Contents

Part I Energy System

1 Net-Zero Energy Technical Shelter ........................................ 3
   Chen Zhang, Per Kvols Heiselberg and Rasmus Lund Jensen

2 The Study on Paraffin-Water Emulsion PCM
   with Low Supercooling Degree ........................................... 19
   Xiyao Zhang, Jianlei Niu, Jianyong Wu and Shuo Zhang

3 Analysis of Energy Utilization on Digestion Biogas
   Tri-Generation in Sewage Treatment Works .......................... 27
   Zhiyi Wang, Hongxing Yang, Jinqing Peng and Lin Lu

4 Approach and Practice of District Energy Planning Under
   Low-Carbon Emission Background ........................................ 37
   Baoping Xu, Changbin Zhu and Wenlong Xu

5 Study on the Heat Insulation Performance of EMU Structure ... 47
   Huasheng Xiong and Xuquan Li

6 Thermal Matching of Heat Sources for District Heating System
   Based on Energy Quality .................................................. 55
   Kan Zhu, Jianjun Xia, Yi Jiang and Hao Fang

7 Performance Analysis of Single Well Groundwater Heat
   Pump Systems Based on Sand Tank Experiment ...................... 63
   Wei Song, Long Ni, Yang Yao and Jeffrey D. Spitler

8 Investigating the Thermal Performance of Horizontal
   Slinky Ground Heat Exchangers for Geothermal Heat Pump ....... 73
   Ping Cui, Jie Yang, Yun Lin and Zhaohong Fang
9 The Secondary Ring-Shaped Pipe Network Optimization
Design of a District Cooling Project in Chongqing .............. 85
Xiaodan Min, Xiangyang Rong, Pengfei Si, Hai Liu and Lijun Shi

10 Factor Analysis for Evaluating Energy-Saving Potential
of Electric-Driven Seawater Source Heat Pump District
Heating System Over Boiler House District Heating System ...... 93
Haiwen Shu, Hongbin Wang, Lin Duanmu and Xiangli Li

11 A Review on Radiant Cooling System in Buildings of China .... 101
Hongbin Wang, Haiwen Shu and Lin Duanmu

12 Performance Analysis on Energy-Storage Heat
Transfer Process .................................................. 109
Zhen Tong, Xiaohua Liu, Lun Zhang and Yi Jiang

13 Analysis and Optimization on Solar Energy Chemical
Heat Storage Material ........................................ 121
Qiuhui Yan, Xuedong Zhang and Li Zhang

14 CO₂ Heat Pump Water Heater: System Design
and Experimental Study ......................................... 131
Yefeng Liu, Zhiyang Zhuo, Feng Zhang and Tuanwei Bao

15 Design and Analysis on a Kind of Compound Renewable
Energy System for Heating .................................... 143
Guohui Feng, Mingzhi Jiang, Kailiang Huang,
Jialin Sun and Cheng Cheng

16 Operation Regulation of Combined District Heating Systems
with Multiple Large-Scale Peak-Shaving Heat Sources .......... 165
Haichao Wang, Wenling Jiao, Chengzhao Jiang,
Risto Lahdelma and Pinghua Zou

17 Study on the Energy System of Ice Storage Air Conditioning
of China World Trade Center Phase 3 by the Method
of ‘Local-Global Optimization’ ............................... 175
Zonggen Si, Hongqi Li and Yongpeng Shen

18 Experimental Study on Heat Transfer of Pool Boiling
and In-tube Condensation .................................. 183
Ming Wang and Yajun Guo
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Optimum Design of a Solar-Driven Ejector Cooling System</td>
<td>193</td>
</tr>
<tr>
<td></td>
<td>Wei Zhang, Saffa B. Riffat, Xiaoli Ma and Siddig A. Omer</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Influence of Intermittent Operation on Soil Temperature and Energy Storage Duration of Ground-Source Heat Pump System for Residential Building</td>
<td>203</td>
</tr>
<tr>
<td></td>
<td>Tao Yu, Zhimei Liu, Guangming Chu and Yunxia Qu</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>China's Low-Carbon Economy and Regional Energy Efficiency Index Analysis</td>
<td>215</td>
</tr>
<tr>
<td></td>
<td>Huifen Zou, Hao Tang, Ying Zhang, Fuhua Yang and Yingchao Fei</td>
<td></td>
</tr>
</tbody>
</table>

