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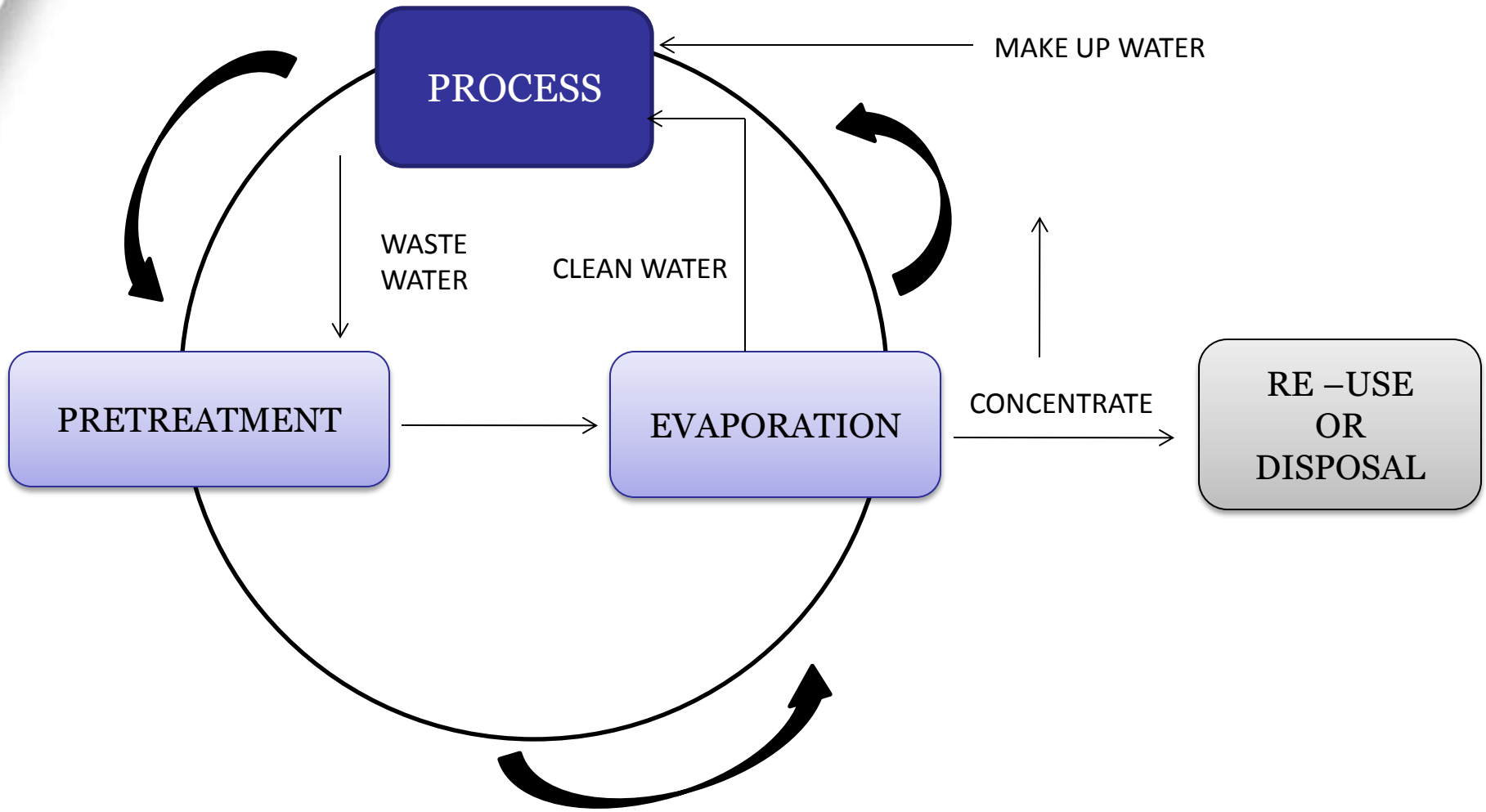
# ACHIEVING ZLD THROUGH MECHANICAL VAPOUR RECOMPRESSION

