pre364 - Thermal Energy Storage

Module label: Thermal Energy Storage
Module code: pre364
Credit points: 4.0 KP
Workload: 120 h
Used in course of study: Master's Programme European Master in Renewable Energy (EUREC) > Mastermodule

Skills to be acquired in this module
- be familiar with main storage materials and technologies and will be able to choose which one is the most adapted to a specific solar application.
- have an understanding of the basic physical phenomena relevant to the principles of operation and design of thermal energy storages.
- have an understanding of the principles of operation and design of thermal energy storages.
- have an understanding of the need to define properly the functionalities of the TES.
- acquire the knowledge of the main technologies and materials used in TES.
- acquire the awareness of the importance of considering the relevant integration of TES in the whole process of application.
- acquire the awareness of the importance of strategy and management in the use of TES.
- acquire the knowledge of the main companies involved in the various aspects of TES (material, envelopes, fluids).
- have a critical understanding of the physical principles used in TES.
- be able to compare the design, operation and performances of the main types of TES.
- be able to choose the relevant TES for a particular application.
- be able to highlight the main limitations of a TES.
- be able to avoid the usual mistakes encountered in TES.
- be able to propose companies providing the various components of TES.

Module contents
1. Overview on Thermal Energy Storage (TES)
   - TES definitions
   - TES functionalities
   - TES basic principles
   - TES technologies
   - ES hybridations
   - ES bottlenecks and current research areas
2. Needs of TES in solar applications
   - Resource/demand shift management
   - Thermal protection
   - Thermal regulation
   - Production optimisation
   - Process design optimisation
   - Process management
3. Available technologies (sensible, latent heat, thermochemical)
   - Sensible heat based TES, direct mode.
   - Sensible heat based TES, indirect mode.
   - Latent heat based TES (organic, inorganic)
   - Thermochemical based TES
4. Related materials
   - Low temperature TES materials (sensible heat, latent heat, thermochemical, classifications and properties, characterizations)
   - High temperature TES materials (sensible heat, latent heat, thermochemical, classifications and properties, characterizations)
5. Heat transfer interfaces and fluids
   - Envelops for TES units
   - Insulating materials for TES units
   - Heat transfer fluids for TES
6. Implementation of TES
   - TES integration
   - TES instrumentation
   - TES charge/discharge assessments
7. Management and strategy of TES
   - TES management
   - TES strategy
   - LTA of TES in Solar Applications
8. Related companies and products
   - Companies and products for sensible heat based TES
   - Companies and products for latent heat based TES
   - Companies and products for thermochemical TES
- Companies and products for envelopes and connections

Reader’s advisory

Links
Language of instruction English
Duration (semesters) 1 Semester
Module frequency jährlich
Module capacity unlimited
Modullevel MM (Mastermodul)
Modulart Pflicht
Lern-/Lehrform / Type of program Lecture, Tutorial

Vorkenntnisse / Previous knowledge

Examination
Final exam of module End of the Semester

Type of examination
Written exam: 2 hours

Course type Seminar

SWS Frequency

Workload attendance 0 h