

# **ADVANCES IN WATER DESALINATION TECHNOLOGIES WORKSHOP**

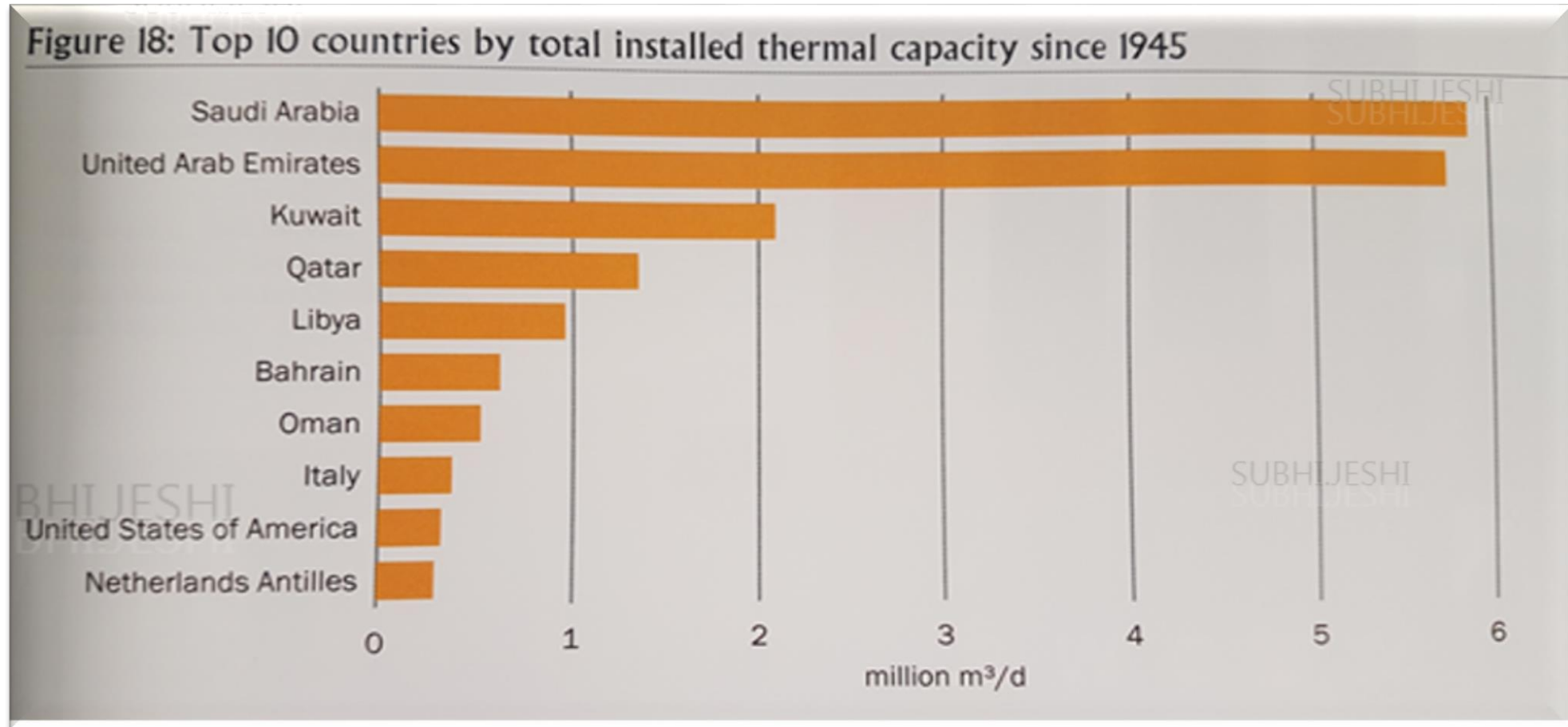
**Thermal Desalination Technologies**

A series of several parallel white lines of varying lengths and thicknesses, slanted diagonally from the bottom left towards the top right, set against a blue gradient background.