# EVAPORATION – NATURE'S PURIFICATION METHOD

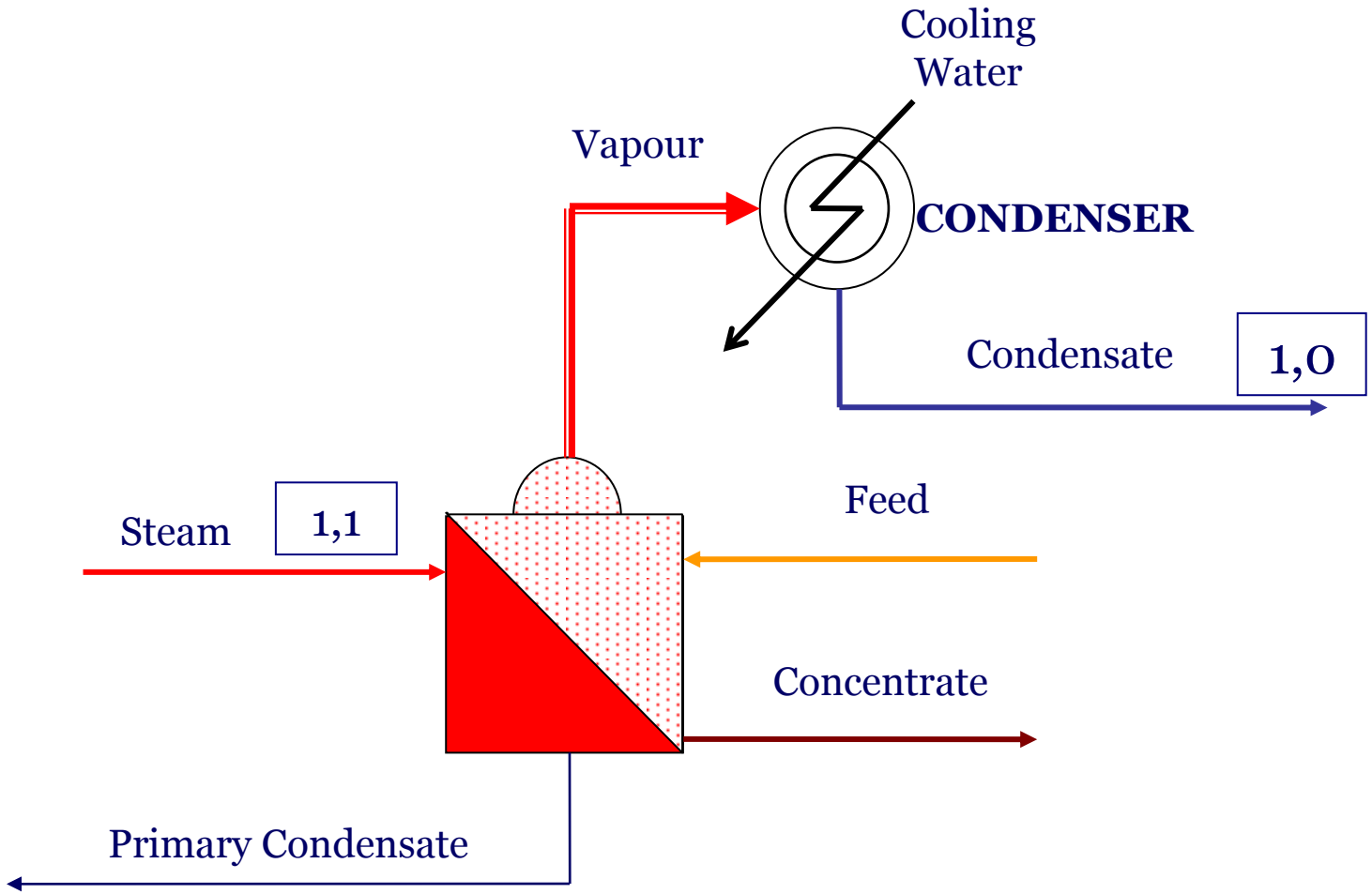
# ZERO DISCHARGE SYSTEM BY EVAPORATION



# SINGLE EFFECT EVAPORATION

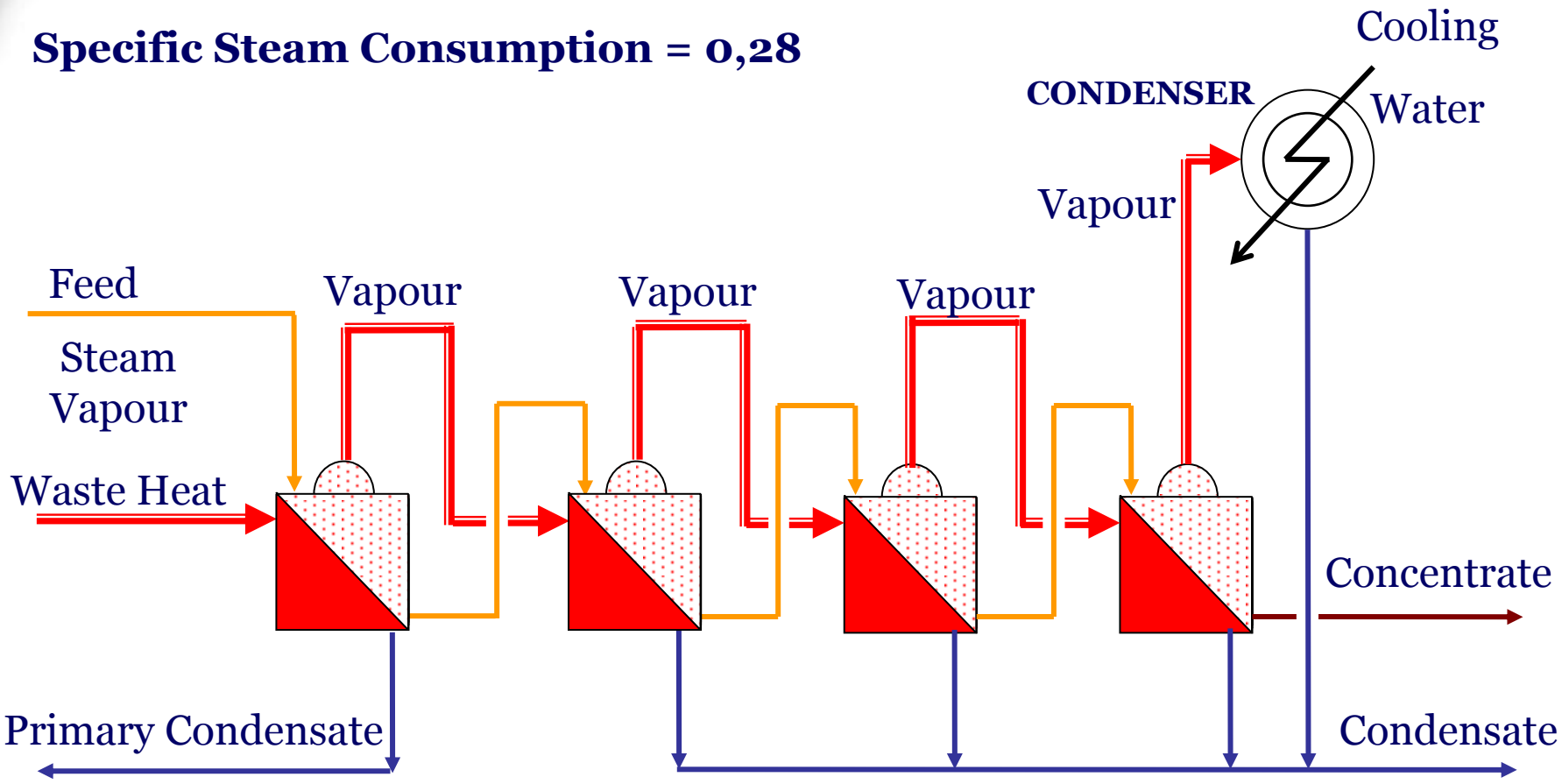
**Specific Steam Consumption =**

**1,1**



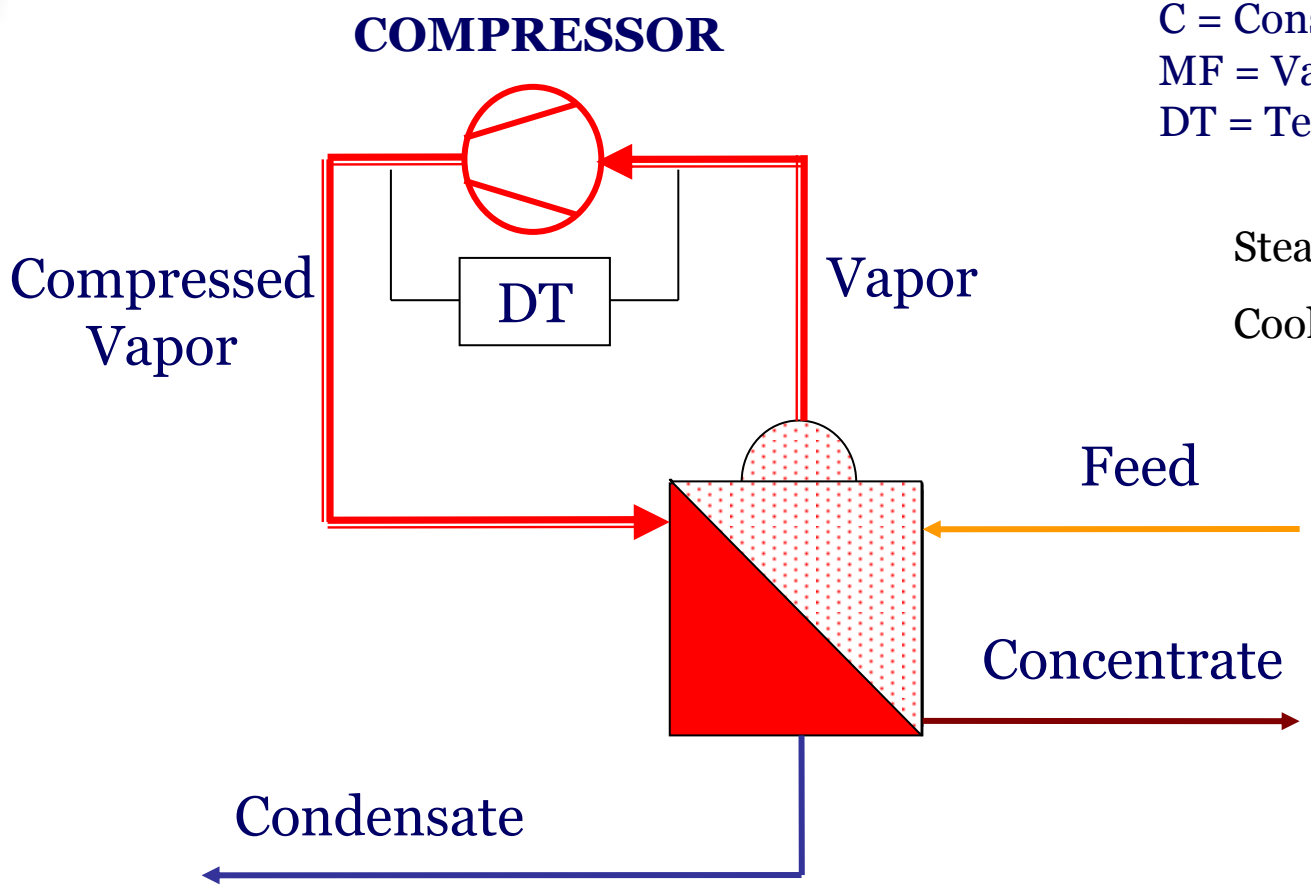
# 4-EFFECT MULTI-EFFECT EVAPORATION

**Specific Steam Consumption = 0,28**



# MECHANICAL VAPOR RECOMPRESSION EVAPORATION

**P = C x MF x DT**
P = Fan Power Use (kW)
C = Constant (2,5...3)
MF = Vapor mass flow (ton/h)
DT = Temp. difference (°C)




Steam consumption ~ 0

Cooling water cons. ~ 0

# ARVIND ENVISOL INTRODUCES NEW EVAPORATION TECHNOLOGY

## USING LOW COST POLYMERIC FILM AS HEAT TRANSFER MEDIA

# POLYMERIC FILM EVAPORATION TECHNOLOGY

- ✓ Low cost Evaporative surface
  - o large heat transfer surface
  - o small temperature difference
  - o low energy use - typically 8 to 14 kWh per $m^3$ of purified water

- ✓ Efficient production of polymeric heat exchanger elements by new machine (1,5 million $m^2$/year)

