广州酒店的暖通设计

毕业设计开题报告

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多组热管散热器空气源热泵的实验研究

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摘要

作为一种清洁、可持续电气化供暖技术，空气源热泵 (ASHP) 已在中国家庭中得到广泛应用。然而，常用的水循环系统存在效率低、结构复杂、易冻裂、电能消耗高等问题。本文提出了一种新型多组热管散热空气源热泵 (ASHPMP)。在 ASHPMP 系统中，冷凝器和热管耦合在一起，形成一种新型的热辐射终端，被命名为热管散热器，由压缩机驱动的多个终端为多个房间提供热量。开发 ASHPMP 系统的实验装置，并在住宅楼中进行了实验，热泵使用 R410A，热管使用 R134a。分析结霜与除霜条件下温度、热泵和热管压力对 ASHPMP 供热性能的影响。结果表明，新系统可在室外温度为 −12.7 °C 至 6.5 °C 的条件下稳定运行. 当室内温度设定为 20 °C, 室外温度为 −12.7 °C 时, 制热性能系数 (制热 COP) 可达 3.15, 室外温度为 6.5 °C 时, 制热性能系数为 6.73.

关键字: 空气源热泵; 热管散热器; 供热性能; 应用研究

Experimental investigation of an air source heat pump with multigroup heat pipe radiators

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ABSTRACT

As a clean and sustainable electrified heating technology, air source heat pump (ASHP) has been widely used in household in China. However, some problems occurred with the commonly used water loop system, such as low efficiency, complicated structure, more likely to be frozen and burst as well as high electric energy consumption, etc. In this paper, a new air source heat pump with multigroup heat pipe radiators (ASHPMP) was presented. In ASHPMP system, the condenser and heat pipe were coupled together to form a new type of heat radiation terminal, which was named as heat pipe radiators, multiple terminals driven by the compressor provided heat for several rooms. An experimental apparatus of the ASHPMP system was developed and the experiment was carried out in residential buildings also, and R410A was used in the heat pump and R134a was used in heat pipes. The influence of temperature, pressure of heat pump and heat pipe on the heating performance of ASHPMP under frosting/defrosting condition was analysed. The results showed that the new system can operate stably under outdoor temperatures of −12.7 °C to 6.5 °C. As the indoor temperature was set at 20 °C, the heating coefficient of performance (heating *COP*) could reach up to 3.15 with outdoor temperature −12.7 °C, and it was 6.73 with outdoor temperature 6.5 °C.

严寒地区新风与回风混合的空气源热泵机组供热性能研究

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摘要

为保证建筑室内空气质量，针对严寒地区新风采暖问题，提出一种新风与回风混合的空气源热泵新风机组。新风与回风的混合过程在混合箱内实现，提高了冷凝器进风温度，创造了合适的冷凝压力，保证了机组节能稳定运行。为了探索机组的运行效果、供热性能和节能效果，在哈尔滨搭建了实验台，用于实验室供热。实验结果表面，当回风量为 1400 m^3/h 时，在保证新风量 700 m^3/h、送风温度 24.0 °C 的条件下，新风机组能够稳定运行。室外温度为 4.9 °C，热泵 COP 为 4.29。即使室外温度降至 20.9 °C，热泵 COP 仍达到 2.46，而电预热、热回收和空气源热泵组合新风系统的 COP 仅为 1.44，而电预热、热回收和空气源热泵组合新风系统的 COP 仅为 1.44。电预热、热回收和电加热仅为 1.21。此外，热泵 COP 随着回风量的增加而增加。随着设定温度的升高，热泵 COP 先升高后降低。

关键字: 新风机组，新风回风混合，空气原热泵，寒冷地区服务，COP

Experimental study on heating performance of air source heat pump fresh air unit with fresh air and return air mixing in severe cold regions

