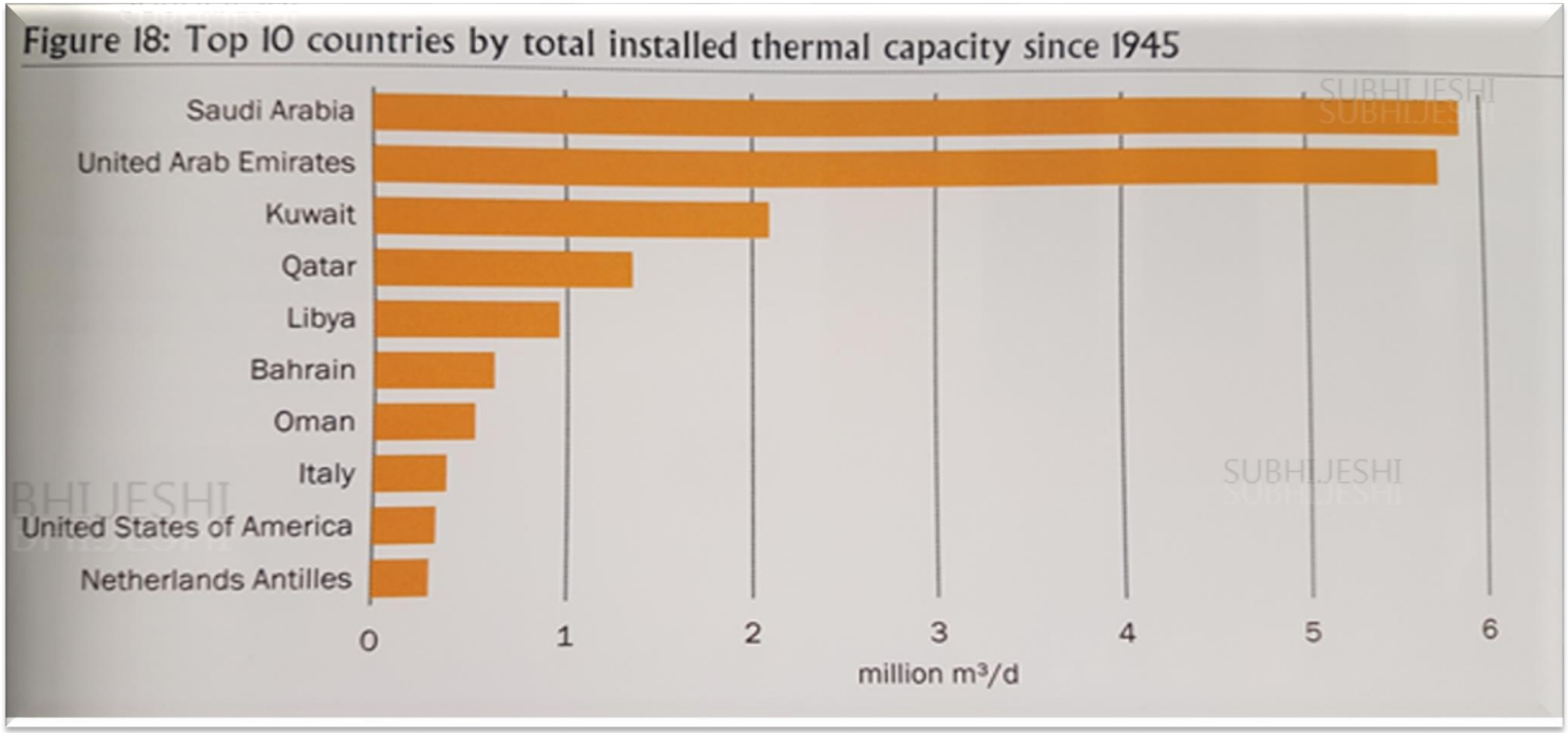
ADVANCES IN WATER DESALINATION TECHNOLOGIES WORKSHOP

Thermal Desalination Technologies

Outline

- Major Thermal Desalination Plants Users
- Multi Stage Flash Evaporation Process
- Multi Effect Desalination Process
- Common operating problems and major challenges.