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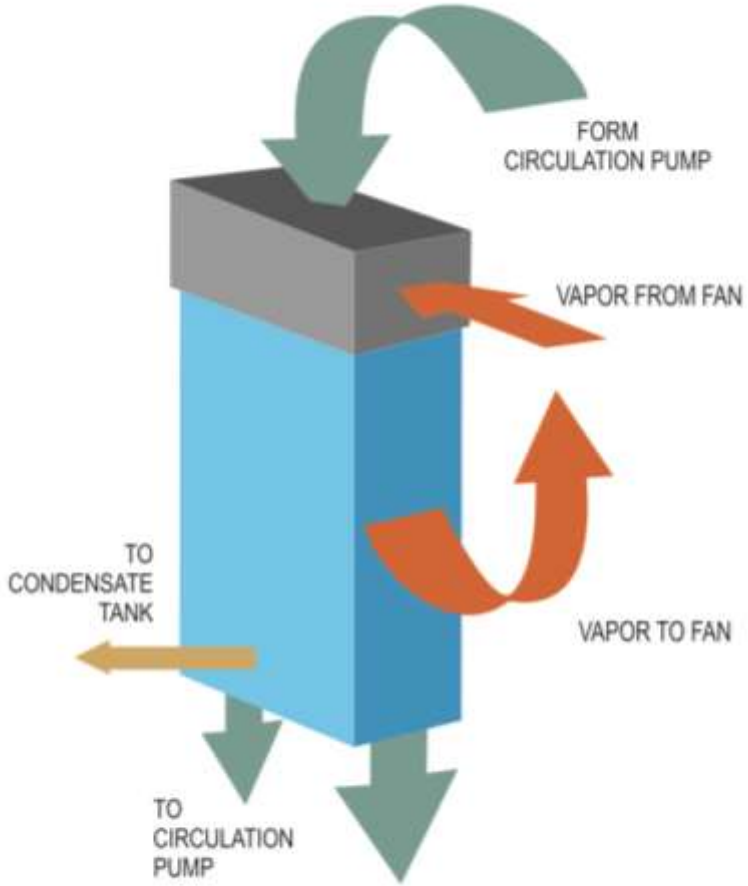
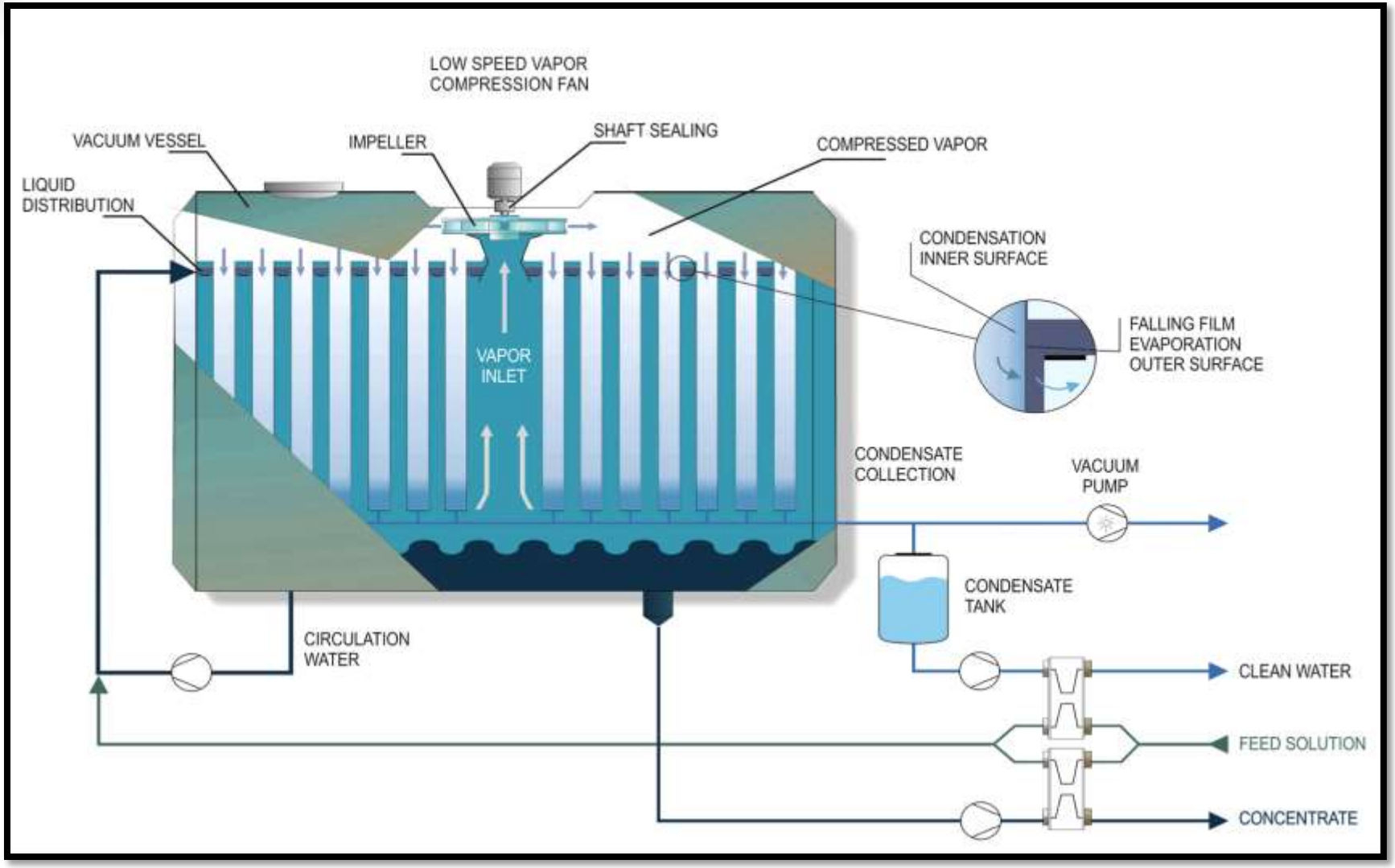
# POLYMERIC EVAPORATIVE HEAT EXCHANGER CASSETTE