# 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

SUBHI JESHI  
SUBHI JESHI

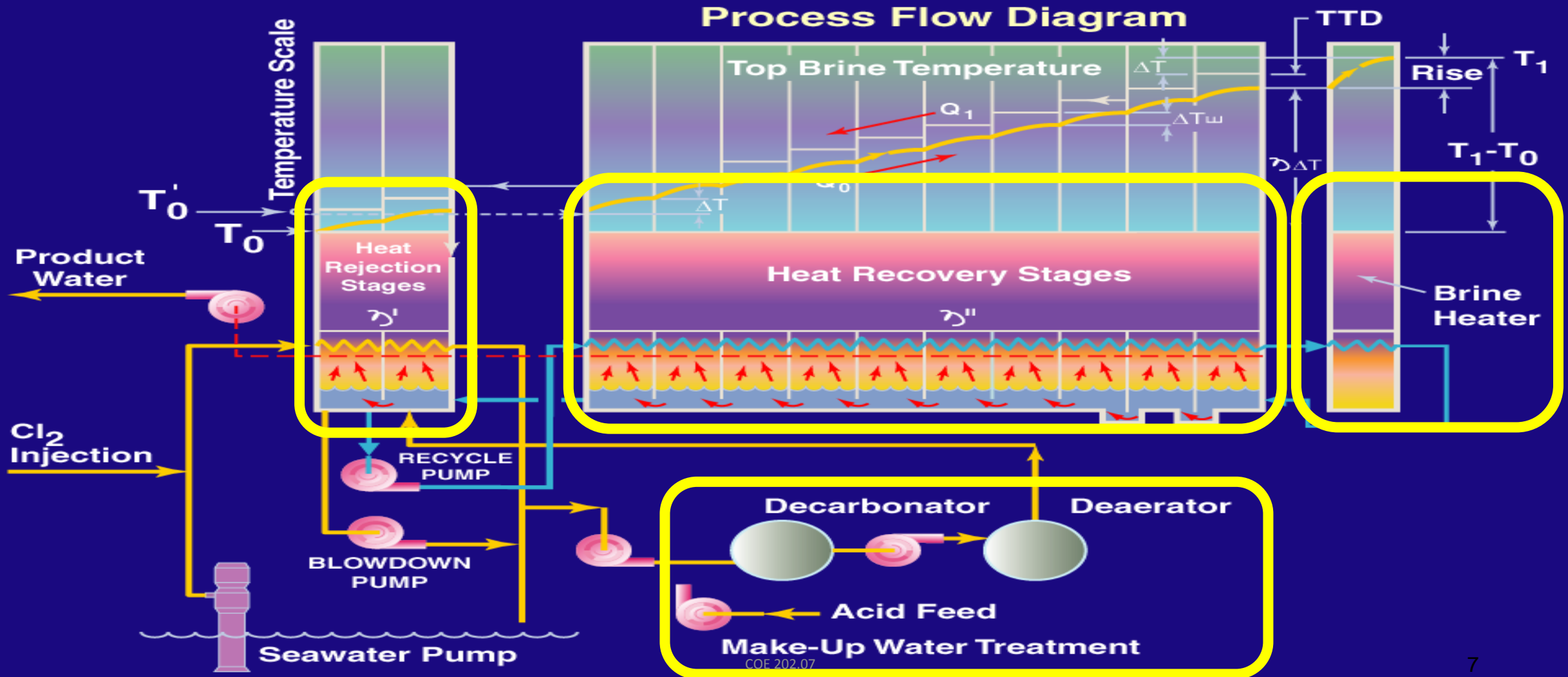


# Multi Stage Flash Evaporators