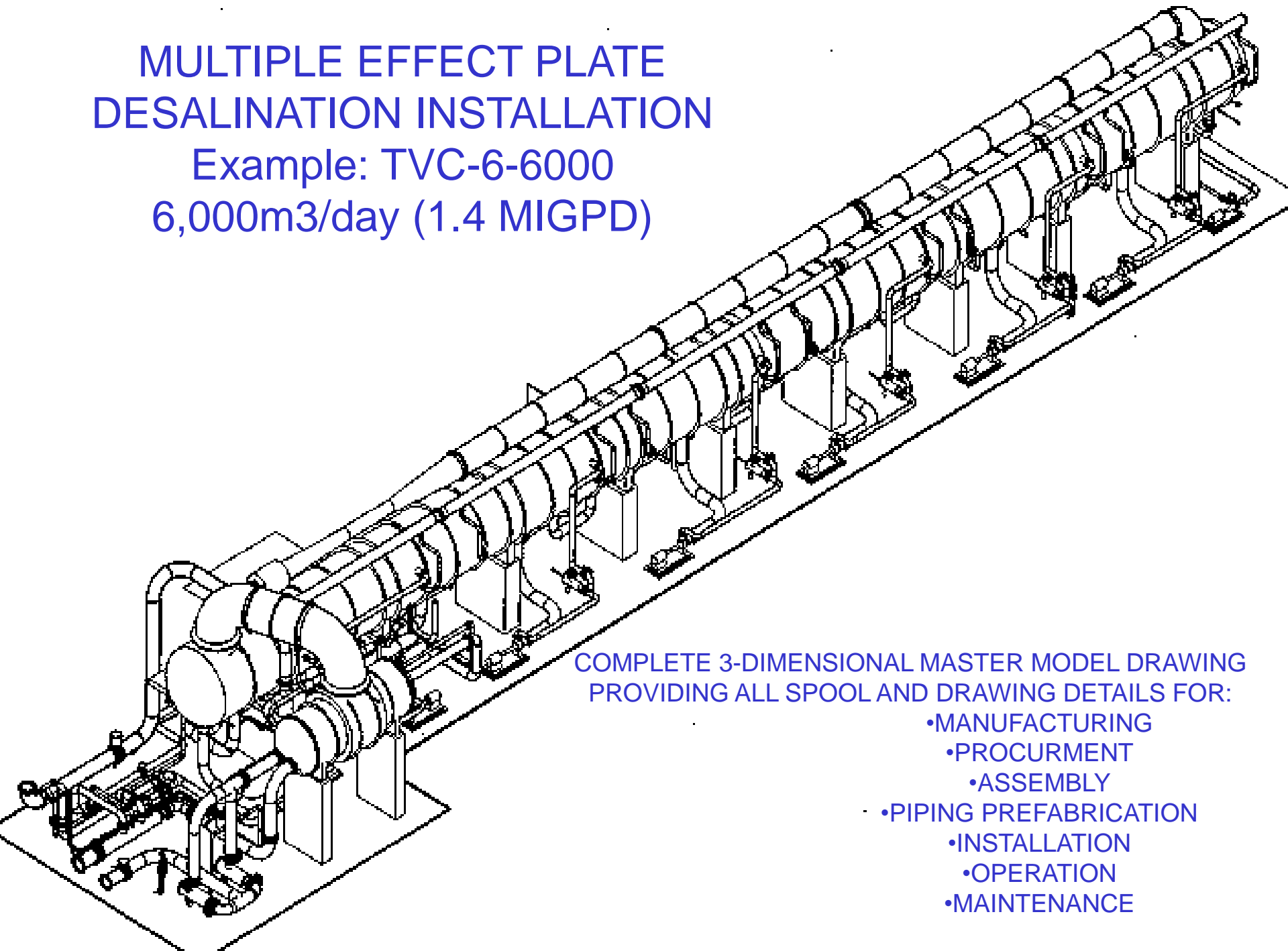
Type TVC-6-6000 (6,000 m³/day or 1.4 MIGPD)

1999



MULTIPLE EFFECT PLATE DESALINATION INSTALLATION

Example: TVC-6-6000
6,000m³/day (1.4 MIGPD)



COMPLETE 3-DIMENSIONAL MASTER MODEL DRAWING
PROVIDING ALL SPOOL AND DRAWING DETAILS FOR:

- MANUFACTURING
- PROCUREMENT
- ASSEMBLY
- PIPING PREFABRICATION
- INSTALLATION
- OPERATION
- MAINTENANCE

Curacao TVC-6-6000

processing purposes on petrochemical plant

Customer: Mitsubishi Heavy Industries
End User: Curacao Utilities Company

Contract date: November 2000
Delivery date: September 2001
Commissioning: 2002

Main data:

Water desalination capacity: 6,000 m³/day

Raw water source: Seawater

Type of desalination unit: Multi-effect Distillation with
thermo-compression

Number of effects: 6, single vessel type

Specific energy consumption: 91 kWh/m³ of product

Heat transfer surface material: Titanium Gr. 1

Evaporator vessel material: St. steel AISI 316L



3 效液鹼濃縮

從 32 to 50% 180 ton / day



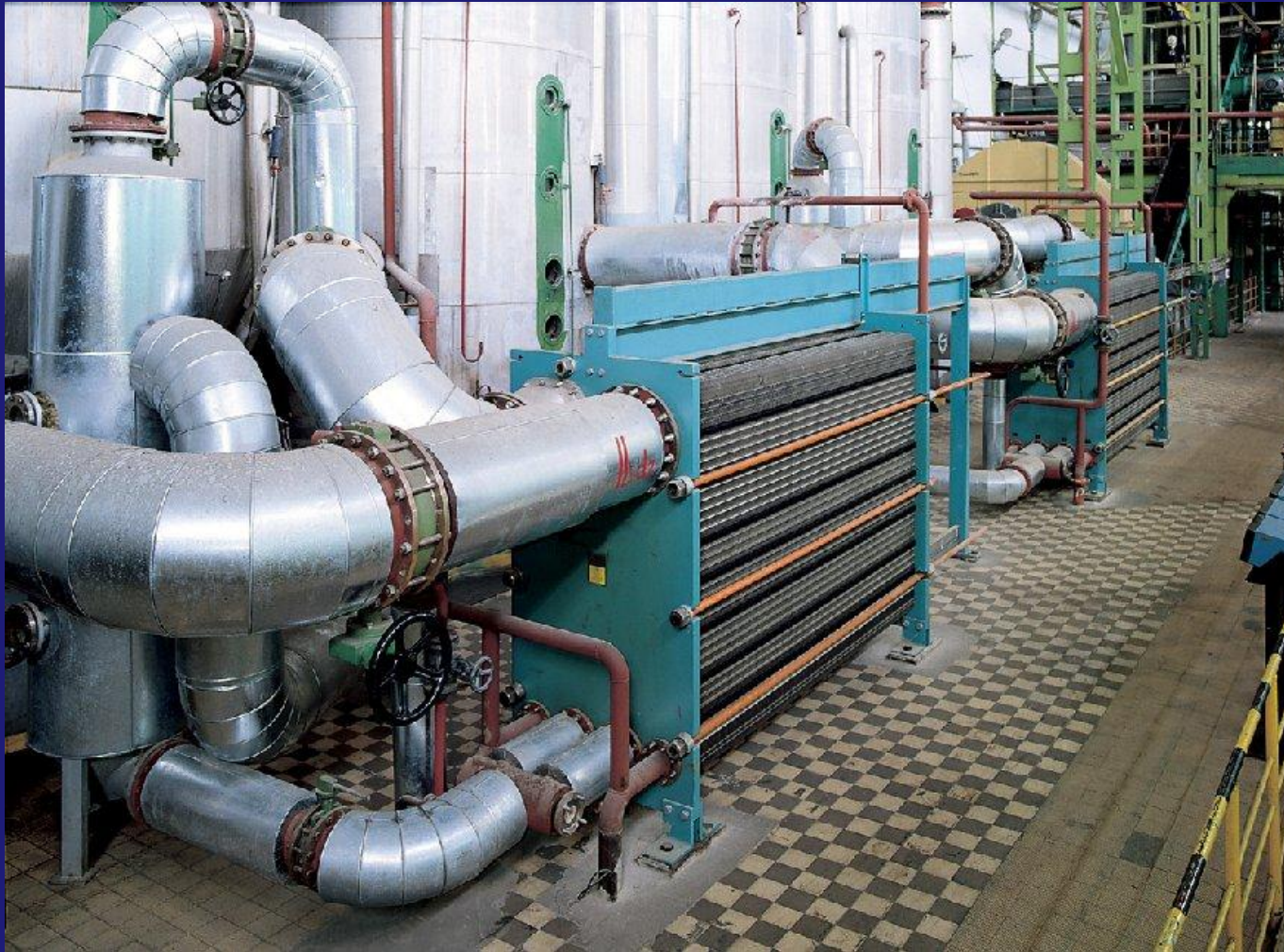
Equatorial Guinea 2 x 1360 m³/day



3 效果糖濃縮 從35 to 75%



Two AlfaVap boosters installed in Polish sugar plant as boosters to effect 2 and 3



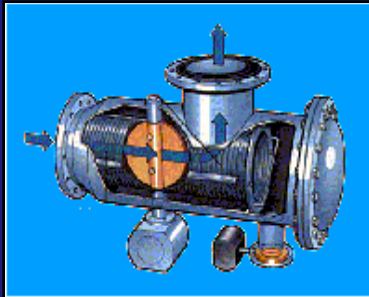
Apple juice from 10 to 72 % in 4 effects+TVR



