Aluminium Heat Exchanger Technologies for HVAC&R

Lectures of the 4th International Congress taking place in Düsseldorf on 10 to 11 June 2015

Organiser:

DVS - German Welding Society, Düsseldorf

Bibliographic information published by the Deutsche Nationalbibliothek The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.dnb.de. **DVS-Berichte Volume 312** ISBN 978-3-945023-41-9 The lectures are printed in form of manuscripts. All rights, also for translation, are reserved. The reproduction of this volume or of parts of it only with approval of the DVS Media GmbH, Düsseldorf.

 \circledcirc DVS Media GmbH, Düsseldorf \cdot 2015 Printing: SDK Systemdruck Köln GmbH & Co. KG, Köln

Welcome to the 4th International Congress on Aluminium Heat Exchanger Technologies for HVAC&R

The 4th International Congress on Aluminium Heat Exchanger Technologies for HVAC&R is hosted in Düsseldorf, Germany, from 10 to 11 June 2015. We are looking forward to meeting participants from all over the world gathered here to exchange information about current processes and innovation in this industrial sector.

Not only with regard to the climate change it is becoming more important to use energy efficiently and reduce emissions. Stringent environmental requirements are the greatest challenges the heating, ventilation, air conditioning and refrigeration industry faces. This international congress is dedicated to these aspects and will be organised for the second time by DVS – German Welding Society.

DVS is proud to support this congress, which is in fact one of the best ways to transfer knowledge in different directions. Joining and brazing are complex technologies, applications of those technologies must be based on continuous activities in research, development, guidelines, rules, standards and training – the DVS concept of joining and brazing combines all those activities, thus we are ready to contribute to the further success of this congress.

We deeply thank all authors and session chairs for their valuable contributions to the congress and we welcome all participants!

Dr.-Ing. Roland Boecking General Manager of DVS

German Welding Society

Table of contents

Preface

| M. Kauffeld, Karlsruhe/DE | |
|--|----|
| State of the art in R&D of aluminium mini- and micro-channel heat exchangers – update | 1 |
| Current Market / Future Overview | |
| F. Flohr, Düsseldorf/DE | |
| The new F-Gas regulation | 16 |
| M. K. Yanik and S. Padhmanabhan, Baltimore/US | |
| High performance MCHE condenser design for commercial air conditioners | 17 |
| Applications | |
| O. Ploug and B. Vestergaard, Tønder/DK | |
| New tube concept: microchannel profile for evaporators and for refrigeration condensers | 21 |
| A. Roos, D. Alba, S. Hanke, J. F. dos Santos, Geesthacht/DE, A. R. Gonzales, Rio Grande do Sul/BR, and G. Wimmer, Tacherting/DE | |
| Hybrid friction diffusion bonding for tube-to-tube sheet welds – Process principles and joint properties of a novel solid state joining method | 25 |
| Corrosion | |
| K. Wang, Shanghai/CN, M. Melander and C. Martin-Callizo, Finspång/SE | |
| Corrosion performance of the MultiClad material folded tube on condenser | 31 |
| A. Gray, Oxon/UK | |
| Aluminium material developments for brazed HVAC&R applications | 35 |
| D. Ellerbrock, Rockledge/US, D. Steiner, Tønder/DK, J. H. Nordlien and O. Daaland, Karmøy/NO | |
| Fundamental alloying, processing, and field application considerations for aluminum HVAC&R heat exchangers | 36 |
| Equipment | |
| M. McQuirk, Wixom/US | |
| Should maintenance materially alter purchasing decisions? | 37 |
| HVAC&R and HX products | |
| A. Strehlow, Hofgeismar/DE, S. Braungardt, Freiburg/DE, C. Martín-Callizo, Finspång/SE, T. Oltersdorf, Freiburg/DE, M. Popovac and Ch. Reichl, Vienna/AT | |
| GreenHP: heat exchangers for next generation heat pump | 41 |
| S. Schlueter, