

## Solar process heat – a technology overview

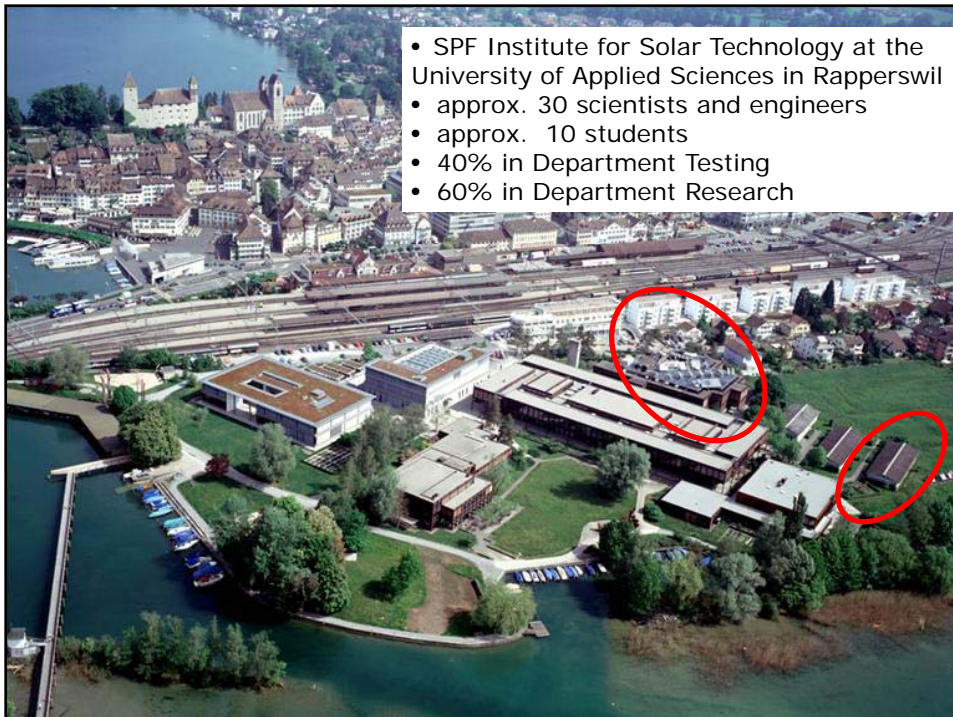


**Prof. Matthias Rommel**

Director of Institute  
SPF Institut für Solartechnik

University of Applied Sciences HSR  
Rapperswil, Switzerland

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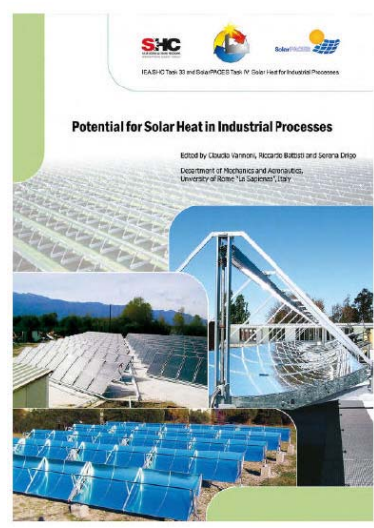


- SPF Institute for Solar Technology at the University of Applied Sciences in Rapperswil
- approx. 30 scientists and engineers
- approx. 10 students
- 40% in Department Testing
- 60% in Department Research

## Potential for Solar Heat in Industrial Processes

It is estimated that about 100 to 125 GWth could be contributed by solar thermal systems to the industrial heat demand in Europe

This is about four times as much as the totally installed solar thermal capacity in Europe today.