Process

- 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

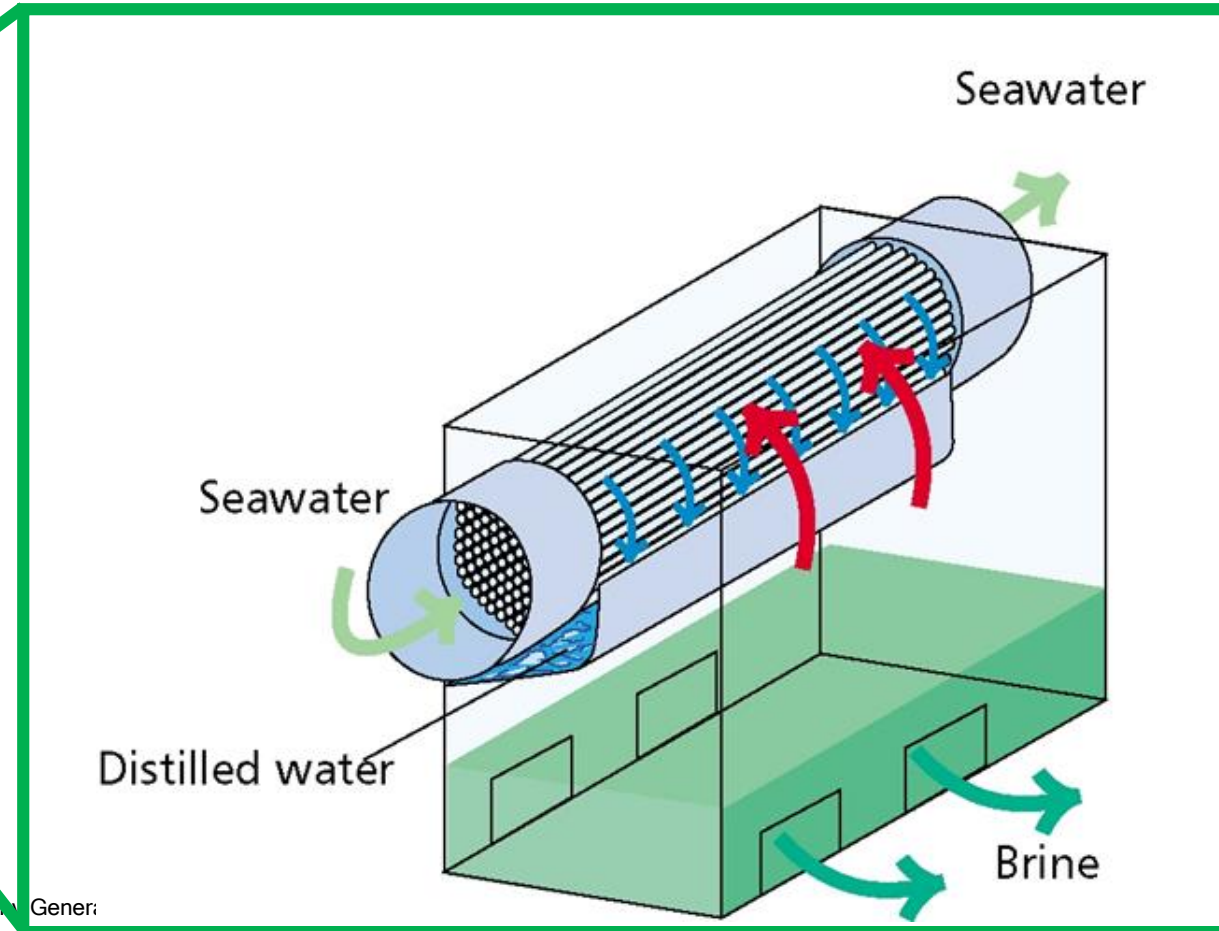
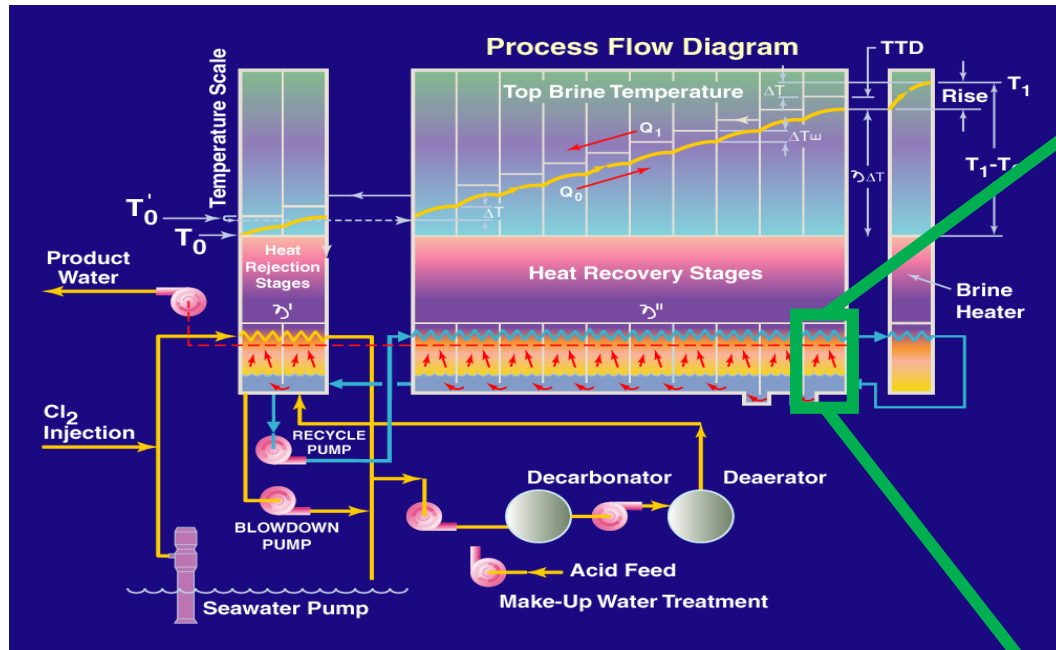