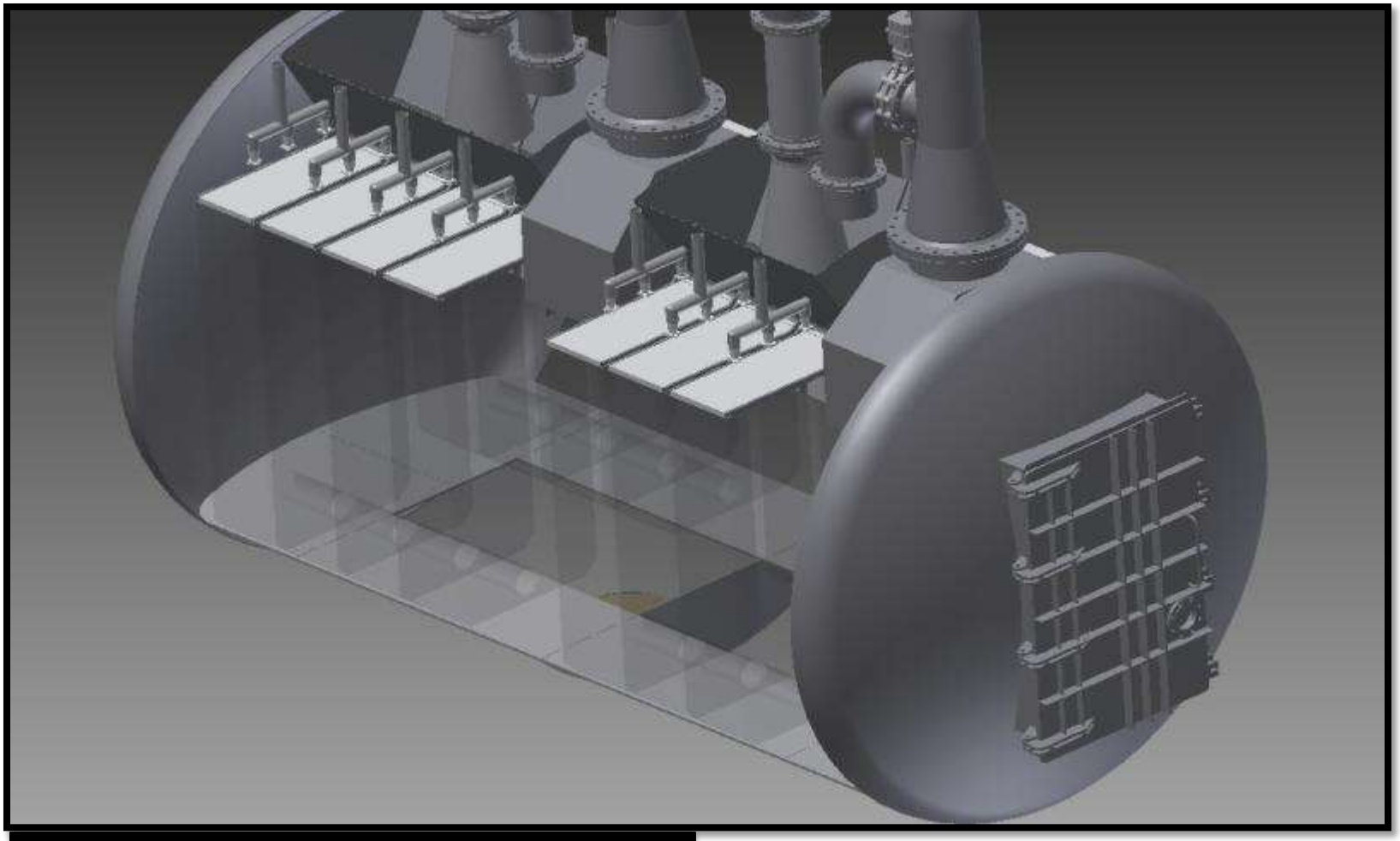

THE HEART OF THE SYSTEM

- 50 elements
- Surface area 200 $m^2$
- Total weight 50 kg

# OPERATION PRINCIPLE

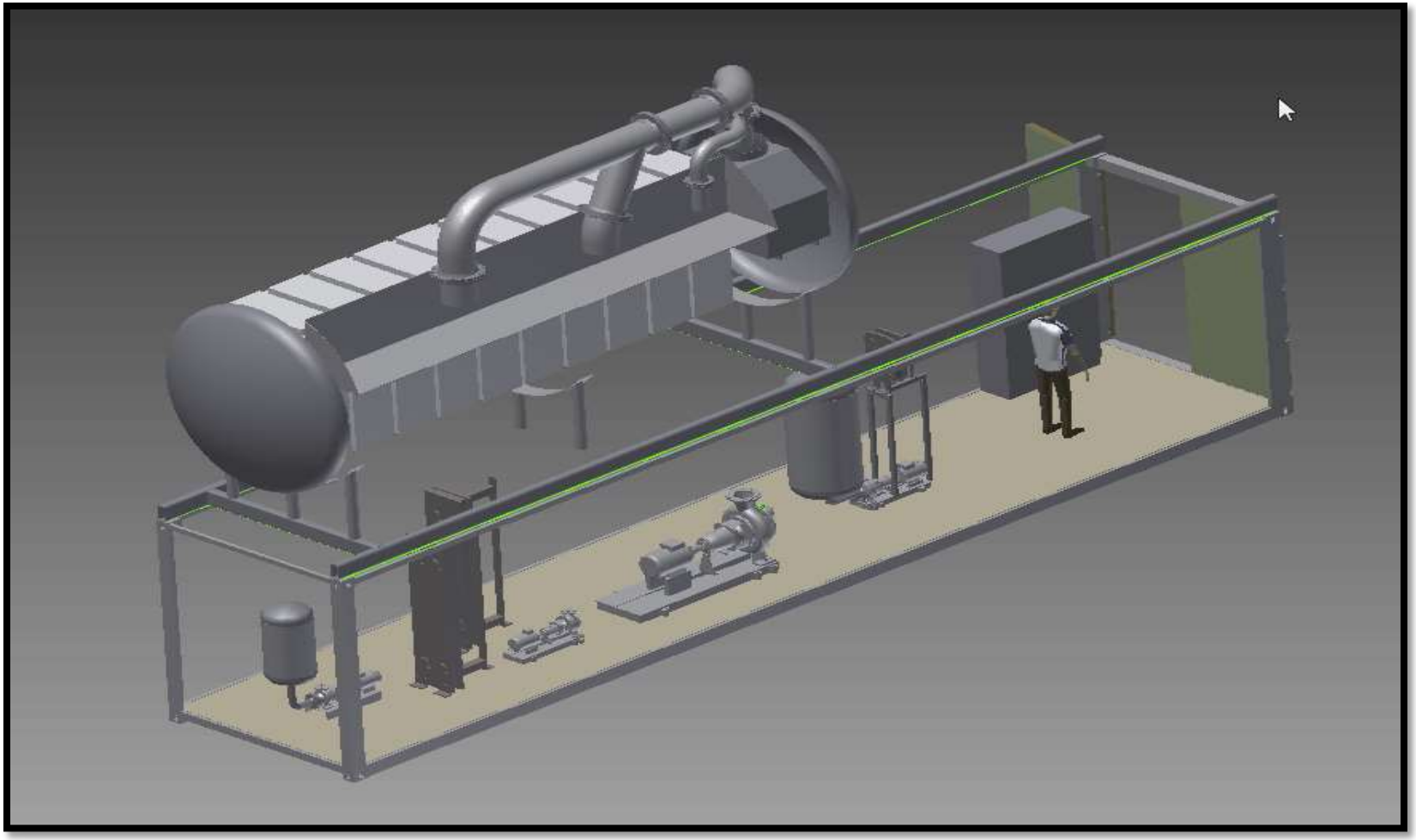


