

# Experience with different Heat Transfer Fluids

Dipl.-Ing. Klaus Hennecke

Knowledge for Tomorrow





## Background

- Concentrating solar technologies
  - Parabolic trough
  - Linear Fresnel
- Medium to high temperatures
  - 100 – 500°C
- Test facilities
  - SOPRAN, DLR Cologne (Water / Steam)
  - HTF Testloop PSA, Spain (VP1)
  - KONTAS PSA, Spain (Syltherm)
  - DISS Testfacility, PSA Spain (Steam)
- Pilot and Demo plants
  - SOLITEM solar cooling Sarigerme Park Hotel, Turkey (Water)
  - REACT: solar cooling Hotel Jordan, Hospital Morrokko (Water)
  - P3: ALANOD process steam, Germany (Steam)
  - TRESERT: solar tri-generation, Thailand (Steam)



# Water

Heat capacity, heat transfer characteristics	Good, Well investigated, stable
Operating temperature range	Limited by freezing $< 0^{\circ}\text{C}$ and Increasing vapour pressure Economic limit: PN 40 (28 bar, 230°C)
Operating risks	Pressure Corrosion (counteract by additives) Scaling and fouling (counteract by demineralising)
Cost	Very low



## Water / Glycol

Heat capacity, heat transfer characteristics	Good
Operating temperature range	Freeze protection down to $-30^{\circ}\text{C}$ Upper temperature limited by stability of Glycol ( $\sim 170^{\circ}\text{C}$ )
Operating risks	Pressure (moderate) Aging of Glycol
Cost	low



## Water / steam

Heat capacity, heat transfer characteristics	Very good (heat of condensation)
Operating temperature range	~ 100°C up to above 250°C Freeze protection may be required
Operating risks	Pressure (qualified personnel) Corrosion (counteract by additives)
Cost	low

Note: Saturated steam is a very common heat transfer medium in industrial processes





## Thermal Oil VP1 (Diphenyl/Diphenyloxide)

Heat capacity, heat transfer characteristics	medium
Operating temperature range	Up to 400°C at moderate pressure (pressureless up to 350°C) Freeze protection below ~ 15°C
Operating risks	Environmental and fire hazards Toxicity
Cost	medium



# Thermal Oil Syltherm 800

Heat capacity, heat transfer characteristics	medium
Operating temperature range	-40 – 400°C
Operating risks	Moderate fire hazard Non-toxic
Cost	high



# Summary

	Water	Water/ Glycol	Steam	VP1	Syltherm 800
Heat transfer characteristic	+	+	++	o	o
Temperature range [°C]	0 – 230	-30 - 170	100 - 250	15 – 400	-40 - 400
Hazards	1	1	1	3	1
Cost	Very low	Low	Low	Medium	High

