



Modeling and Simulation of a Solar Thermal Storage Collector

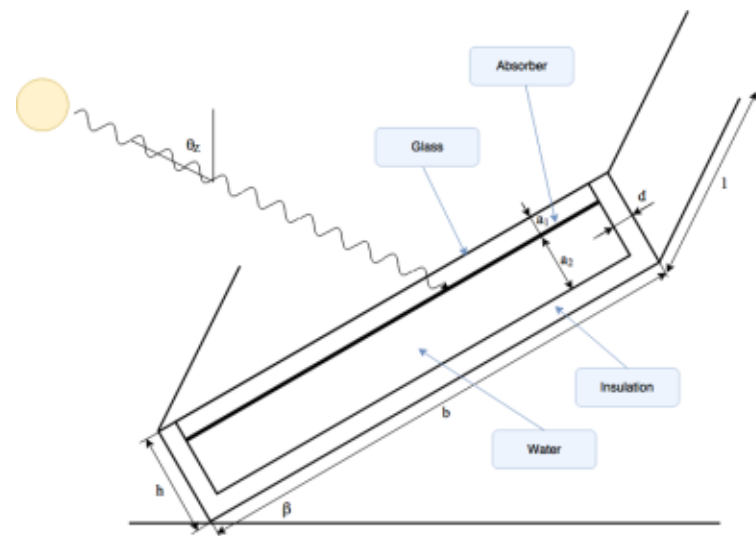
Thomas Aigenbauer, 04.10.2018



RESEARCH &
DEVELOPMENT

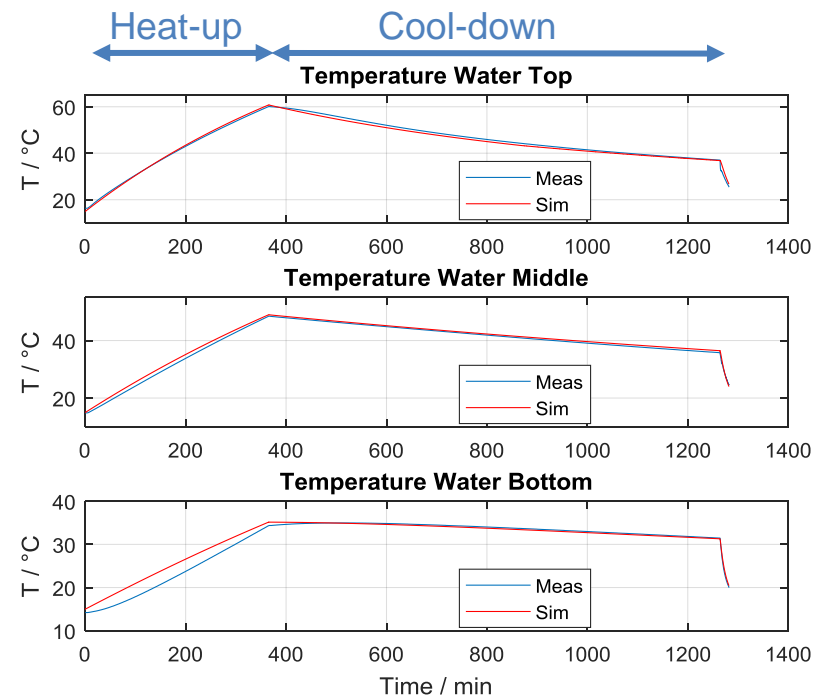
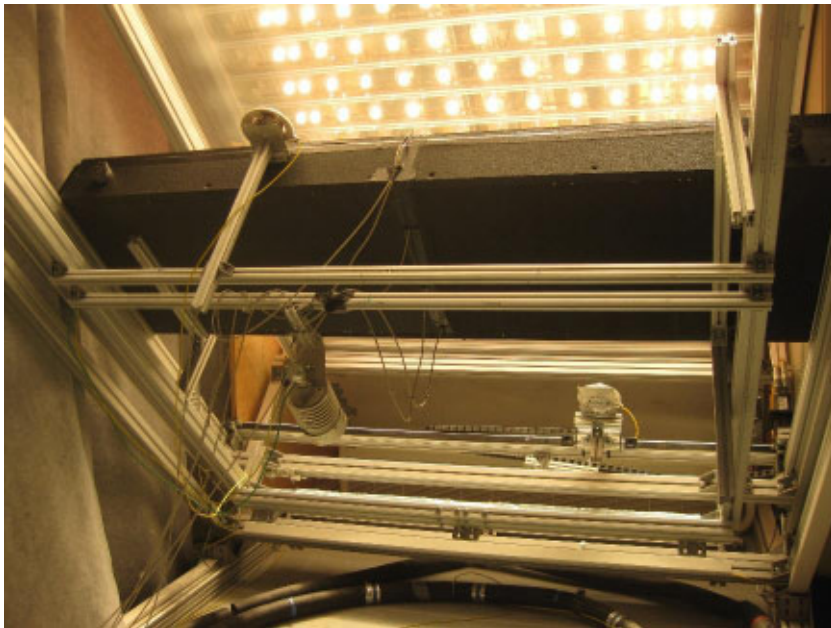
Solar Thermal Storage Collector

- Prototype was built, simple construction
- 150 kg water storage mass, thermo coated absorber
- $L = 2\text{m}$, $b = 0.8\text{m}$, $h = 0.09\text{m}$
- Intended use-case: hot water for domestic homes
- Research question
 - > In which locations is such a system useful?
 - > Can it be used to prepare water for showering in the morning and in the evening?



Method

- Derive a mathematical model of the collector
- Parameter identification
- Validation of the model with measurements on the solar simulator
- Good match between measurements and model output



Results

- Simulation at several locations, real weather data
 - > showers at 08:00, 08:15, 18:00, 18:15
 - > one shower takes 30 liter @ 40°C within 5 minutes
 - > dishwashing at 12:00, 19:00
 - > dishwashing takes 10 liter @ 40°C within 1 minute

- How often per year is it possible?

Location	Shower1	Shower2	Cooking	Shower3	Shower4	Cooking
Brasilia	52/365	2/365	202/365	314/365	287/365	206/365
Casablanca	1/365	0/365	24/365	300/365	260/365	167/365
Dakar	156/365	65/365	355/365	364/365	363/365	359/365
Damascus	165/365	156/365	254/365	313/365	292/365	248/365
Los Angeles	0/365	0/365	90/365	258/365	197/365	66/365