# TYPICAL EVAPORATOR LAY OUT (14 CASSETTES)



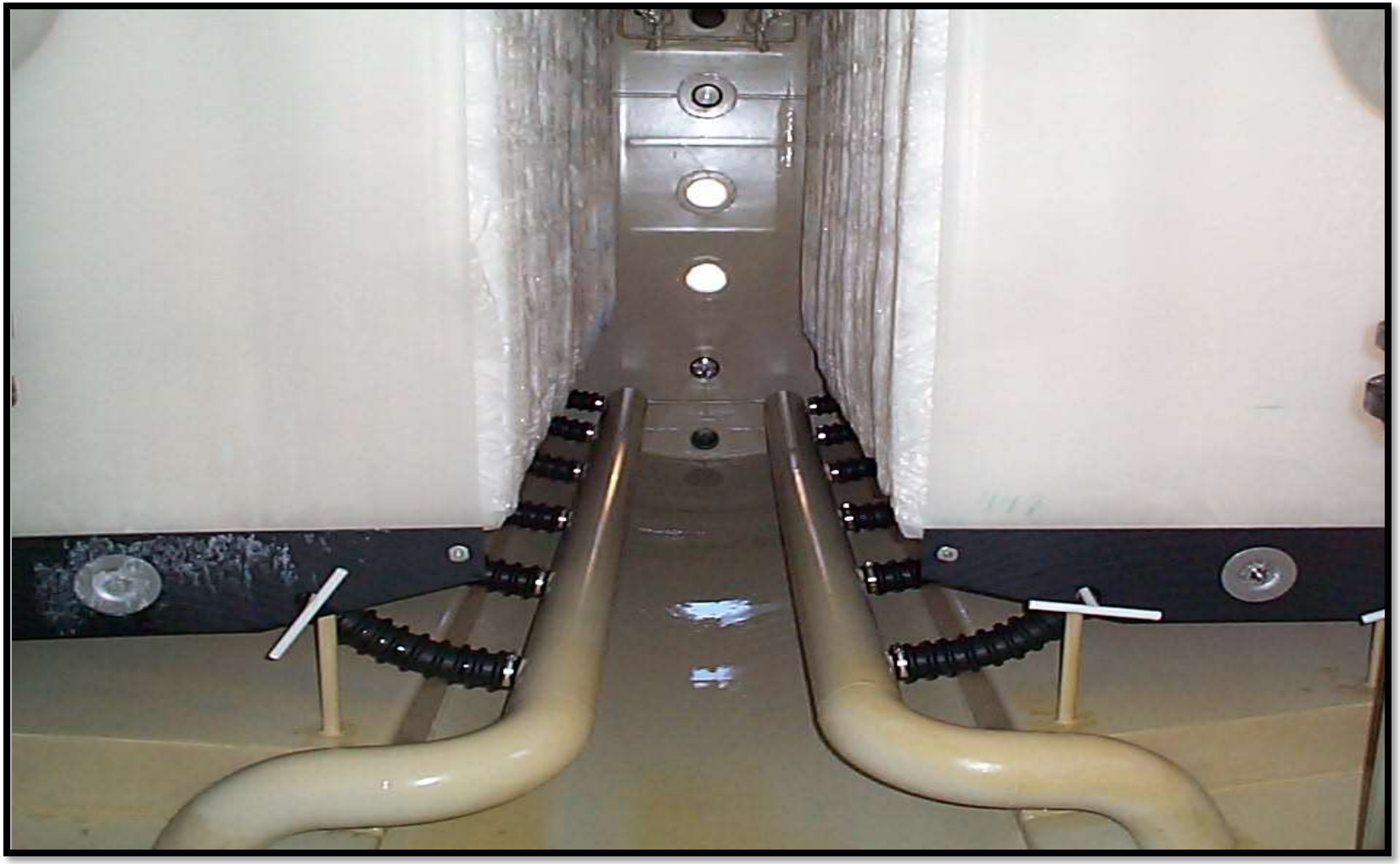
LARGE DIAMETER UNIT (3.8 mtr.)

# CONTAINER SIZE EVAPORATOR (10 CASSETTES)



SMALL DIAMETER UNIT (2.4 mtr.)