**Part II HVAC&R Component and System**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>A Flexibility Chilled Beam System in Hot and Humid Climate</td>
<td>227</td>
</tr>
<tr>
<td></td>
<td>Risto Kosonen</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Experimental Evaluation of a Total Heat Recovery Unit with Polymer Membrane Foils</td>
<td>235</td>
</tr>
<tr>
<td></td>
<td>Lei Fang, Shu Yuan and Jinzhe Nie</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Radiant Floor Behavior in Removing Cooling Loads from Large Glassed Buildings</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Stefano P. Corgnati and Matteo Jarre</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Influence of Different Temperature Control Patterns Through TRV on District Heating Loads</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>Valentina Monetti, Enrico Fabrizio and Marco Filippi</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Window Operation and Its Impacts on Thermal Comfort and Energy Use</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>Liping Wang</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>An Evaluation of Filtration and Air Cleaning Equipment Performance in Existing Installations with Regard to Acceptable IAQ Attainment</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>H. E. Burroughs, Chris Muller, Wenlei Yao and Qingli Yu</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Variation Law of Aqua Ammonia Falling Film Absorption Vertically Outside of Transversally Grooved Tube</td>
<td>277</td>
</tr>
<tr>
<td></td>
<td>Xiaozhuan Chen, Wei Sheng, Xiufang Liu, Junjie Chen and Jianhua Liu</td>
<td></td>
</tr>
</tbody>
</table>
29 Experimental Research on Resistance Characteristics of Filtering Materials of Biofilter Process of Sludge Composting Plants .................................................. 289
Gaoju Song, Henggen Shen, Wenjuan Ren, Yonggang Song and Jiaping Zhang

30 Research of Data Center Fresh Air Ventilation Cooling System ........................................ 299
Yin Liu, Renbo Guan, Jing Ma and Ke Zhang

31 Design Principle of Air Curtain Ventilation ................. 307
Haiguo Yin and Angui Li

32 The Comparison of Cooling Performance Between New-Type Capillary Radiant Panel and Traditional Radiant Panel ........................ 317
Jianbo Chen, Haizhao Yu and Gang Liu

33 Analysis on Influence Factors of Lewis Number in a Crossflow Reversibly Used Cooling Tower by Experimental Investigation . . . 327
Jiasheng Wu, Yanshun Yu, Lin Cao and Guoqiang Zhang

Jibo Long and Siyi Huang

35 Experimental Measurement of Airflow Turbulence Characteristics in a Full-Size Aircraft Cabin .................. 341
Chen Shen, Junjie Liu, Wei Wang and Nan Jiang

36 Measurement and Control System of HVAC&R Integration Testing Platform ........................................ 351
Kai Zhang, Xiaosong Zhang, Shuhong Li and Geng Wang

37 Discussion on Testing Method of Ventilation System Air Leakage Rate ........................................ 361
Jing Ma, Yin Liu and Renbo Guan

38 Dynamics Characteristics of an Indirect District Heating System and Operational Optimization ......................... 369
Lei Zhao, Jia Wang, Lidong Zhu and Lianzhong Li

39 Simulation on a Two-Stage Compression Heat Pump with Focus on Optimum Control ........................ 381
Shuang Jiang, Shugang Wang, Xu Jin and Tengfei Zhang
40 Experimental Analysis of Direct Evaporative Cooling in Special Temperature Range and Extended Application Study .................................................. 399
Yao Chen, Yonggao Yin and Xiaosong Zhang

41 Hydraulic and Thermodynamic Condition Analysis of Unidirectional Loop Hot Water Heating System ............... 411
Shanshan Cao, Yang Yao, Hua Zhao and Huanhuan Li

42 Experimental Study on Measuring the Amount of Jet Entrainment by the Tracer Gas Concentration Method ............. 421
Xin Wang, Youqin Liu and Yuntian Dai

43 Experimental Investigation of Airflow Pattern of Fabric Air Dispersion System ........................................ 429
Xiaoli Wang and Angui Li