Major Thermal Desalination Plants Users



Thermal Desalination Processes

Designed to desalinate seawater to produce high quality water (TDS < 5 ppm) that can be used as:

- **Boiler Feedwater**
- **Injected in Processes**
- **Drinking water**

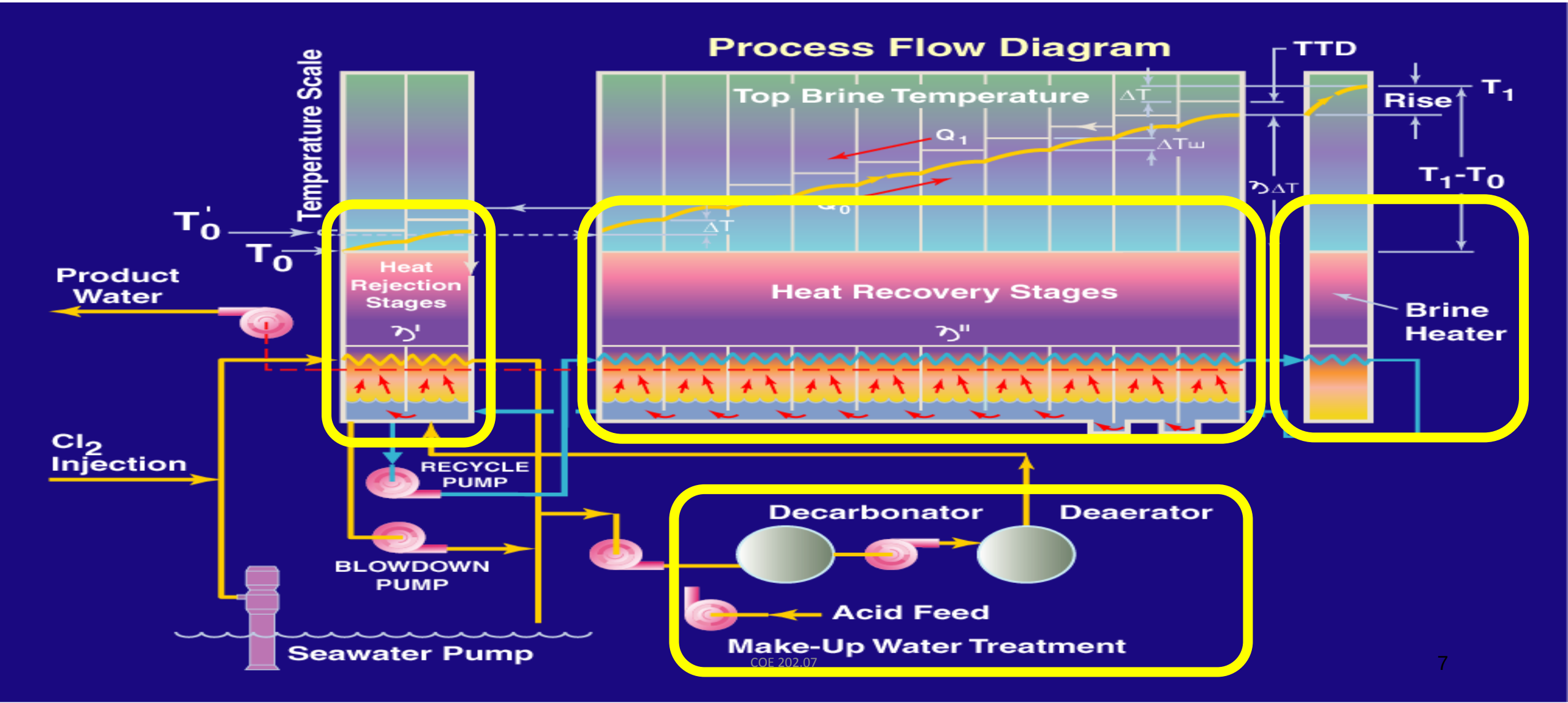
Multi Stage Flash Evaporators Desalination Plant, Dubai