# INTERNAL ARRANGEMENT OF CASSETTES



# CASSETTE ARRANGEMENT

## STANDBY MODE

## OPERATIONAL MODE

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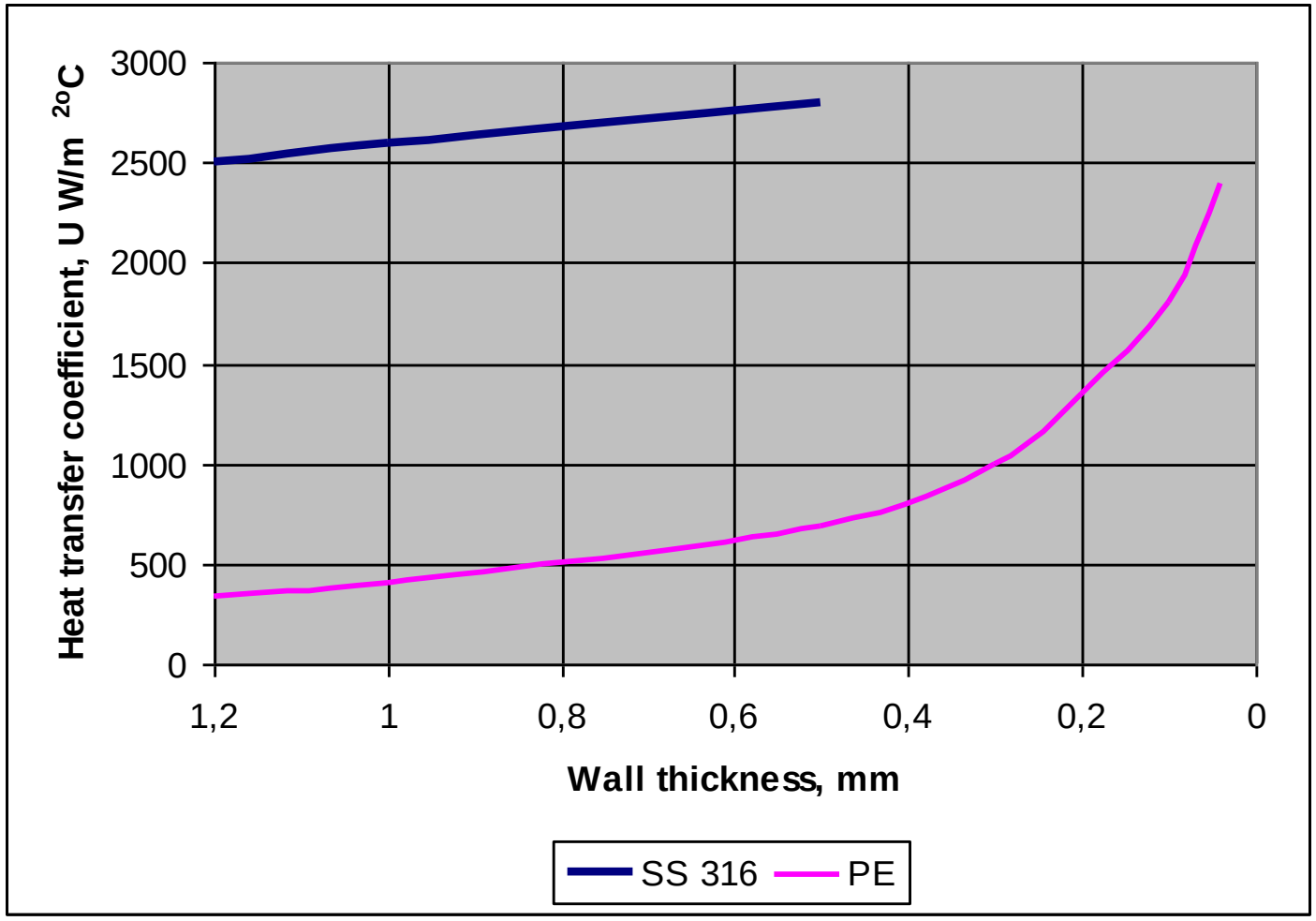
# LIQUID DISTRIBUTION ON POLYMERIC HEAT EXCHANGER

Uniform distribution of Liquid on the Surface of Polymeric Heat Exchanger

# OVERALL HEAT TRANSFER COEFFICIENT AS FUNCTION OF WALL THICKNESS



# MVR-FAN (HEART OF SYSTEM)

THE HEART OF THE SYSTEM

# OPEX COMPARISON OF POLYMER MVR WITH CONVENTIONAL MEE & MVR

| **Energy consumption (el = 6 rp/kWh, steam 1 rp/kg) water** | **rp/m³ clean** |
|---|---|
| ➢ New technology MVR (12 kWh/m3 + 10 kg/m3) | 82 |
| ➢ Conventional MVR (25 kWh/m3 + 20 kg/m3) | 170 |
| ➢ Conventional ME 1 stage (2 kWh/m3 +1100 kg/m3) | 1112 |
| ➢ Conventional ME 4 stage (3 kWh/m3 + 280 kg/m3) | 298 |

# COST COMPARISION OF SOME HEAT EXCHANGE MATERIALS

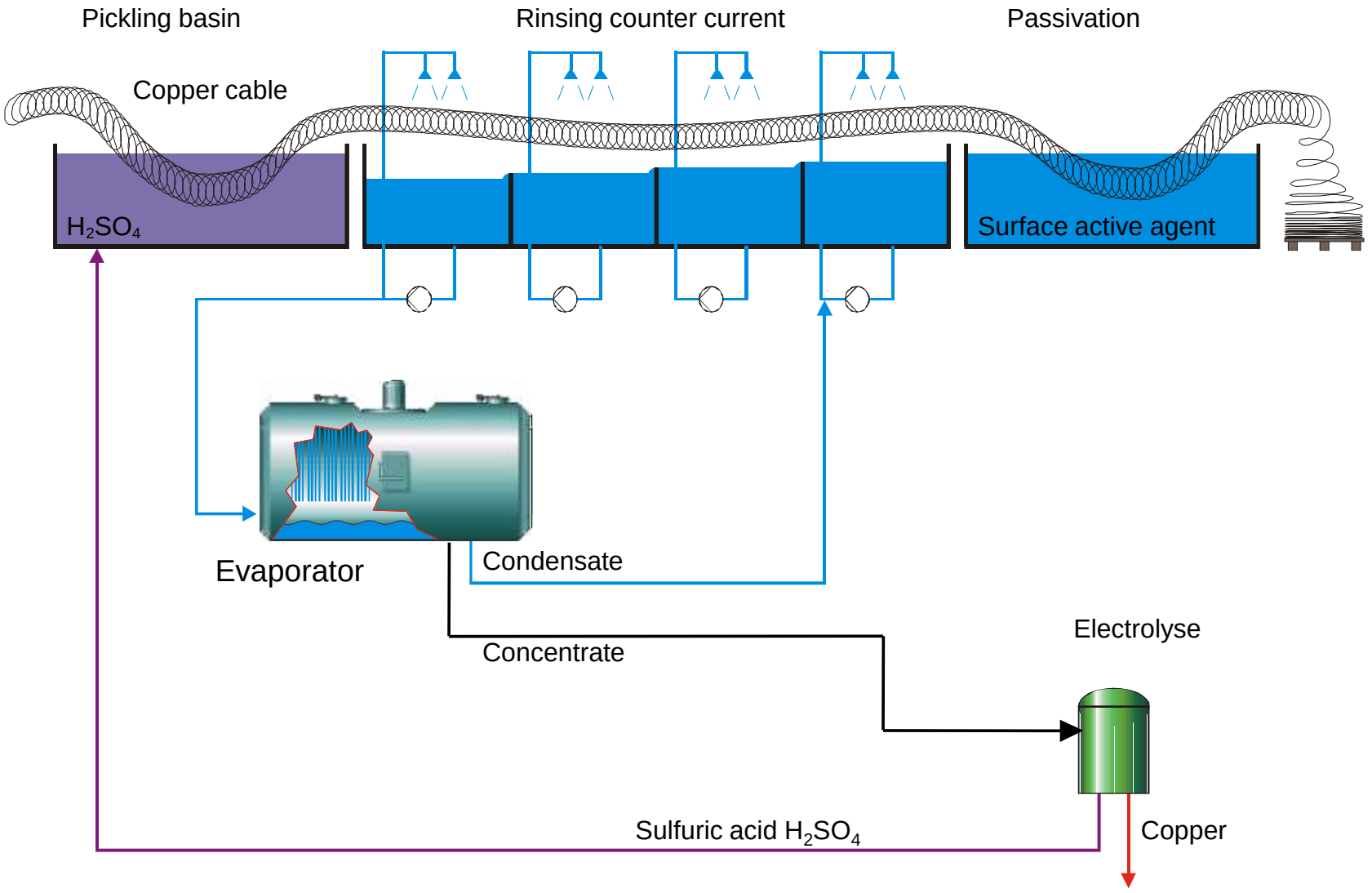
| **Material** | | **Relative cost/m²** |
|---|---|---|
| AISI 316 | ∅ 51 x 1,0 mm tube (50 EUR/m²) | 1 |
| 254 SMO | ∅ 51 x 1,25 mm tube | 2,5 |
| 654 SMO | ∅ 51 x 1,25 mm tube | 4,9 |
| Sanicro 28 | ∅ 51 x 1,8 mm tube | 5,7 |
| Hastelloy C276 | ∅ 51 x 1,0 mm tube | 13 |
| Titanium | ∅ 50,8 x 0,9 mm tube | 13 |
| Polyolefin film 40 my | (0,3 EUR/m²) | 0,006 |
| High tech plastic film | | 0,06 |