44 Dynamic Soil Temperature of Ground-Coupled Heat Pump System in Cold Region ........................................ 439
Tian You, Wei Wu, Baolong Wang, Wenxing Shi and Xianting Li

Ping Zhou, Chao Chen, Jinshun Wu, Guixia Hu, Yang Guo and Kang Li

46 Optimized Configuration of Cooling Source in Districted CCHP System: A Case Study in Guangxi ............... 461
Chundie Li, Jun Lu, Chuck Yu, Xinhui Zhang and Wenzhuo Wang

47 Experimental Study on Performance Comparison Between Heavy and Lightweight Radiant Floor Cooling Combined with Underfloor Ventilation Air Conditioning System ........ 475
Dongliang Zhang, Ning Cai, Yingxiang Rui, Hu Tang and Minghui Liu

48 Optimization and Energy Efficiency Research of a Large Reclaimed Water Source Heat Pump System ............... 485
Ziping Zhang and Fanghui Du
49 Study on Thermal Storage Performance of Phase Change Heat Storage Type Air Conditioning Cooling Reservoir in Civil Air Defense Engineering .................................................. 497
Guozhu Li, Guohui Feng, Xiaolong Xu, Na He, Huixing Li and Qizhen Chen

50 Study on Components Match of Solar-Ground Source Heat Pump and Heating Network Complementary Heating System in Severe Cold Region ........................................ 509
Hong Hao, Xiujuan Zhao, Guohui Feng and Xiangyuan Xue

51 Experimental Study on Running Spacing of Buried Pipe and System Heating Performance in GSHP System ............... 519
Songtao Hu, Bo Lin, Zhigang Shi and Hengjie Yu

52 Electricity Consumption of Pumps in Heat Exchanging Stations of DH Systems in China .............................. 527
Lei Dong, JianJun Xia and Yi Jiang

53 The Study on Thermal Property of the Rural Traditional Kang Surface Within 24 Hours ........................................ 539
Qi Feng, Yongan Ao, Lin Duanmu, Zongshan Wang and Feng Qiu

54 Comparison of the Distribution and Concentration of Dust Particles by Different Ventilated Systems ................. 551
Yang Lv, Bailin Fu, Genta Kurihara and Hiroshi Yoshino

55 Research and Apply on DCS-Based Water-Source Heat Pump System ............................................................. 559
Pengfei Si, Xiangyang Rong, Angui Li, Xiaodan Min and Zhengwu Yang

56 Waste Heat Recovery System Using Coal-Fired Boiler Flue Gas to Heat Heating Network Return Water .................. 567
Hua Zhao, Pengfei Dai, Shanshan Cao and Qing Hao

57 District Heating System Adjustment Theoretical Based on Heat Users’ Real Load .................................................. 577
Shanshan Cao, Hua Zhao, Xin Xie and Xiaolin Liu

58 Design of Split Evaporative Air Conditioner of Evaporative Cooling and Semiconductor Refrigeration .................. 589
Zhe Sun, Xiang Huang and Jiali Liu
59 Energy-Efficient Heating and Domestic Hot Water Systems
Suitable for Different Regions ......................... 601
Wei Wu, Baolong Wang, Wenxing Shi and Xianting Li

60 Match Properties of Heat and Mass Transfer Processes
in the Internally-Cooled Liquid Desiccant System .......... 609
Jingjing Jiang, Xiaohua Liu and Yi Jiang

61 Frosting Characteristics of Fin-Tube Heat Exchanger
at Temperature Range of −18 to 6 °C of a Cascade Heat Pump 619
Xing Han, Wei Fan, Jianbo Chen and Qiuhuo Chen

62 Research on the Character of Discharge Temperature
of Air Conditioning System with R32 .................... 635
Deyin Zhao, Wenhong Ju, Zhangquan Chen and Xu Zhang

63 Experimental Study of Heat Transfer and Resistance
on Finned Tube Exchanger ..................................... 645
Yajun Guo, Ming Wang and Guangcai Liu

64 Analytical Thermal Analysis of Novel Foundation Pile Ground
Heat Exchanger with Spiral Coils ..................... 653
Man Yi, Hongxing Yang, Zhaohong Fang and Yunxia Qu

65 The Experimental Analysis of GSHP_RF Heating System
in Controlled Operation ........................................ 665
Weiwei Yin and Qian Zhang