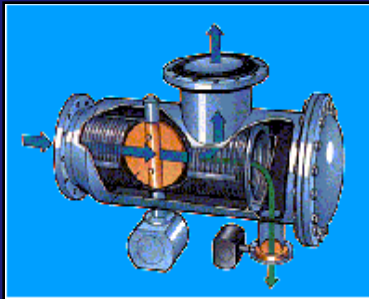
3 effects orange juice 11 to 65%



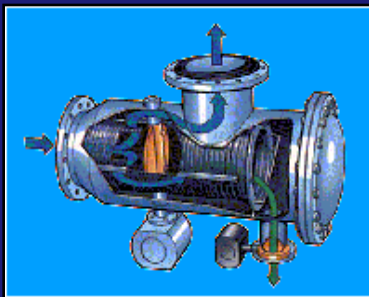
Automatic Filters



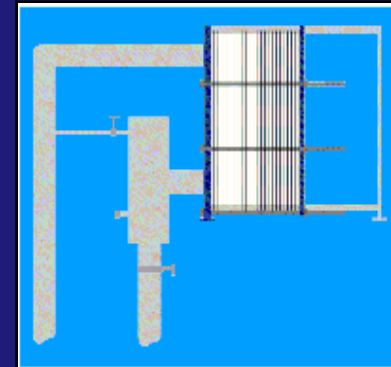
Normal operation **Stop debris from getting into the system in the first place**



First stage flushing



Backflushing



Alfa Laval Filters

Raw Water Filters are installed to protect heat exchangers, cooling ducts and nozzles from clogging.

FEATURES

- For use with sea, river or tower water
- Collected debris automatically removed without disrupted liquid flow
 - Low pressure drop
- Continuous automatic cleaning process



Raw Water Filters

BENEFITS

- Short flushing period with flexible regulation of flushing intervals
- Easy to service; filter basket can be removed without removing the pipes
- Low installation costs



Examples of AlfaVap applications

Sugar

- Beet sugar
- Cane sugar

Starch & Sweetener

- Glucose, Fructose
- Dextrose, Sorbitol
- Lysine, Lactic acid
- Wheat effluent
- Corn steep water

Distillery

- Stillage
- Distillation column reboilers

Chemical industry

- Calcium chloride
- Sodium hydroxide
- Sodium chloride
- Ammonium Nitrate
- Glycerine
- Soap, Polyols

Food industry

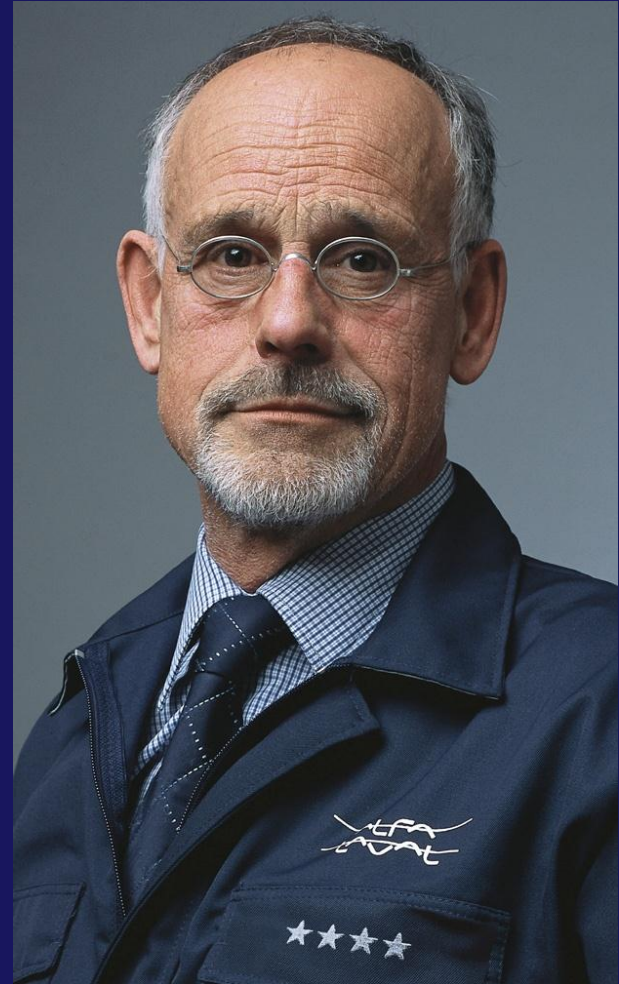
- Fruit juice
- Yeast effluent
- Fish & Meat industry
- Gelatine

蒸發系統 半導體業界適用項目

- RO 濃排回收
- 剝離劑回收
- 晶圓切削液(DEG)回收
- 含化學鹽類廢液減廢
- 含重金屬離子廢液再資源化或減廢
- 含溶劑廢液前處理
- 溶劑回收

專業的技術支援，提供最佳化設計

- 資深專業技術支援團隊，以多年實務經驗，提供客戶最佳化設計與操作建議



感謝各位長官 業界先進蒞臨指教

如有任何意見或想法, 歡迎與我連絡

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