Source: <http://www.iea-shc.org/task33/publications>

## Only very few solar process heat systems are in operation

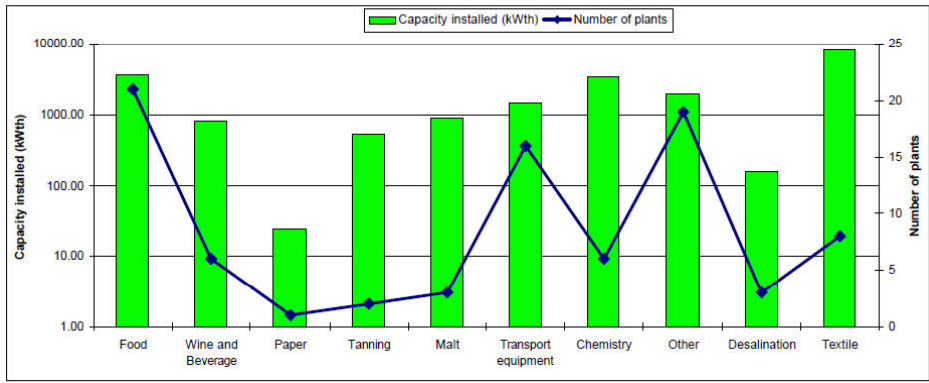


Figure 1. Solar industrial process heat plants - distribution by industry sector. Reported within Task 33/IV as of October 2007.

Source: <http://www.iea-shc.org/task33/publications>



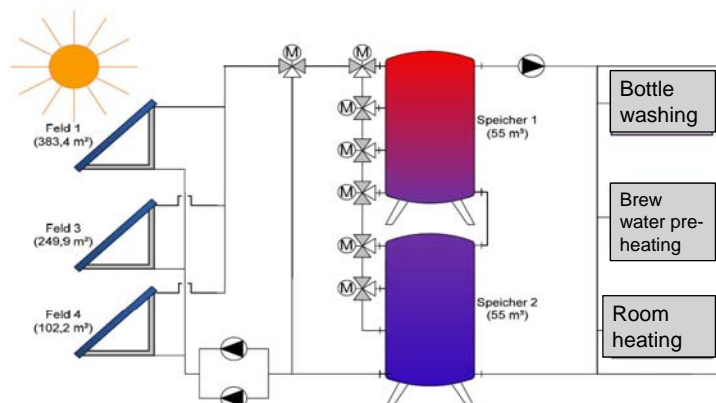
## Vacuum tube collectors installed at a brewery



Solar thermal system of 736 m<sup>2</sup> of vacuum tube collectors and 110 m<sup>3</sup> storage tanks installed in 2009 at Hofmühl Brauerei in Eichstätt

Source: TU-Chemnitz, OTTI 2010

## Scheme of Solar Thermal System at Hofmühl Brewery in Eichstätt



Source: TU-Chemnitz, OTTI 2010

### Improved flat plate collectors

double glazed  
AR-collectors

operating  
temperatures up  
to 120°C

desalination  
system for  
capacities up to  
2000 litres per  
day, 90 m<sup>2</sup>,  
Gran Canaria.



Source: Rommel, Fraunhofer ISE

### Concentrating high vacuum flat plate collectors for operating temperatures of 250°C



Bilder: colas

Demonstrationsanlage bei COLAS in Genf mit 20 Kollektoren und Bitumen-Tanks.

## RefleC collector development

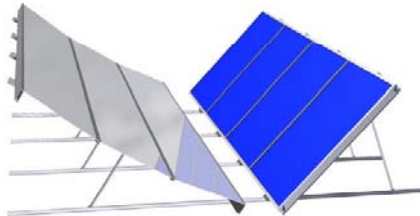


Abb. 1: CAD-Grafik des RefleC-Prototyps  
(Quelle: Wagner & Co. Solartechnik)



