

Simulation of Solar Double Effect Ammonia - water Cooling Systems and its Performance for Different Climates of Iran

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ABSTRACT

In this paper, solar double-effect Ammonia-Water cooling cycle is simulated. Then, the effects of parameters on the cycle efficiency including temperature of generator and condenser, and pressure of evaporators have been analyzed. Also cooling load and COP of the cycle has been expressed as a function of the aforesaid parameters. Then cities of Iran has selected as a representative of different climates, and the performance of cycle for these cities has been analyzed using the environmental and geographical conditions such as solar radiation intensity, wet and dry bulb temperature for each city. The acceptable efficiency of the cycle for the southern cities of Iran which have the high radiant intensity is a result of this work.

KEYWORDS : Solar cooling, Ammonia-Water absorption cooling, COP, Radiant intensity.

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[] شبیه‌سازی چرخه آب - آمونیاک را برای
چرخه ۱ اثره با استفاده از انرژی‌های بازیافتی در ژنراتور به عنوان انرژی
ورودی، به کمک نرم افزار [^] انجام دادند.



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$$\begin{aligned} \sum \dot{m}_e &= \sum \dot{m}_i & () \\ \sum \dot{m}_e x_e &= \sum \dot{m}_i x_i & () \\ q &= \sum \dot{m}_e h_e - \sum \dot{m}_i h_i & () \end{aligned}$$

$h \times \dot{m}$

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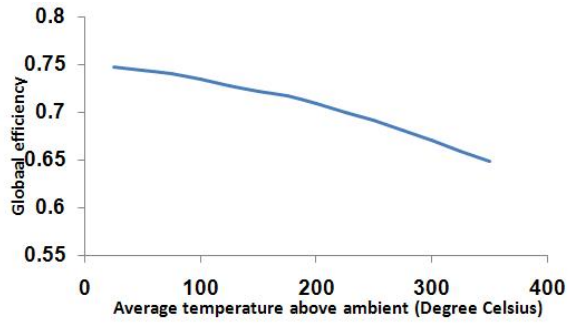
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$$COP = \frac{Q_{eva}}{Q_{gen}} \quad ()$$

$Q_{gen} \quad Q_{eva}$



Archive of SID

$$Q_{gen} = \epsilon_c W''$$

W''

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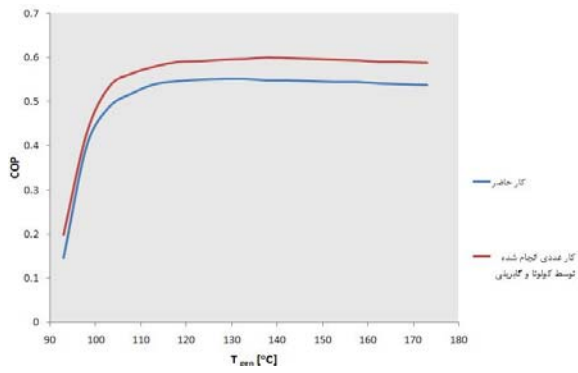
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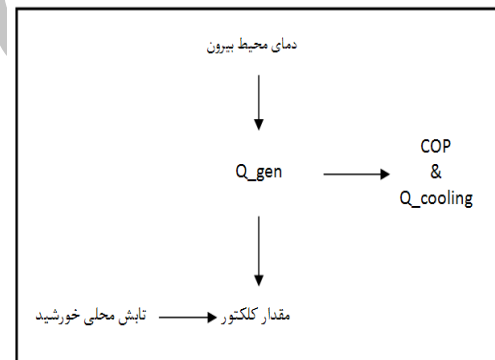
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| R_{number} | R_{number} | $T_{amb} (°C)$ | $T_{amb} (°C)$ | $T_{amb} (°C)$ | η_{opt} |
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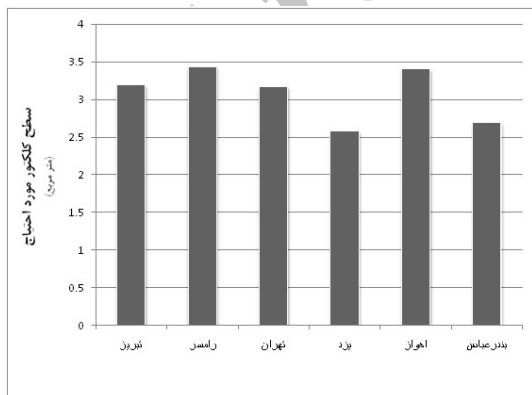
| | | | () | () | () | () | COP | () | () | () |
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- V Mittal, KS Kasana and NS Thakur, "The study of solar absorption air-conditioning systems", Journal of Energy in Southern Africa, 2005. [] - []
- N. Ben Ezzine, M. Barhoumi, Kh. Mejbri, S. Chemkhi and A. Bellagi, "Solar cooling with the absorption principle: First and Second Law analysis of an ammonia-water double-generator absorption chiller", Desalination, 2004. [] []
- M.M. Ardehali, M. Shahrestani and Charles C. Adams, "Energy simulation of solar assisted absorption system and examination of clearness index effects on auxiliary heating", Energy Conversion and Management, 2007. []
- Mehrdad Mazloumi, Mohammad Naghashzadegan and Kouros Javaherdeh, "Simulation of solar Lithium Bromide-Water absorption system with parabolic through collector" Energy Conversion and Management, Journal 24th, March 2008. []
- Piero Colonna and Sandro Gabrielli, "Industrial trigeneration using ammonia-water absorption refrigeration systems (AAR)", Applied Thermal Engineering, 2002. []
- Umberto Desideri, Stefania Proietti and Paolo Sdringola, "Solar-powered cooling systems: Technical and economic analysis on industrial refrigeration and air-conditioning applications", Applied Energy, 2009. []
- Michael Geyer and Eckhard Lüpfer, "EUROTROUGH - Parabolic Trough Collector Developed for Cost Efficient Solar Power Generation", 11th Int'l. Symposium on Concentrating Solar Power and Chemical Energy Technologies, 2002. []
- Dong Seon Kim, Carlos Infant Ferreira, Gianluca Tanda and Pepijn Pronk, Optimization of solar ammonia-water absorption cooling system, DTU, 2002. []
- Abdeen Mustafa Omer, "Energy, environment and sustainable development", Renewable and Sustainable Energy Reviews, 2007. []
- N.A. Darwish, S.H. Al-Hashimi and A.S. Al-Mansoori, "Performance analysis and evaluation of a commercial absorption-refrigeration water-ammonia (ARWA) system", International Journal of Refrigeration, 2008. []
- D.S. Kim and C.H.M. Machielsen, "Evaluation of air cooled solar absorption cooling systems", ISHPC '02, Proc. Of the Int. Sorption Heat Shanghai, China, 2002. []

- ¹ Ferdinand Carre
² ARKLA
³ Rubour
⁴ IEA
⁵ Integrated compound parabolic collectors
⁶ Aspen
⁷ Coefficient Of Performance
⁸ Cycle tempo
⁹ Rectifier
¹⁰ Condensate pre-cooler