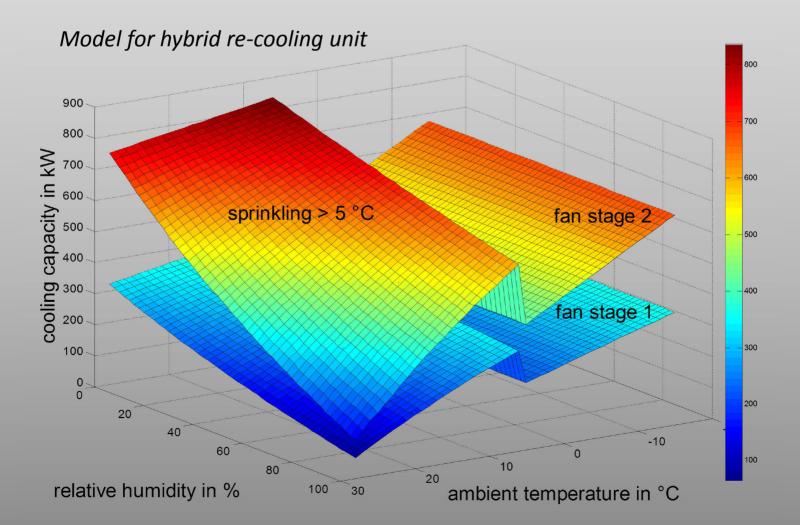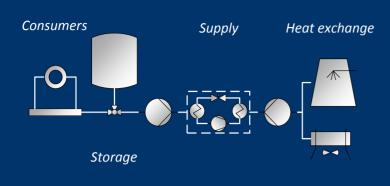FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

Customized Simulation of Cold and Hot Water Energy Systems

Modelling, Simulation, Characterization

Model for hybrid re-cooling unit

sprinkling > 5 °C

fan stage 2

fan stage 1

cooling capacity in kW

relative humidity in %

ambient temperature in °C

Customized Simulation of Cold and Hot Water Energy Systems

Consumers

Supply

Heat exchange

Storage

Description

Thermal energy systems like hot or cold water networks are energy intensive building blocks of modern infrastructures. Well over half of the local energy demand and easily two thirds of the overall energy costs originate from thermal energy systems. Therefore, investigating and implementing efficiency measures and effective operating strategies can be a lever to save energy and reduce energy costs.

The section energy technology at the IISB covers the topics of system characterization and system simulation. Besides identification and analysis of efficiency measures, the simulation of thermal infrastructures as well as individual components (e.g. chillers, storage units, CHP components) is offered in order to develop effective operating strategies and provide significant data for reconstruction measures and building processes. Our main expertise is the simulation of hot and cold water supply systems with arbitrary energy producers and energy storage. We also provide customized simulation services for renewable energy networks on a system level.

Fraunhofer Institute for Integrated Systems and Device Technology IISB

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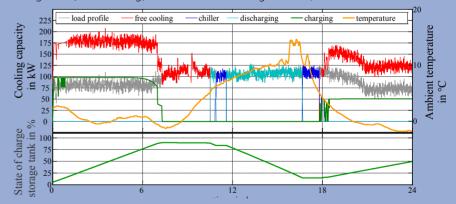## Simulation features

Energy systems	Cold and hot water networks, CHP plants, renewable energy systems
Time frame	Seconds to years
Boundary conditions	Load and demand profiles, ambient temperature, solar radiation, etc.
Storage technologies	Water, ice, paraffin, Li-batteries
Target objectives	Energy and mass flows, feasibility data, operational concepts
Software tools	Matlab/SIMULINK, TRNSYS

Simulation examples:

• Operating strategy and performance of different cooling (compression chiller, storage tank, free cooling, measured data cooling demand)

• Feasibility studies different component configurations

compression chiller + storage + free cooling

absorption chiller + storage

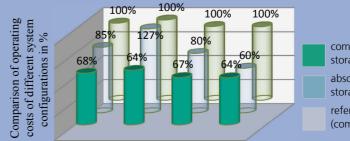reference (compression chiller)

Services and solutions

• Simulation of energy related components and systems including development of operating strategies for multiple energy sources and storage units

• Time resolution of seconds to years depending on customer specification and measured load profiles

• Modelling of differing energy supply concepts with regard to finding the most economic operating strategies, component dimensions and designs

• Investigation of transient processes and dynamic component behavior for better characterization of supply shortfalls and inefficient system operation

• Prediction of payback periods, efficiency measures and adequate component dimensions