



Heat Pump Systems with Vertical Ground Heat Exchanger and Uncovered Solar Thermal Collectors: Solar Ground Regeneration - Dynamic Simulation, Measurement and Dimensioning (MV-Wissenschaft)

Erik Bertram

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This book provides valuable information for scientists, developing engineers, and ambitious planners in the field of energy systems in buildings. Regenerative heat sources continuously gain importance for the heating of buildings. In the center of the investigations presented are heat pump systems with a hybrid heat source: the uncovered solar collector and the vertical ground heat exchanger. The combination promises to improve the heat pump system in efficiency and stability or to reduce investment costs.

Starting from this particular system, the combination's benefits and limits are investigated and practical dimensioning rules are derived which are supported and validated against dynamic system simulations, component laboratory tests, and field measurements. Finally, the applied IEA SHC Task 44/HPP Annex 38 simulation set-up improves the results' comparability and reproducibility.

Many of the results and methods derived are transferable and also apply to heat pump systems in general. The temperature potential introduced enables easy and fast assessment of any hybrid heat source combination. The dimension method developed allows a lucid and comprehensible calculation of any equilibrated vertical ground heat exchanger field pattern. The findings are of high relevance for solar ground regeneration, but also for ground regeneration by cooling and multiple adjacent systems in residential areas.



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