Abb. 3: Wkl-Messung des 3.  
Testmusters am TestLab  
Solar Thermal des ISE

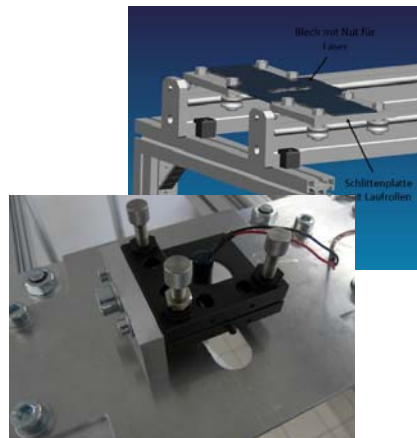
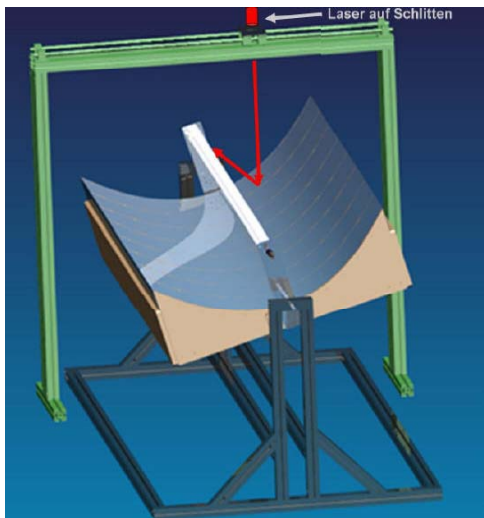
Source: Hess et al., Fraunhofer ISE, OTTI 2010

## Optical and thermal characterization of parabolic trough collectors at SPF



Source: SPF Institut für Solartechnik, 2010

### Optical measurements to characterize concentrating collectors



Source: M. Larcher, SPF Institut für Solartechnik, 2010

### NEP Parabolic trough collector



New Energy Partners NEP  
Australia / Switzerland  
Operating temperature 250°C

Source: NEP



#### PolyTrough 1200 Collector Module

The standard PolyTrough 1200 module is 1.2 m wide, 24 m long and 1.6 m high and consists of:

- 5 rigid galvanised steel mounts for ground or roof mounting with flexible spacing
- Lightweight, stiff and precise parabolic reflector panels manufactured from composite (reinforced polymeric) materials
- A structurally efficient galvanised steel torque tube
- A tubular receiver (various options available)
- An accurate and reliable solar tracking system

NEP SOLAR's innovative polymer carrier based reflector technology is protected by international patents.

#### Collector Field

A PolyTrough Collector Field consists of:

- PolyTrough modules combined to form the required field size
- Pumps, valves and field reticulation
- A collector field master controller and field wiring, assuring fully automatic and safe operation and communication with the building or process control system
- Buffer storage and associated equipment (optional)



### Sopogy NELHA-project



## Mirroxx



### Temperature Range

- 150-200 °C pressurized water
- Up to 400 °C with thermal oil
- Direct steam up to 40 bar and 250 °C

### Power Range

- Weight: 27 kg/m<sup>2</sup>
- Peak Power: 500 W/m<sup>2</sup>

**Building integration is very often also important for industrial process heat systems!**



### New requirements for process heat collector components, materials and system components of the solar loop

- appropriate heat transfer fluids** (sufficiently temperature-stable, anti-freeze properties, efficient thermodynamic and hydraulic performance)
- reflectors** (high performance, cost effective and long service times)
- tracking systems** (reliably operating for the whole service time)
- receivers** (with and without selective coating, applicable in vacuum or in atmospheric conditions)
- solar loop components** (appropriate and temperature-resistant pumps, piping and connection systems, heat exchangers and valves and other system components)

### More demonstration plants are needed which are well monitored and evaluated!

Almost all **existing solar process heat plants** are working at temperatures **below 100°C**.

**Demonstration plants are needed with operating temperatures above 100°C** and up to 250°C in order to fully exploit the solar process heat potential.

HSR  
HOCHSCHULE FÜR TECHNIK  
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Prüfung  
Forschung



Thank you for your attention!