能源和环境工程

注蒸汽燃机–热蒸馏海水淡化复合系统的环境负荷及其分摊

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摘要

以注蒸汽燃机–热蒸馏海水淡化复合系统为例，基于火用经济学理论，建立了系统中电、水环境负荷的分摊模型，初步分析了系统的生命周期污染物排放，计算了系统中各火用流以及系统产品的环境负荷向量，得到了电、水的环境负荷分摊比。本文的研究虽然基于注蒸汽燃机–热蒸馏海水淡化系统而进行，但所探讨的方法同样适用于以干式燃机或其他湿式燃机为基础的电水联产系统。

关键词

注蒸汽燃机 热蒸馏海水淡化 电水联产系统 生命周期环境负荷 热经济学分摊方法

分类号

Environmental load and its allocation in a combined steam-injected gas turbine and thermal seawater desalination system

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Abstract

Combined power and water systems，in which high-grade energy is used to produce power in a power plant and low-grade heat is used to run a thermal desalination unit to produce fresh water from saline water，are identified to be energy-，economy- and environment-advantageous over separate power-only and water-only systems.The previous studies usually focus on thermal and economic performance of the systems.This study presents an environmental performance analysis on a combined steam-injected gas turbine (STIG) and thermal seawater desalination (TSD) system.Based on thermoeconomics，a mathematical model is formulated for environmental load allocation between power and water in STIG-TSD.After analyzing the life-cycle environmental impact of the system run by natural gas，environmental vectors for each energy stream as well as produced power and water are obtained，and the environmental load allocation between power and water is calculated.Although the study is based on the STIG-based combined system，the method is also applicable to combined power and water systems based on other dry and wet gas turbines.

Key words

steam-injected gas turbine thermal seawater desalination power and water cogeneration system life-cycle environmental load thermoeconomic allocation method

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