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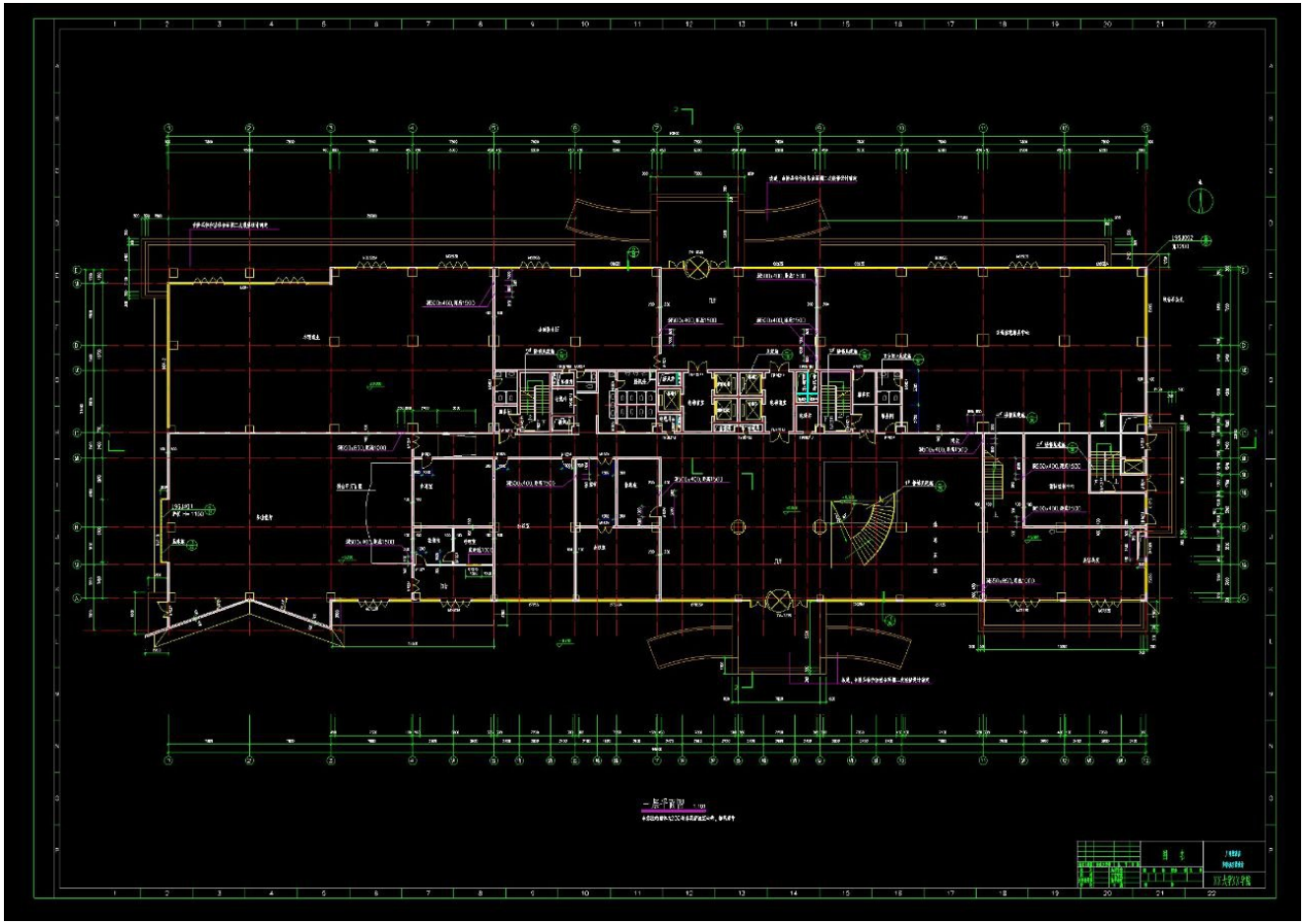
ABSTRACT

In order to ensure the indoor air quality of the building, in view of the problem of fresh air heating in severe cold regions, this paper proposes an air source heat pump fresh air unit with fresh air and return air mixing. The mixing process of the fresh air and return air is realized in the mixing box, which increases the inlet air temperature of the condenser, creates a suitable condensation pressure, and ensures the energy-saving and stable operation of the unit. In order to explore the operation effect, heating performance and energy saving of the unit, an experimental bench was built in Harbin for laboratory heating. The experimental results showed that when the return air volume was 1400 m^3/h, the fresh air unit could operate continuously and stably under the conditions of ensuring the fresh air volume of 700 m^3/h and the supply air temperature of 24.0 °C. When the outdoor temperature was 4.9 °C, the heat pump COP was 4.29. Even when the outdoor temperature dropped to −20.9 °C, the heat pump COP still reached 2.46, while the COP of the fresh air system combining electric preheating, heat recovery and air source heat pump was only 1.44, and the COP of the fresh air system combining electric preheating, heat recovery and electric heat was only 1.21. In addition, the heat pump COP increased with the increase of the return air volume. As the set temperature increased, the heat pump COP increased first and then decreased.



该工程为 13 层高层建筑。该酒店包含休息室、接待室、控制室、大厅、会厅和客房等部分。大致长 96 米，宽 32 米。设计思路：客房等独立小房间采用风机盘管 + 新风系统。新风系统采用分楼层水平送风。广州地理位置靠南，夏热冬暖，采用风冷式机组。

1.2 国内现状

据相关数据统计，在 2020 年，我国数据中心的年用电量已经达到了 2500 亿 kWh，占据了全国用电量的 3% 以上[2]，在 2021 年，我国数据中心的年用电量达到了 2166 亿 kWh，占据全国用电量 2.6%[3]。伴随着深度学习技术进步，层出不穷的大模型训练要求更多的数据中心提供更多的算力支持，许多新能源车企也开始搭建数据中心用于智能驾驶模型训练，三大运营商也开始深入开展数据中心建设[4]，可见数据中心规模将逐渐增大，其能耗增加也将快速增长[5]。很显然，科技的迅速发展需要更多的数据中心提供支持，但其伴随的能耗问题十分严重，降低能耗对于数据中心十分重要。

研究主题：数据中心的气流组织。

在计算机技术快速发展的今天，数据中心的数量也随着巨大的市场需求逐步增加。由于数据中心的能耗较大，因此探究其节能问题十分重要。空气中的气流组织对数据中心的能耗有影响。本文献综合探究了气流组织的特点与影响。