Multi Stage Flash Evaporators Process

- Pretreatment System
  - Seawater intake
  - Filtration
  - Chlorination

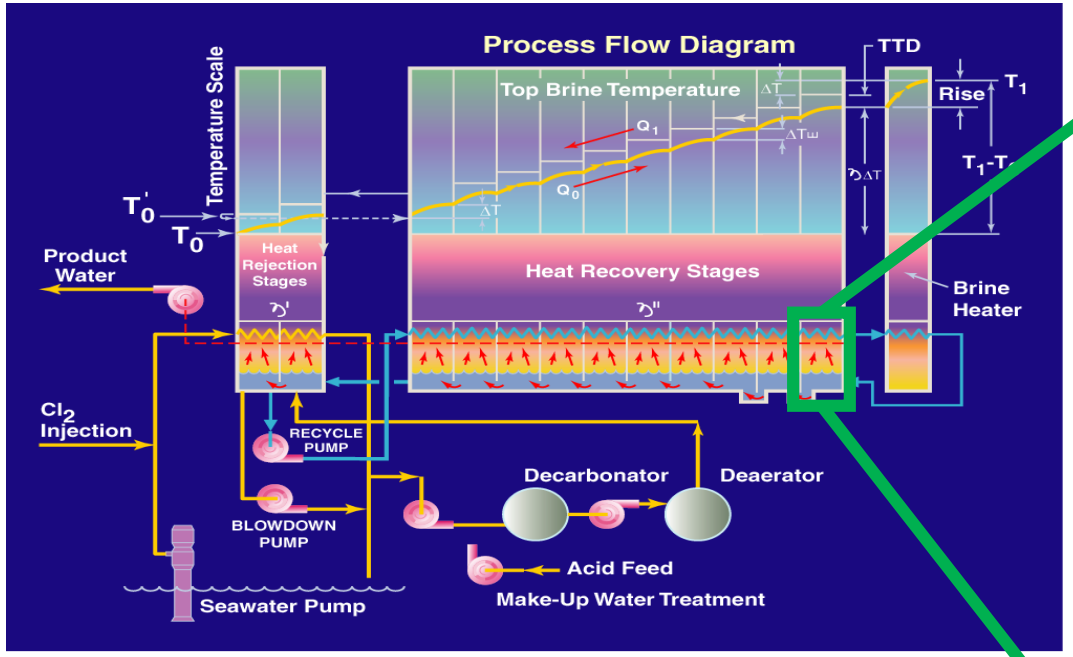
- Multi Stage Flash Evaporation Main Components
  - Flash evaporators chambers
  - Brine heater
  - Ejector system for vacuum and removal of non-condensable gasses

