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2.4.3 Pumped solar combisystems; 2.5 Research and development needs and future trends in technological development, markets, and applications; 2.6 Conclusions; References

3 - Solar thermal process heat (SPH) generation

3.1 Introduction; 3.2 Potential; 3.2.1 Germany; 3.2.2 European Union; 3.2.3 Worldwide; 3.3 Market deployment; 3.4 Suitable applications and framework conditions; 3.5 Solar thermal technologies for process heating; 3.5.1 Process heat collectors; 3.5.1.1 Air collectors; 3.5.1.2 Improved stationary collectors; 3.5.1.3 Parabolic trough collectors; 3.5.1.4 Linear concentrating Fresnel collectors; 3.5.1.5 Parabolic dish collectors; 3.5.1.6 Heliostats with central receiver; 3.5.2 Storage; 3.5.3 Integration of solar heat; 3.6 Examples; 3.6.1 Brewing

3.6.2 Surface treatment

3.6.3 Drying; 3.6.4 Mining; 3.7 Future trends and research and development needs; Sources of further information; References;

4 - Deep geothermal energy for heating and cooling; 4.1 Introduction; 4.1.1 Geothermal resource classification; 4.1.2 Utilization of deep fluids; 4.2 Direct heat utilization technologies; 4.2.1 Subsurface installations (well, submersible pumps); 4.2.2 Utilization; 4.3 Resource assessment and economics; 4.3.1 Exploration technologies; 4.3.2 Geothermal costs; 4.3.3 Risk management; 4.4 Case history of major district heating

4.4.1 Paris (France), a very large and long-lasting application

4.4.2 Ferrara (Italy): integration from different sources; 4.4.3 Direct heat utilizations in Tuscany (Italy) from high enthalpy geothermal steam; 4.4.4 Example number 5: Beijing (China): cascade applications; 4.5 Conclusion; References;

5 - Shallow geothermal and ambient heat technologies for renewable heating; 5.1 Introduction-ambient heat and renewable energy; 5.2 Technology overview; 5.2.1 The basic thermodynamic principle of a heat pump and the factors affecting efficiency and SPF

5.2.1.1 Basic description of a heat pump and its components

Sommario/riassunto

Renewable Heating and Cooling: Technologies and Applications presents the latest information on the generation of heat for industry and domestic purposes, an area where a significant proportion of total energy is consumed. In Europe, this figure is estimated to be almost 50%, with the majority of heat generated by the consumption of fossil fuels. As there is a pressing need to increase the uptake of renewable heating and cooling (RHC) to reduce greenhouse gas emissions, this book provides a comprehensive and authoritative overview on the topic. Part One introduces key RHC technologies and discusses RHC in the context of global heating and cooling demand, featuring chapters on solar thermal process heat generation, deep geothermal energy, and solar cooling technologies. Part Two explores enabling technologies, special applications, and case studies with detailed coverage of thermal energy storage, hybrid systems, and renewable heating for RHC, along with case studies in China and Sweden. Users will find this book to be an essential resource for lead engineers and engineering consultants working on renewable heating and cooling in engineering companies, as well as academics and R&D professionals in private research institutes who have a particular interest in the subject matter. Includes coverage on biomass, solar thermal, and geothermal renewable heating and cooling technologies

Features chapters on solar thermal process heat generation, deep geothermal energy, solar cooling technologies, and special applications

Presents case studies with detailed coverage of thermal energy storage, hybrid systems, and renewable heating for RHC

Explores enabling technologies and special applications