Paper Number: ICR0100

Title of Paper: Fundamental Aspects of the Application of Carbon Dioxide in Comfort Cooling

Presenter: J.S. Brown

Session: B1-9

Person Contributing Discussion or Question: P. Neksa, Sintef Energy Research, No-7465 Trondheim Norway

Comment or Question: Results shown of COP as function of ambient temp comparing CO_2 and R13Ya showed steadily lower COP for CO_2. All experimental/theoretical results from other sources show that CO_2 is better from a given ambient temperature and lower. What is wrong with your model since this not reflected?

Presenter's Reply: Many previous studies which show better CO_2 performance at lower ambient temperatures employed microchannel heat exchangers with significantly lower air-side resistance than their halocarbon counterparts. In a previous study, Kim & Bullard (J. of Energy Resources Tech., 2001) compared the performance of a microchannel condenser with a conventional finned-tube condenser in a window-type R22 air conditioner. They found that, compared to the finned-tube heat exchanger of the same capacity, the core volume and weight of the microchannel condenser were smaller by 55% and 35%, respectively. In the present study, we employed similar component technologies in the various systems in order to obtain a more equal comparison among the different systems.

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Person Contributing Discussion or Question: Perevozchikov , M., Copeland, Corp., 1675 West Campbell Rd., P.O. Box 669, Sidney, OH 45365

Comment or Question: What was the volumetric efficiency of compressors for CO_2 and R13Ya systems?

Presenter's Reply: We calculated the volumetric efficiencies of the compressors using an empirical correlation developed from data taken from various sources in the open literature. The empirical equation is:

$$\eta_{\upsilon} = 0.8263\left[1 - 0.09604\left(\frac{P_2}{P_1}\right)^{C?/C_p} - 1\right]$$

Paper Number: ICR0231

Title of Paper: Boiling Heat Transfer and Air Coil Evaporator of Carbon Dioxide

Presenter: J.F. Wang, S. Ogasawara and E. Hihara

Session: B1-9

Person Contributing Discussion or Question: Neksa, P., Sintef Energy Research, No-7465 Trondheim Norway

Comment or Question: Does the dryout quality change depending on if the measurements are done with and without lubricant?

Presenter's Reply: Yes, this work is only for the conditions with lubricant oil. The experiments for oil-free conditions are being under the way.

Paper Number: ICR0231

Title of Paper: Boiling Heat Transfer and Air Coil Evaporator of Carbon Dioxide

Presenter: J.F. Wang, S. Ogasawara and E. Hihara

Session: B1-9

Person Contributing Discussion or Question: Prof. John Thome, LTCM-ISE-STI, EPFL, CH-1015 Lausanne, Switzerland.

Comment or Question: In these tests, only one fluid and essentially one saturation temperature were tested for four tube diameters. Yet, your heat transfer correlation used on the order of 20-25 empirical constants. How can you defend your method as being appropriate?

Presenter's Reply: With the decrease of tube diameters, the boiling mechanism in tubes changes obviously. It seems that a little bit more constants are used in correlations, but deviations can be reduced. This work is for the AC evaporator design. The coefficient is assumed to change within a limited range when evaporation temperature is from 10 - 20EC.

Paper Number: ICR0251

Title of Paper: Performance Prediction of Vane Type Expander for CO_2 Cycle

Presenter: M. Fukuta, T. Yanagisawa, Shizuoka University, Japan; R. Radermacher, University of Maryland, USA

Session: B1-9

Person Contributing Discussion or Question: Wang Qianfeng, 7-3-1 Hongo, Bunkyo-Ku, Tokyo 113-0033, Japan

Comment or Question: Some researchers are working on expanders, some on ejectors. Which selection is better to increase the COP of the cycle? Please make some comments.

Presenter's Reply: I didn't check the performance of the ejector yet, and I have no idea about that.

Paper Number: ICR0251

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Presenter: M. Fukuta, T. Yanagisawa, Shizuoka University, Japan; R. Radermacher, University of Maryland, USA

Session: B1-9

Person Contributing Discussion or Question: Eric Granryd, Royal Institute of Technology, 10044 Stockholm, Sweden

Comment or Question: Could you please indicate the magnitude of improvement of the net COP that was achieved? Or in other words: what was

the compressor shaft power for the case when the expander produced 208W shaft power?

Presenter's Reply: If the all shaft power can be used to drive the compressor, the net COP will be improved by 20% at the rotational speed of 2000 rpm.