
Cost Reduction by temperature limitation

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TASK 54

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General information

Development focus

Novel solar collector concepts

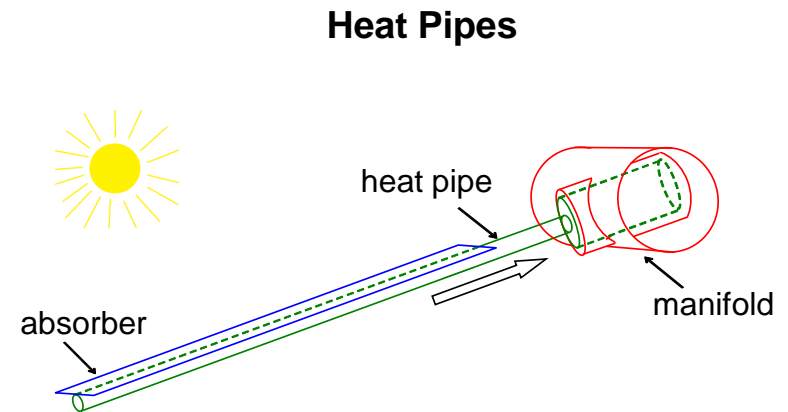
- Reducing thermal stress in the solar loop
- Featuring high performance

Development goals

- Reduction of system investment costs
(less expensive components)
- Reduction of system maintenance costs

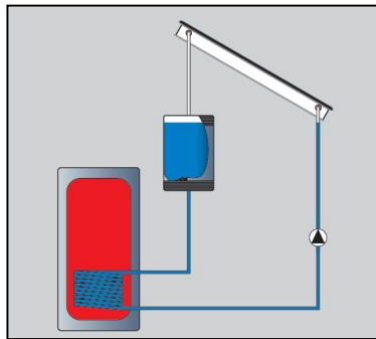
Existing approaches for temperature limitation

- Cooling system
 - Drain back
 - Shades
 - Thermocromic absorber
 - Thermomechanical devices
 - Heat pipes
- } Additional system components needed



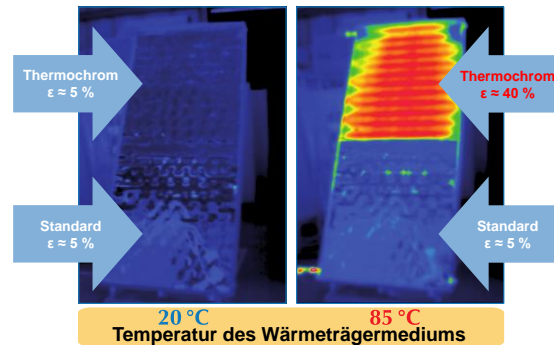
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Drain Back



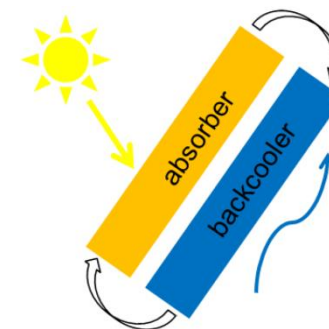
Solar Technologie International GmbH

Thermochromic Absorber Coatings



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Cooling device

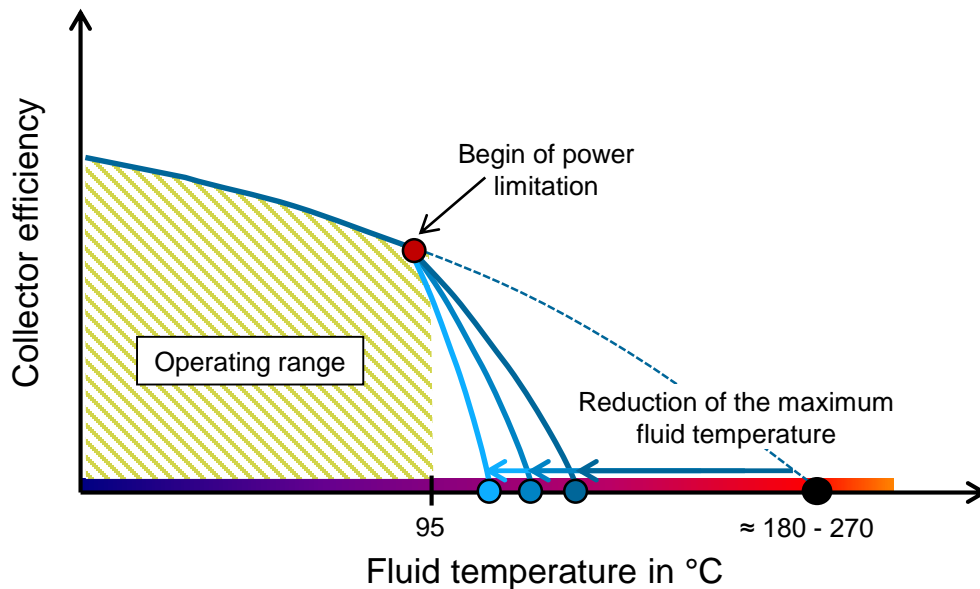


University of Innsbruck

Collectors with inherently temperature limitation

Basic principle

- “Automatic” collector power shut off
- Correspondent reduction of max. temperature



