

單效吸收式冰水主機之解析模式

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摘要

吸收式冰水主機已經成為工廠提升能源有效利用率的重要手段之一，唯其操作牽涉到的工作流體眾多，並且需要考慮到吸收循環(absorption cycles)的熱力學性質，因此吸收式冰水主機的建置便是重要的研究議題。在本研究中利用 Dühring 方程式討論吸收劑與冷凍劑的熱力學性質，並利用冰水、冷卻水、吸收劑、冷凍劑以及蒸氣質量與能量平衡關係建置單效吸收式冰水主機的解析模式，利用此解析模式配合既有工廠的維護保養數據以及材料特性參數計算出各單元設備的熱交換效率、冰水主機未知狀態變數以及性能參數(COP, coefficient of performance)。

關鍵詞：吸收式冰水機、吸收循環、Dühring 方程式、性能參數

Analytic modeling of single-effect absorption chillers

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Abstract

Achieving high energy efficiency, significant efforts have been put by industrial communities into the using of the absorption chillers. Nevertheless, the complicated working fluids and the thermodynamic properties of absorption cycles make the chiller operation difficult. Thus, modeling the absorption chiller is an important issue for chiller operation. In the present work, we used Dühring equation to calculate thermodynamic properties of absorbent and refrigerant and make mass and energy balance of working fluid. These concepts make analytic single-effect absorption chiller models developed. In our study, the real-plane operating data and material property are using to the evaluation of heat exchanger effectiveness for each unit of the single-effect absorption chiller. Applied the effectiveness to analytic model, the value of un-measured state variables and the influence of operation variables for chiller on coefficient of performance (COP) has been discussed.

Key words: absorption chiller, absorption cycles, Dühring equation, COP

一、前言

吸收式冰水主機與常見的離心式與往復式冰水主機最大的差異是在吸收式冰水主機藉由產生

器(Generator)和吸收器(Absorber)來取代壓縮機，並且以熱能來作為動力，其中熱能的來源可透過瓦斯直燃、蒸氣或熱水；在傳統石化產業或鋼鐵產業中，生產過程常產生過剩的蒸氣或熱水，因此利用吸收式冰水主機製冷可視為提升工廠能源