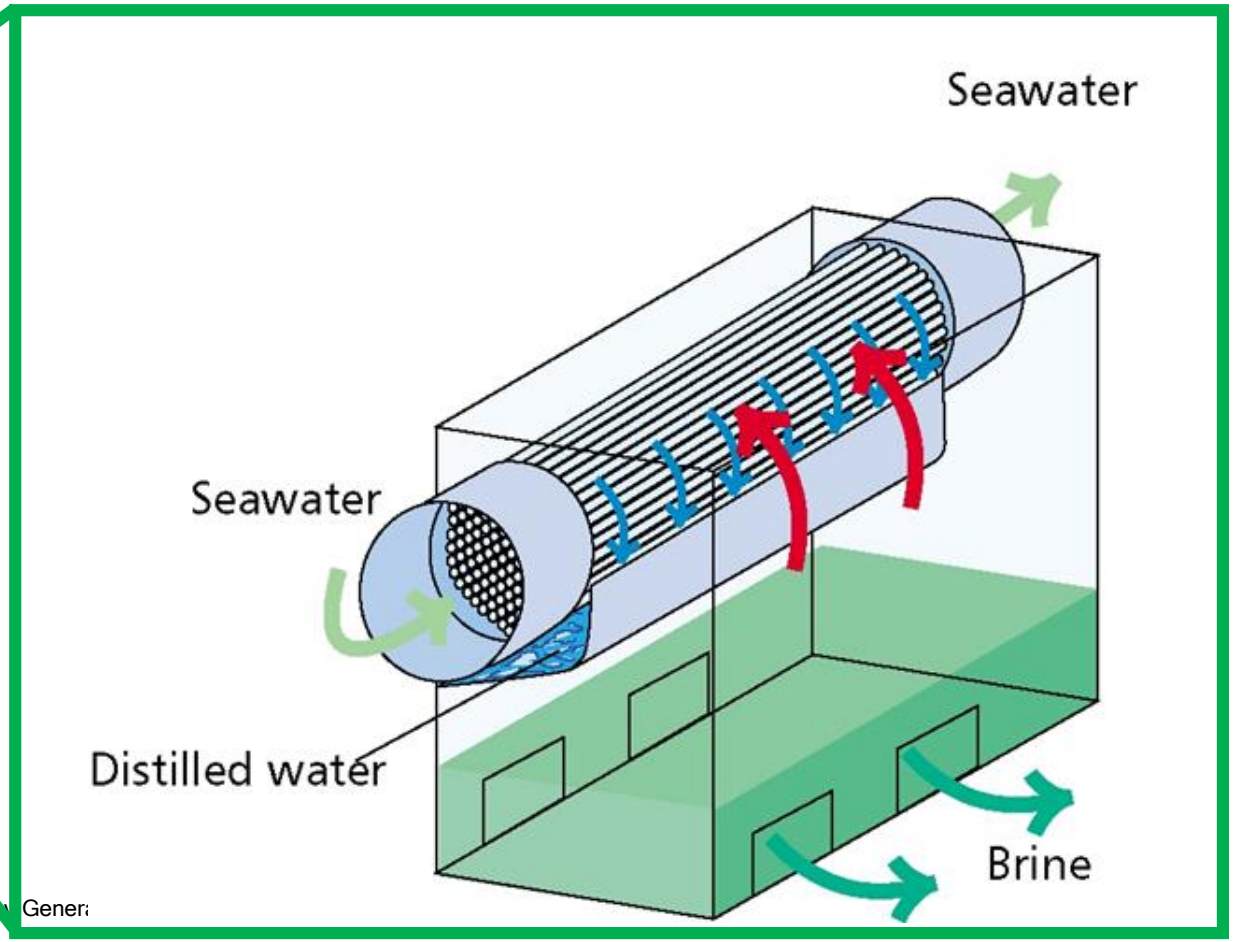
Multi Stage Flash Evaporators Process



Multi-Stage Flash Evaporator

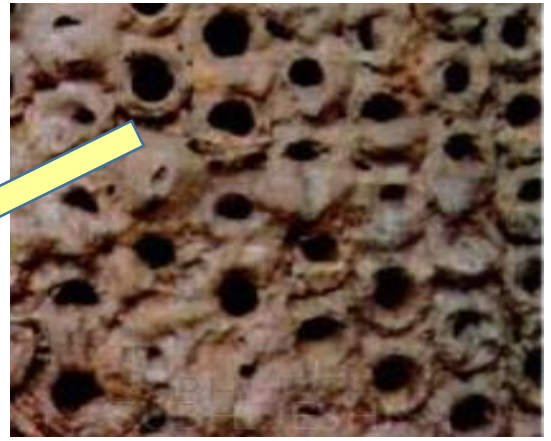
Stage Details



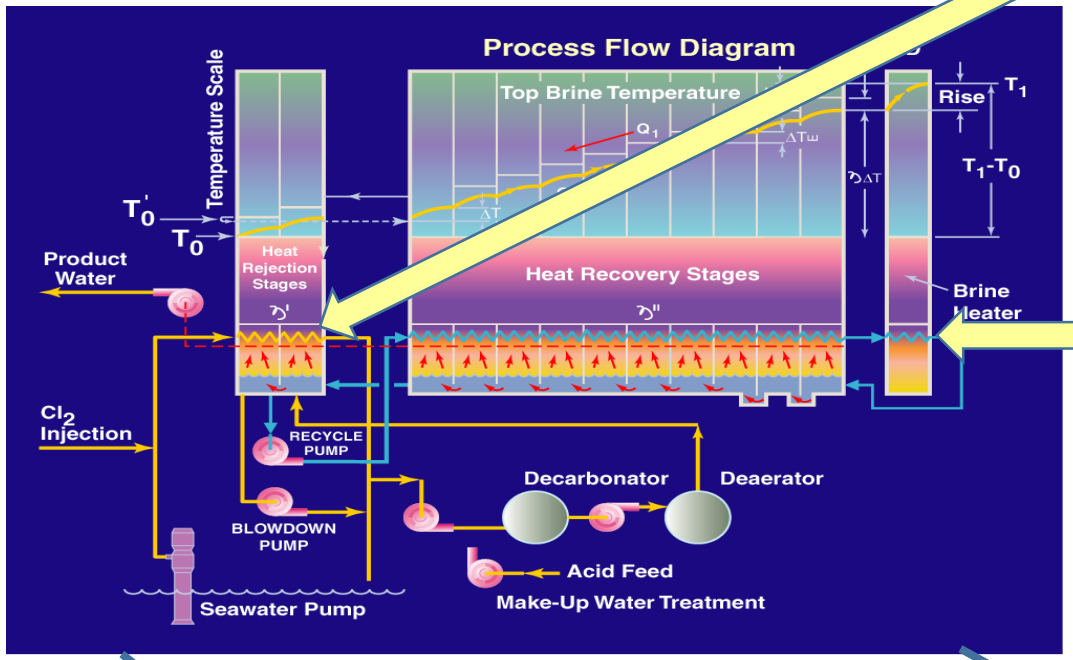


Major challenges

