

Accepted Manuscript

Title: Simulation of an Ammonia–Water Heat Pump Water Heater with Combustion Products-Driven Evaporator

Author: H. Perez-Blanco, K. Gluesenkamp, Moonis R. Ally

PII: S0140-7007(16)30418-2

DOI: <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.12.006>

Reference: IJIR 3498

To appear in: *International Journal of Refrigeration*

Received date: 11-7-2016

Revised date: 8-11-2016

Accepted date: 12-12-2016

Please cite this article as: H. Perez-Blanco, K. Gluesenkamp, Moonis R. Ally, Simulation of an Ammonia–Water Heat Pump Water Heater with Combustion Products-Driven Evaporator, *International Journal of Refrigeration* (2016), <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.12.006>.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



1 **Simulation of an Ammonia–Water Heat Pump Water Heater**
 2 **with Combustion Products-Driven Evaporator**

H. Perez-Blanco
 hpb1@psu.edu
 ph:814-865-7842 fx:814-863-4848

K. Gluesenkamp
 gluesenkampk@ornl.gov

Moonis R. Ally
 allymr@ornl.gov

Mechanical Engineering
 Penn State

Energy and Transportation Division
 Oak Ridge National Laboratory

3
 4 **Highlights**

- 5 • Ammonia-water heaters can reach a COP of 1.47.
 6 • A purification column for variable seasonal conditions is simulated.
 7 • A new evaporator design promises smaller heat transfer area and fan power.
 8 • Subcooling in the condenser eliminates the precooler.
 9 • Subcooling of the pump inlet would result in a compact heater.

10
 11 **Abstract**

12 The objective of this work is to simulate a single effect (SE) ammonia-water heat pump for domestic
 13 water heating, with innovative aspects for cycle simulation and eventual practical implementation. The
 14 following practical difficulties are addressed in the simulation: 1. seasonal temperature variations change
 15 the operating conditions of the distillation column, calling for insightful design to maintain a suitable
 16 refrigerant concentration in all seasons, and particularly in winter; 2. The evaporator activated by outdoor
 17 air suffers from immoderate heat transfer requirements, and these demands are considerably reduced if
 18 the activation is done by products of combustion; 3. Pumps have head requirements that can be
 19 assuaged by judicious selection and inlet solution subcooling. The variables that need to be controlled if
 20 the same column is to be used all year round are specified. As configured with the innovations
 21 mentioned, the cycle simulation yields a coefficient of performance within the expected range for a single
 22 effect, but it harbors the promise of a much smaller evaporator, of small overall height, and of a
 23 distillation column capable of operating effectively all year round with the same feed point.

24 **Keywords:** absorption; ammonia-water; heat pump; water-heater; distillation; domestic water

25 **Nomenclature**

A	Heat transfer area, m ² .
cp	Combustion products.
COP	Coefficient of performance.
CPAE	Combustion products assisted evaporator.
f	Fuel to air mass ratio.
g	Gaseous combustion products.
GAX	Generator absorber heat exchange.
h	Specific enthalpy, kJ kg ⁻¹ .
H_a	Absolute pressure equivalent head, m.
H_f	Head loss in feed pipe to pump, m.

Download English Version:

<https://daneshyari.com/en/article/5017160>

Download Persian Version:

<https://daneshyari.com/article/5017160>

[Daneshyari.com](https://daneshyari.com)