# Multi Stage Flash Evaporators Process



# Multi-Stage Flash Evaporator

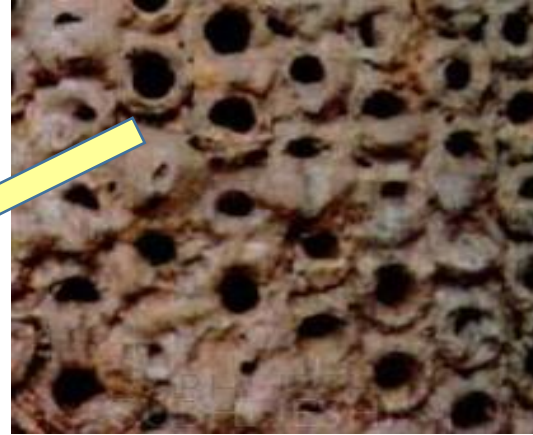
## Stage Details



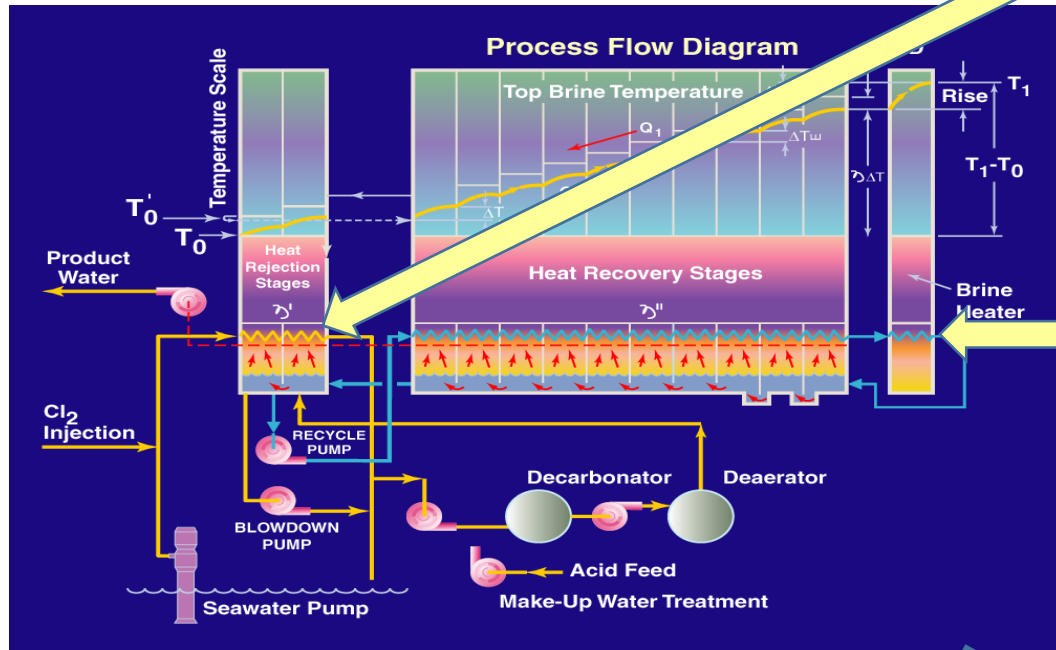


# Major challenges

**Corrosion**



**Biofouling**



**Scale Buildup**

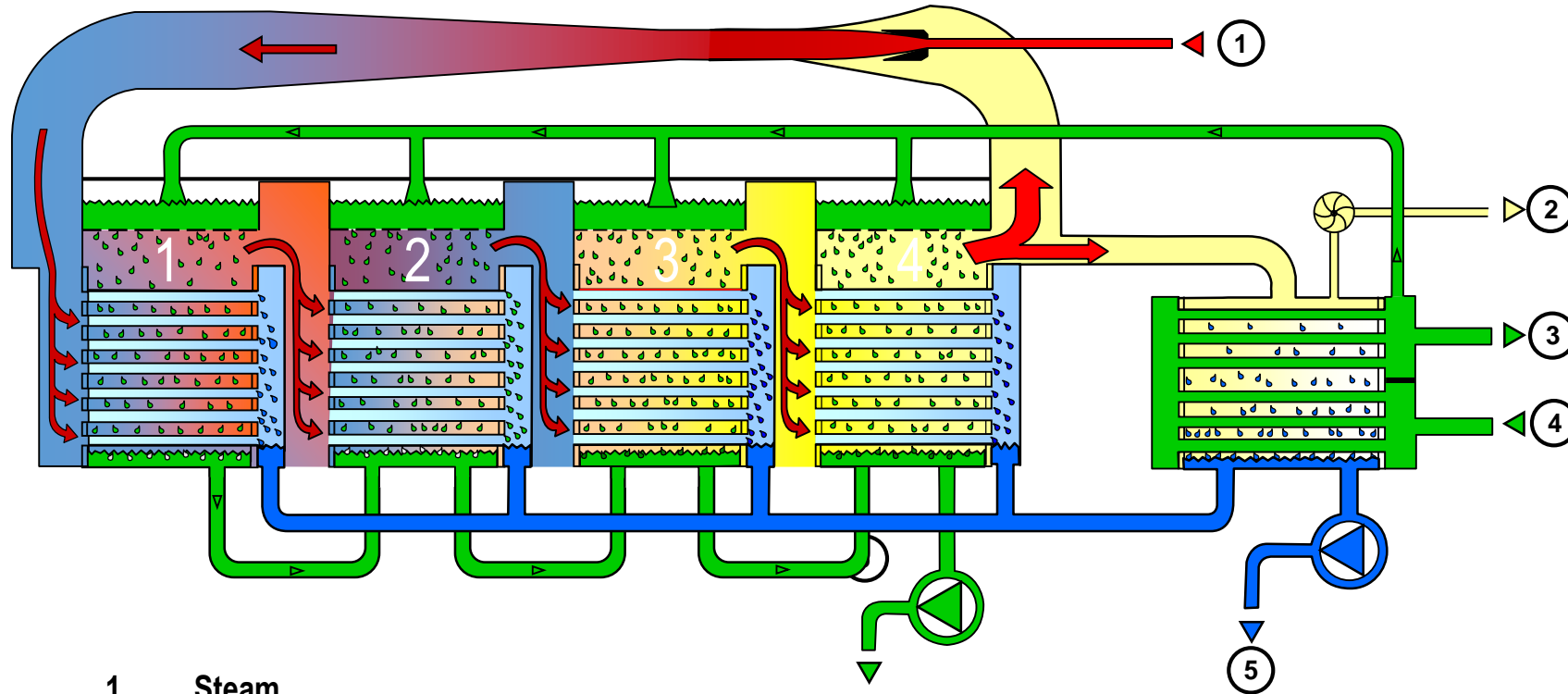
**Production Rate**

**Product Water Quality**

# Multi