

البحث السادس

مشترك - منشور بمجلة دولية ((غير مستخلص من رسالة))

عنوان البحث:

Energy, exergy, environmental, and economic (4E) analysis of an indirect solar cooker

التحليل الحرارى والإكسيرجى والبيئى والاقتصادى (4E) لطباخ شمسي غير مباشر

Abstract:

The solar cooker is considered an effective tool for harnessing solar energy for cooking purposes, significantly promoting environmental sustainability. This study aims to introduce a novel design for an indirect solar cooker by integrating an evacuated tube collector with a box-type cooker, contributing to achieving sustainable development goals. The performance of the proposed system is evaluated through energy, exergy, environmental, and economic analyses. Practical cooking tests designed to meet the needs of a family of two adults and four children highlight the effectiveness of the proposed solar cooker. The overall thermal efficiency of the box solar cooker (BSC) and the proposed solar cooker (PSC) are 26.8% and 36.7%, respectively, with corresponding exergy efficiencies of 1.9% and 7.4%. Additionally, the PSC is capable of preparing approximately 990 meals per year. For a lifespan of 15 years, the energy and economic payback period is 5.7 and 1.8 years, respectively; PSC mitigates CO₂ emission by 3.412 tons/year. PSC showed a good economic indicator since the internal rate of return is 54%, the benefit-cost ratio is 1.23, and the net present value of profit is 161.25\$. Moreover, the levelized cost of the cooked meal equals 0.105 \$/Ml, and the levelized cost of heat equals 0.151 \$/kWh.

الباحثون:

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