Corrosion



Biofouling



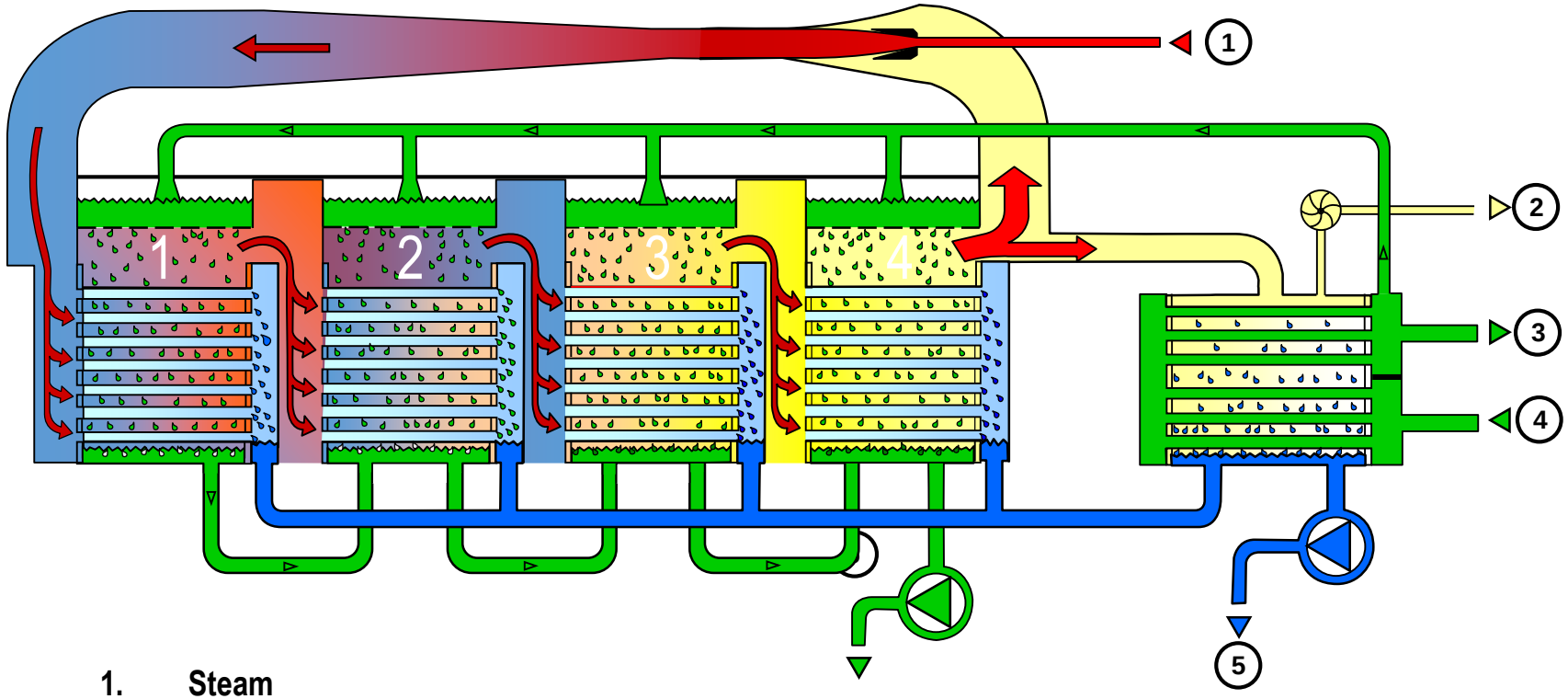
Scale Buildup

Production Rate

Product Water Quality

Multi Effect Desalination Plant, Saudi Arabia

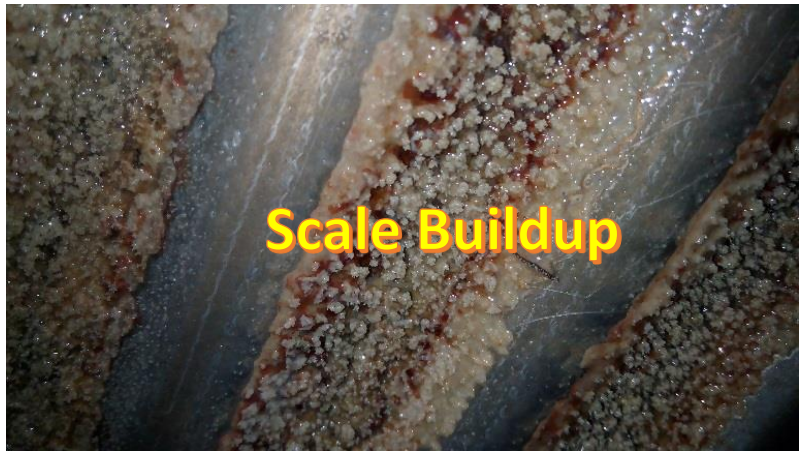
Multi Effect Distillation Process



1. Steam
2. NCG Removal
3. Cooling Water Out
4. Feed and Cooling Water In
5. Distillate Out
6. Brine Out

Major challenges

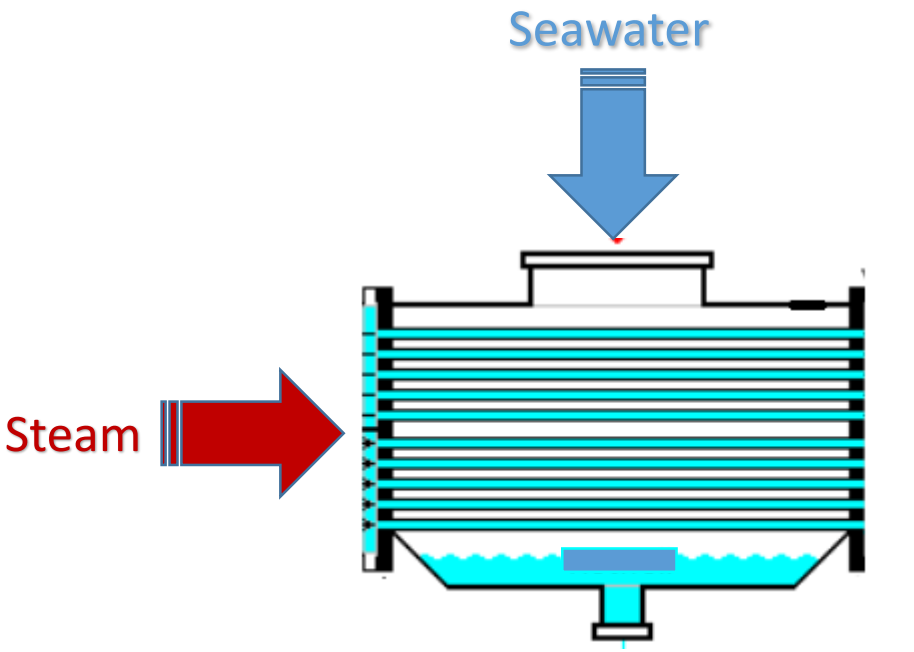
Multi Effect Desalination Unit, Shell Side