Effect Desalination Plant, Saudi Arabia



# Multi Effect Distillation Process

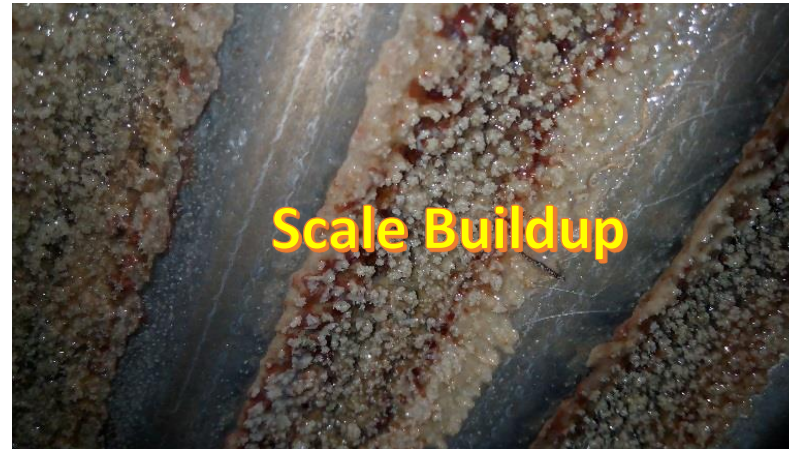


1. Steam
2. NCG Removal
3. Cooling Water Out
4. Feed and Cooling Water In
5. Distillate Out
6. Brine Out

# Major challenges



## Multi Effect Desalination Unit, Shell Side



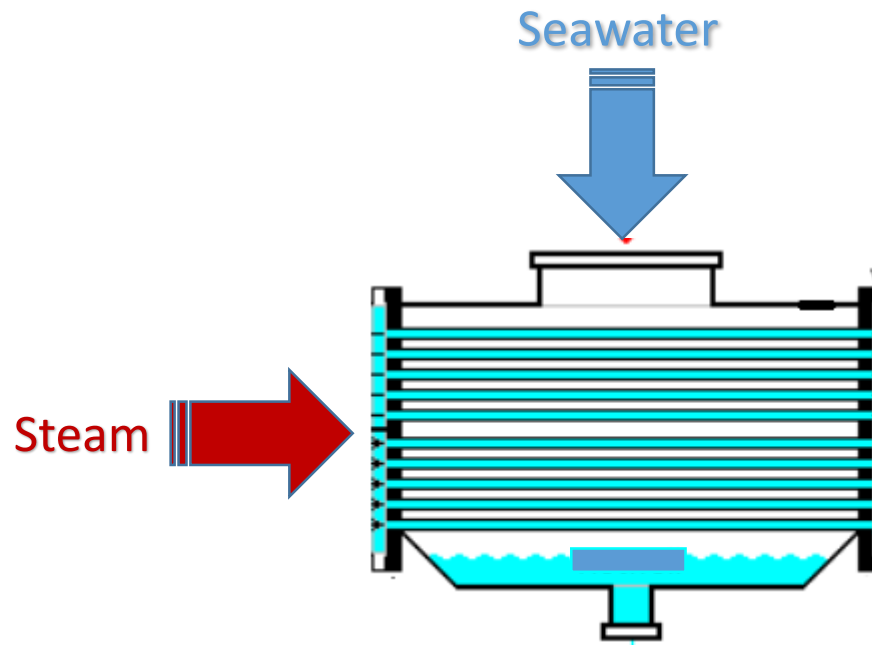