Advantages

- No vaporization of solar fluid
- Lower thermomechanical stress
- Simplification of solar system
- Extended lifetime of the components

Collectors with temperature limitation in TASK 54

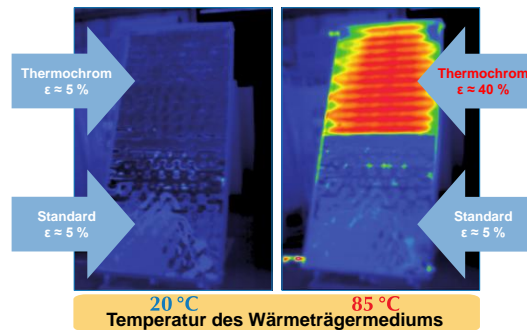
Heat Pipes

- Heat transfer suppression at high temperatures
- Suitable for FPC & ETC



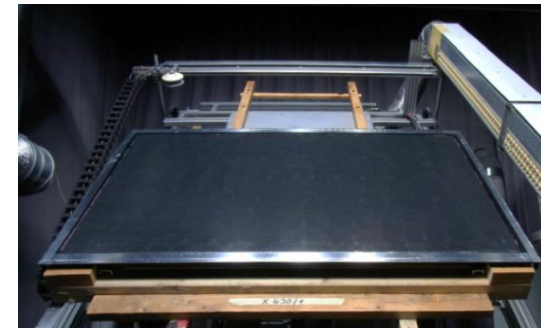
Thermochromic Absorbers

- Emissivity switching from 5 to 40 % at high temperatures
- Suitable for FPC & ETC



SPF-Approach

- Absorber shifting to the front glazing at high temperatures
- Suitable for FPC



Supported by:
 Federal Ministry for Economic Affairs and Energy
 on the basis of a decision by the German Bundestag



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HSR University of Applied Science Rapperswil

Cost optimized system design

*Metal Piping /
EPDM-Insulation*

> 95 °C



*Pre-Insulated
Polymeric Piping*

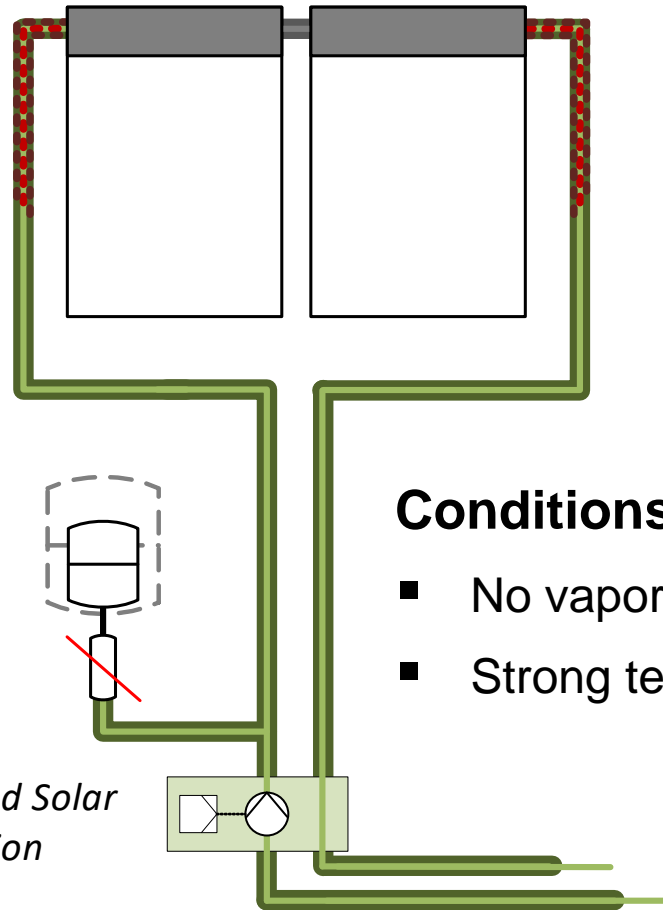
< 95 °C
for short times up to 110°C



*Smaller Expansion
Vessel*

*Omit Ballast
Vessel*

*Optimized Solar
Station*



Conditions:

- No vapor formation
- Strong temperature reduction

Reduction of investment costs compared to reference system

Solar systems without stagnation load (no vapor, temperature limitation)	General system	Heat pipe system
Less solar fluid is needed	0 €	25 €
Smaller expansion vessel / no ballast vessel	100 – 140 €	100 – 140 €
Pre-insulated pipes (PEX, PE)	60 – 200 €	96 – 200 €
Amount of alternative piping	50 – 100 %	75 – 100 %
Optimized solar station	20 – 100 €	20 – 100 €
Easier installation (pipe laying and bleeding)	100 – 190 €	100 – 250 €
Total reduction of investment costs	280 – 630 €	341 – 715 €
Relative benefit of investment costs	7 – 16 %	9 – 19 %