Multi Stage Flash Evaporators, Tube side

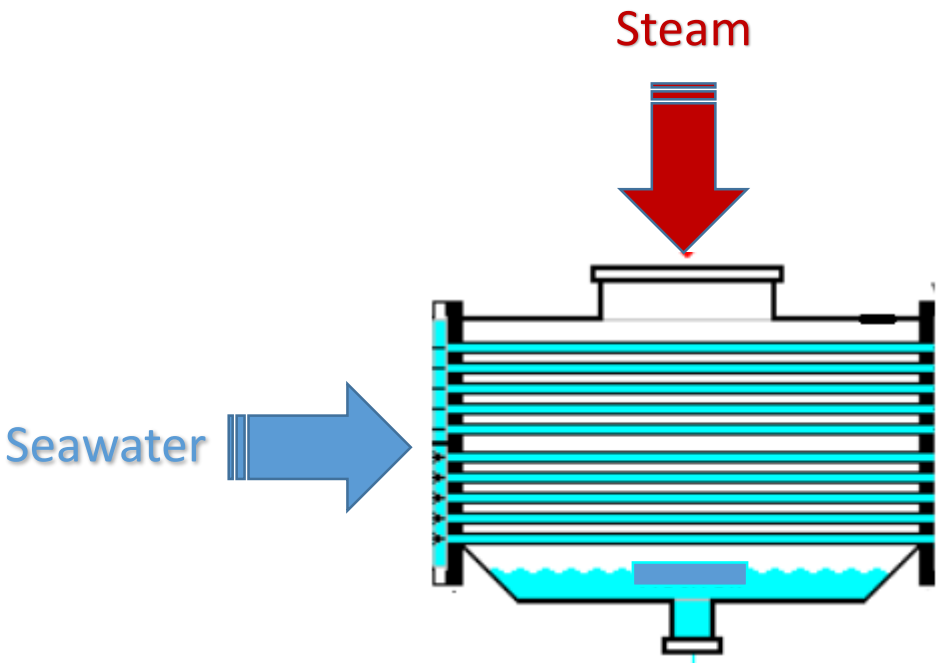
Multi Effect Distillation VS Multi Stage Flash Evaporators

Multi Effect Desalination



- Low Temperature
- Online chemical cleaning

Multi Stage Flash Evaporator



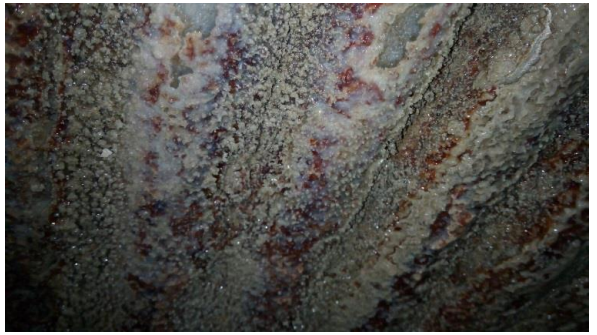
- High Temperature
- offline chemical cleaning


Thank you!