## Multi Stage Flash Evaporators, Tube side



Saudi Aramco: Company General Use

# Multi Effect Distillation VS Multi Stage Flash Evaporators

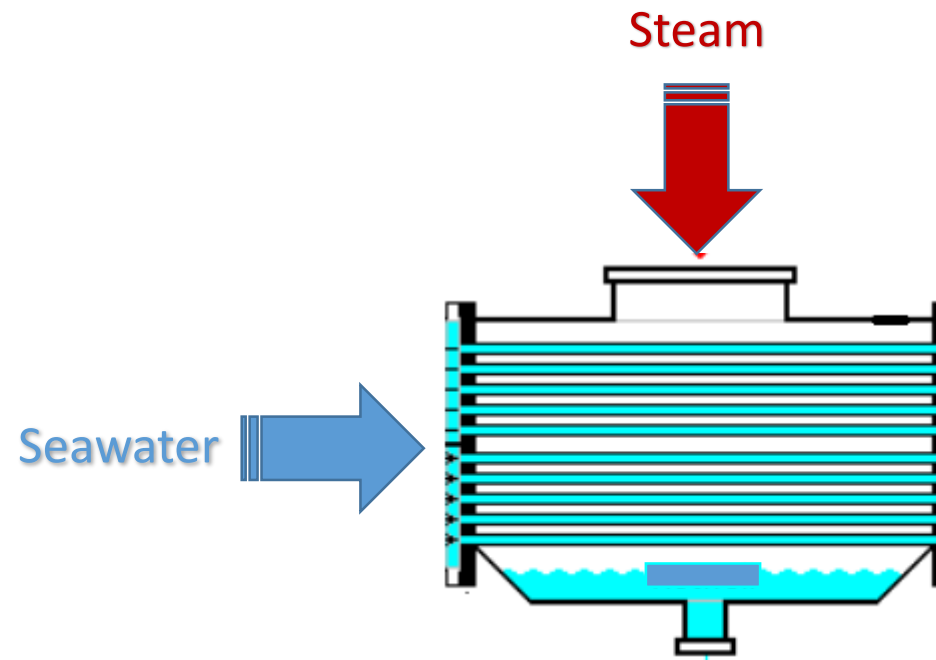
## Multi Effect Desalination



Low Temperature

Online chemical cleaning

## Multi Stage Flash Evaporator



High Temperature

offline chemical cleaning

Thank you!