- **General system:** general technology for temperature limitation
- **Heat pipe system:** heat pipe collectors for temperature limitation

Reduction of maintenance costs

Advantages of lower thermal stress in the loop

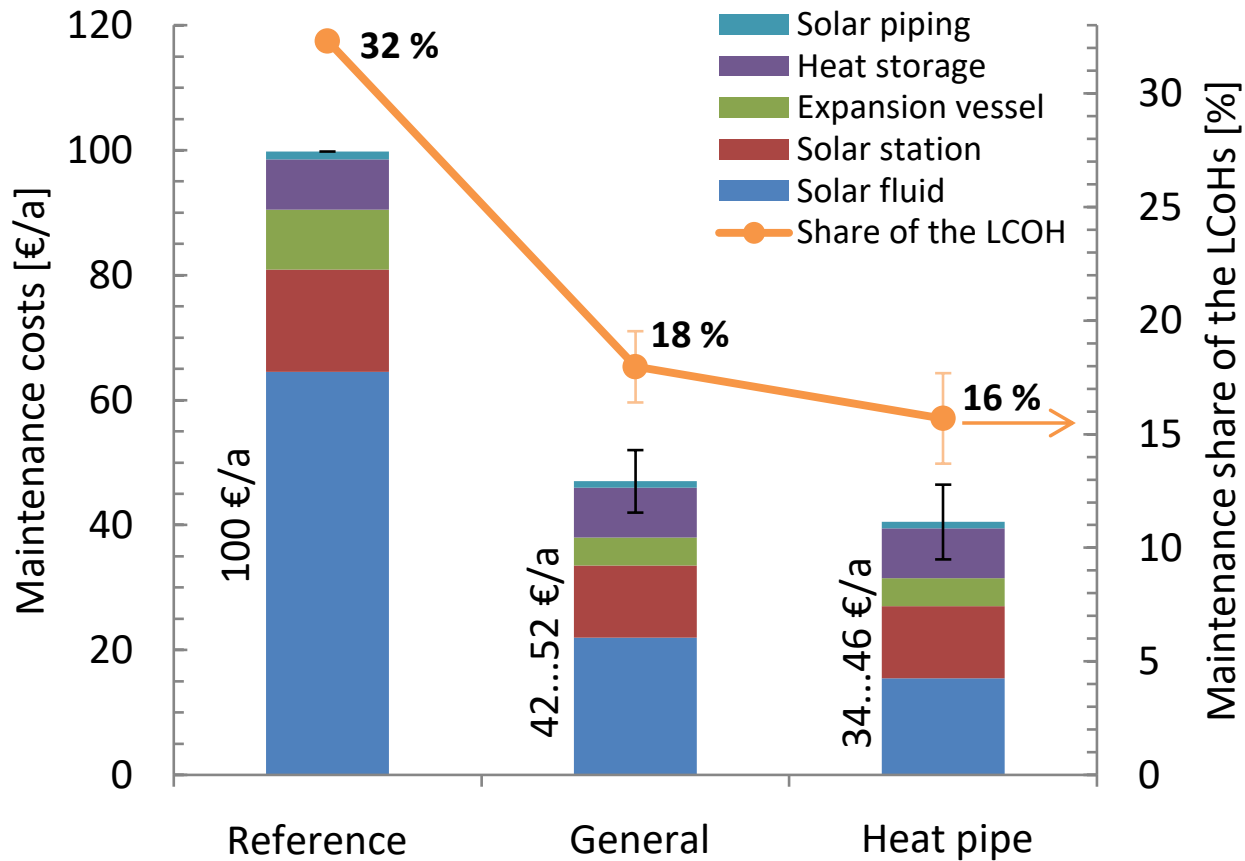
- Longer life time of components
- Extension of general maintenance intervals

Evaluation method

- Estimation of the maintenance effort for each component
- Focus on solar fluid

Life time (statement by producer)	Reference system	General system	Heat pipe system
Solar fluid	5 – 7a	≥ 10a	≥ 10a + easier to change + less fluid needed

Reduction of maintenance costs



Reduction of the average maintenance share from **32 %** to **16 %**

LCoH for SDHW-System

	Reference system	General system	Heat pipe system
Solar investment [€]	3 850	3 220 – 3 570	3 135 – 3 509
Annual maintenance [€/a]	100	42 – 52	34 – 46
Annual yield [kWh/a]	2 226	2 226	2 226
LCoH solar [ct/kWh]	13.9	9.9 – 11.1	9.3 – 10.7
Cost reduction [%]	-	21 – 30	24 – 34

Reduction of Levelized Cost of Heat solar up to 34 %

PRICE REDUCTION OF SOLAR THERMAL SYSTEMS

Subtask B: Cost reduction by temperature limitation

TASK 54

**Thank for you
attention!**

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