# TYPICAL APPLICATION AREAS

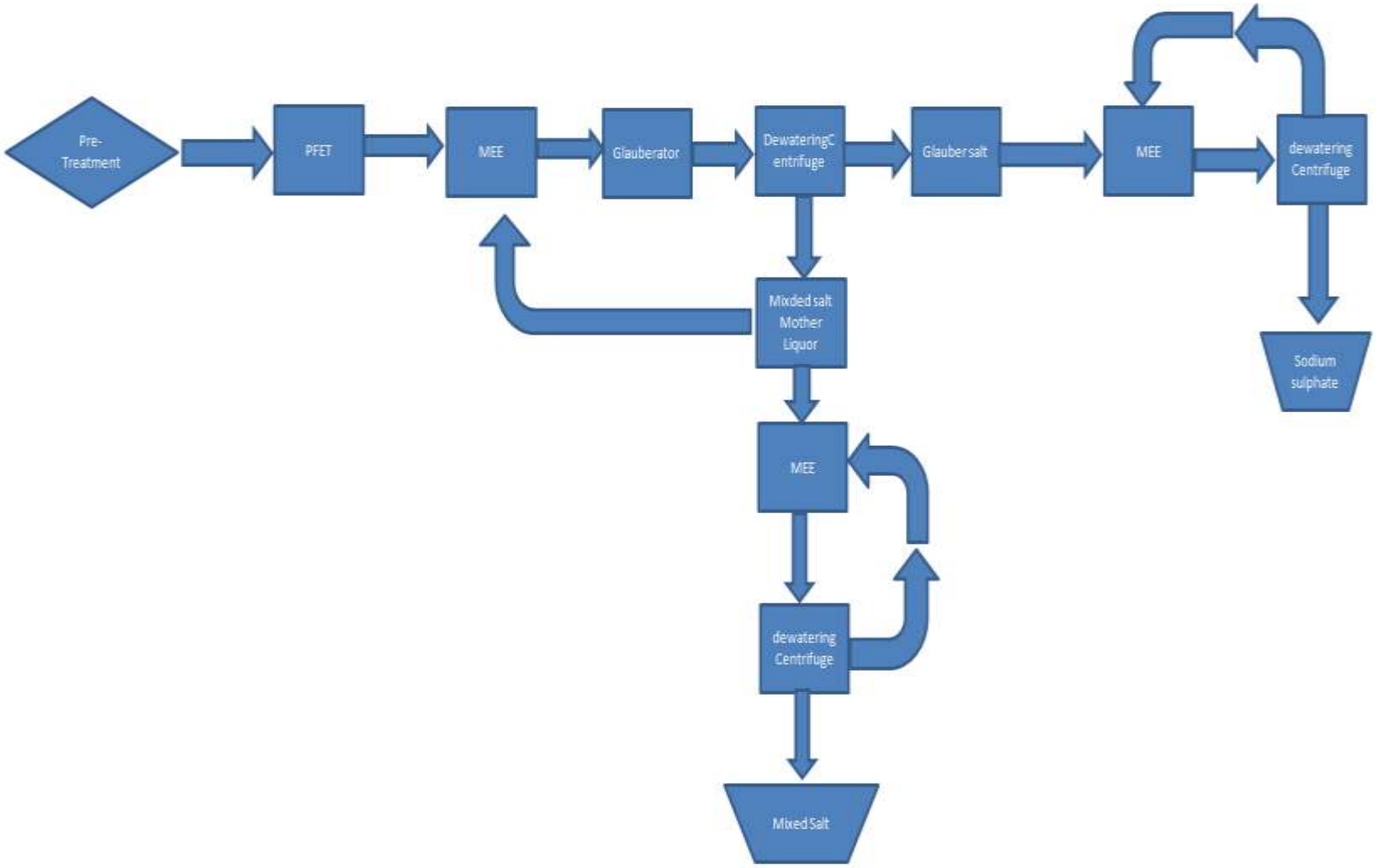
- Textile industry
- Steel and metal industry
- Mining industry
- Pulp & Paper
- Food and feed industry
- Landfill leachate
- Groundwater remediation
- Seawater desalination
- Chemical industry
- Electronic industry
- Power plants
- Pharma industry

# MVRE PLANT (3 X 500 M3/D)

# COPPER CABLE MANUFACTURING FROM COPPER EFFLUENT 350 M3/D



# ZLD IN TEXTILE INDUSTRY

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1/3rd
OPEX

# THANK YOU

Arvind Envisol Private Limited
info@envisol.co.in