SUBHIJEEVA

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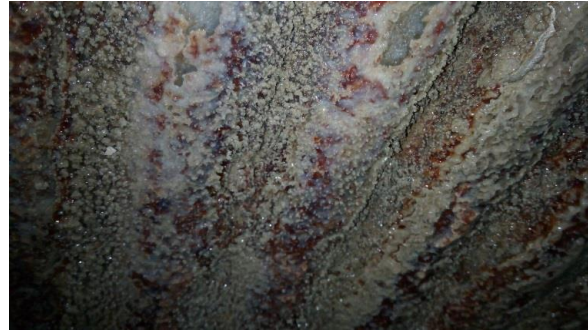
# Multi Effect Distillation Process

## Major challenges

- Corrosion
- Scale Deposits







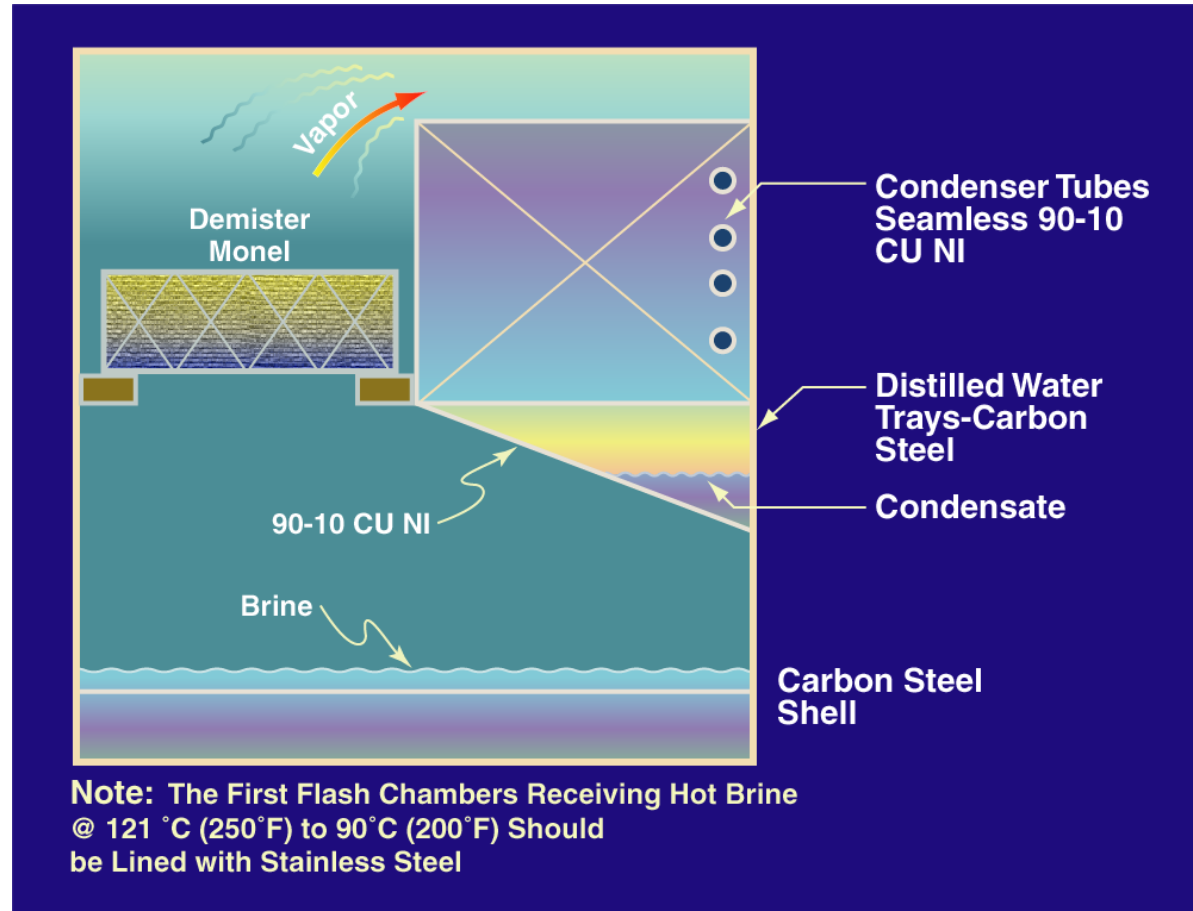
# Materials of Construction

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

# 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**