Multi Effect Distillation Process

Major challenges

- Corrosion
- Scale Deposits




Materials of Construction

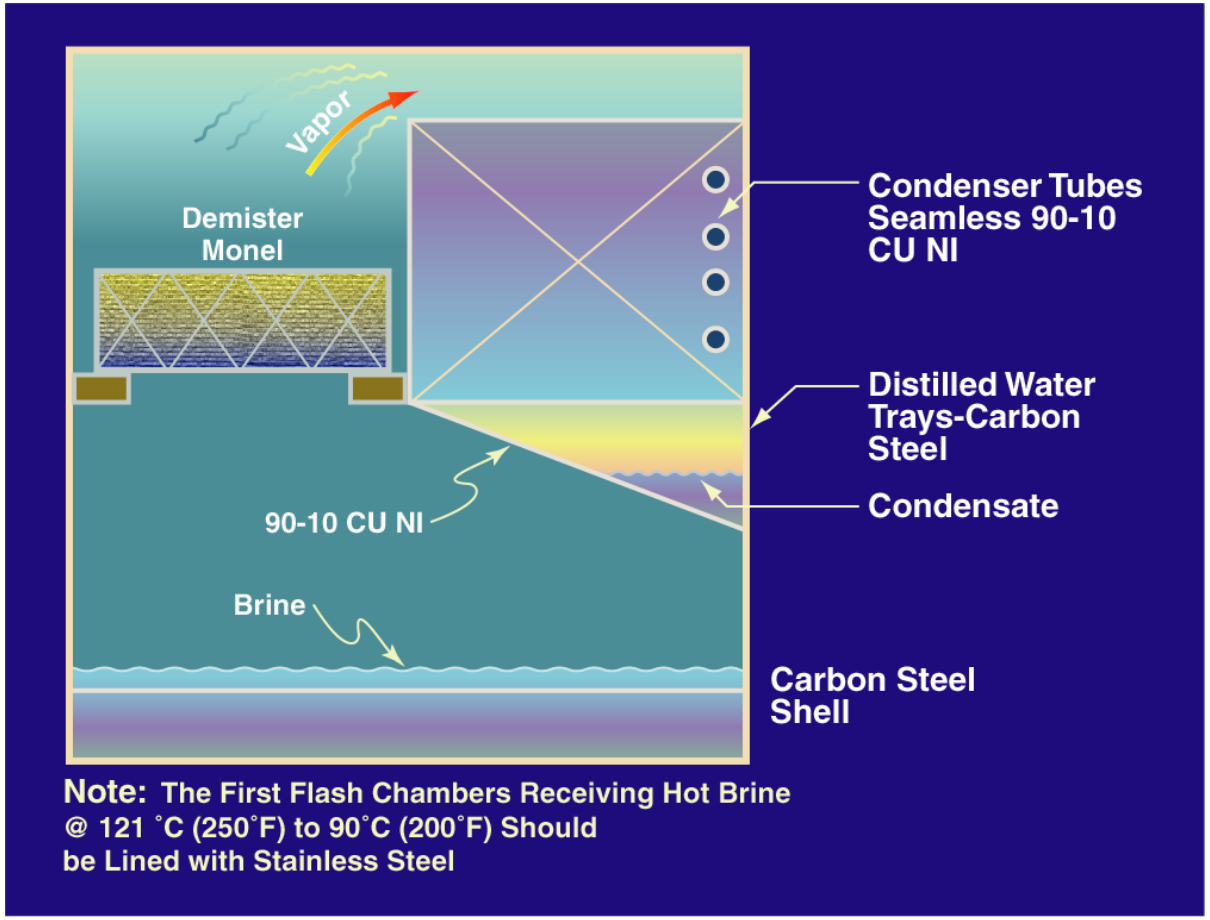
- Evaporator Shells – 316 SS or 317 SS
- Tube Sheets – 254 SMO
- Tubes – Ti gr2

MED Scaling

- Outside of tube bundle
- Normally calcium carbonate with small amounts of calcium sulfate
- Follow by monitoring Gained Output Ratio (GOR)

  - GOR = $\frac{\text{lbs of water produced}}{\text{lbs of steam consumed}}$

Evaporation Stages Material of Construction



Cleaning Methodology

- **MSF –**
  - **Online by ball cleaning**
  - **Offline with sulfamic acid**
- **MED –**
  - **On-line – increase antiscalant dosage and reduce load**
  - **Offline – Sulfamic acid**
  - **Offline – Tetra sodium EDTA**


#5 SEA WATER FLASH
EVAPORATOR