

## Heat pipes as an extra measure to eliminate radioactive contamination in nuclear seawater desalination

Ibrahim Khamis<sup>a\*</sup>, Hussam Jouhara<sup>b</sup>, Vladimir Anastasov<sup>a</sup>

<sup>a</sup>International Atomic Energy Agency, Wagramer Strasse 5, P. O. Box 100, A-1400, Vienna, Austria  
Tel. +43 (1) 260022822; Fax +43 (1) 260029598; email: i.khamis@iaea.org

<sup>b</sup>School of Engineering and Design, Brunel University, Uxbridge, Middlesex, UB8 3PH, UK  
Tel. +44 1895 267656; Fax +44 1895 256392; email: hussam.jouhara@brunel.ac.uk

Received 30 April 2009; Accepted 2 November 2009

---

### ABSTRACT

Reduction in tritium contamination levels in the product water is a top priority for gaining public confidence in nuclear seawater desalination. Hence, the search for new technologies, to enable such reduction is an ongoing process. Heat pipes are seen as a promising technology to achieve such goal. In fact, concern over possible contamination of the product water could well be eliminated using this technology. Utilising new designs for desalination heat exchangers based on the heat pipe technology will add an extra loop, which will prevent direct contact between the nuclear and the product water loops under normal and anticipated operational failure occurrences. As a result, heat pipes can play a decisive role in enhancing public perception of nuclear desalination in particular and seawater desalination in general. When coupled to the low-temperature multi-effect distillation process, heat pipes based heat exchangers could harness waste-heat generated in nuclear power reactors and effectively improve the overall economics of desalination using nuclear power. Furthermore, the use of heat pipes based systems in desalination plants may improve the overall thermodynamics of the desalination process.

*Keywords:* Heat pipe; Tritium-related safety; Nuclear seawater desalination

---

\* Corresponding author.