66 Feasibility Analysis of Utilizing the Concrete Pavement
as a Seasonal Heat Storage Device for the Ground-Coupled
Heat Pump System ........................................... 675
Yunxia Qu, Houxing Cao and Beiping Jia

67 Retrofit of Air-Conditioning System in Data Center Using
Separate Heat Pipe System .................................... 685
Yuwei Zheng, Zhen Li, Xiaohua Liu, Zhen Tong and Rang Tu

68 The Model for the Separation Efficiency of the Electrostatic
Cyclone Dust Collector ........................................... 695
Jiajun Luo, Hao Zhang, Dong Yang, Jiguang Zhang
and Huajun Tang
69 The Exploration on Heat Transfer Models for Borehole Heat Exchanger in the Soil with Groundwater Advection .......................... 705
Lei Zhao, Linlin Zhang and Songtao Hu

70 Numerical Calculation and Analysis of Apply for the Heat Transfer Performance of Porous Brick ............................................. 713
Xiaolu Wang, Fuqin Ma and Huifan Zheng

71 Optimized Design of Ground-Source Heat Pump System Heat Exchanger ................................................................. 723
Zhigang Shi, Shangping Song and Songtao Hu

72 Positive Investigation on the Reliability of Groundwater Source Heat Pump System Usage in Yangling Normal Community ......... 731
Yanzhe Chen, Zhiwei Wang and Zengfeng Yan

73 The Combined Operating of Radiant Floor and Fresh Air Coil in Field Experiment .......................................................... 741
Yanhong Du, Chenggong Qian and Xiangzhao Fu

74 The Complementary Heating Energy Ratio Research of Solar: Ground Source Heat Pump and Heating Network in Cold Regions .................................................. 757
Guohui Feng, Jian Zhang, Hong Hao and Yuan Li

75 Investigation and Analysis of the Heat Pump Application in Shenyang .................................................................................. 767
Hongwei Wang, Jie Feng, Hui Wang, Guohui Feng and Baoling Wang

76 Experimental Study on Unsteady State Properties of Ceiling Radiant Cooling Panels System .................................................. 773
Lin Su, Nianping Li, Xuhan Zhang, Yanlin Wu, Yunsheng Jiang and Qing Huang

77 Orthogonal Test and Regression Analysis on Filtration Performance of PSA/Needle-Punched PSA Filter Material ............. 781
Min Fang, Henggen Shen, Tingting Xue and Libo Wang

78 Research on Condensation Pressure and Temperature of Heat Pumps Using Blends of CO₂ with Butane and Isobutane .......... 791
Xianping Zhang, Xiaowei Fan, Xinli Wei, Fang Wang and Xiaojing Zhang
79  Exergy Analysis of a Ground Source Heat Pump System
    Under Cooling and Heating Conditions .......................... 799
    Lei Zhao and Chen Yuan

80  Ultrasonic Vibration for Instantaneously Removing Frozen
    Water Droplets from Cold Vertical Surface ....................... 807
    Dong Li and Zhenqian Chen

81  Experiment of a New Partitions Filler Regeneration
    Performance .............................................................. 817
    Lining Zhou, Zhijia Huang, Liping Zhu and Ping Jiang

82  Theoretical Analysis and Numerical Simulation of Coupled
    Relationship of Heat and Mass Transfer Between Air
    and Desiccant in Liquid Desiccant Dehumidification .......... 829
    Zhijia Huang and Ping Jiang

83  Analysis of the Floor Heat Storage and Release During
    an Intermittent In-Slab Floor Heating Process ................... 841
    Dengjia Wang, Yanfeng Liu, Yingying Wang and Jiaping Liu

Erratum to: The Study on Thermal Property of the Rural
Traditional Kang Surface Within 24 Hours ....................... E1
    Qi Feng, Yongan Ao, Lin Duanmu, Zongshan Wang and Feng Qiu
Proceedings of the 8th International Symposium on Heating, Ventilation and Air Conditioning
Volume 2: HVAC&R Component and Energy System
Li, A.; Zhu, Y.; Li, Y. (Eds.)
2014, XIX, 850 p. 526 illus., Hardcover
ISBN: 978-3-642-39580-2