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Connection of absorption heat pumps to multi-effect distillation systems: Pilot test facility at the Plataforma Solar de Almería (Spain)

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ABSTRACT

Theoretical analysis demonstrates that coupling a double effect absorption heat pump (DEAHP) cycle to a multi-effect distillation (MED) process shows higher overall performance than other conventional heat pumps like steam ejectors. However, only two demonstration facilities have been implemented worldwide to date, both of them at the Plataforma Solar de Almería (Spain). The first experience (1992) allowed the expected performance results to be achieved, but some operational problems showed that the technology was not mature enough for its commercial implementation. This paper reports on the assessment of a second heat pump prototype (2005) more successful than the first one. Advances in both the DEAHP unit and design layout of the desalination system as a whole have led to proven reliability of the DEAHP/MED concept, which has an overall performance ratio of 20 with stable and fully automatic operation. It requires a 180°C saturated steam supply which can be provided by solar linear-focusing concentrators. This is a 100% increase over the performance ratio of the MED unit, thus becoming the most efficient solar distillation technology.

Keywords: Seawater desalination; Absorption heat pumps; Multi-effect distillation; Solar desalination

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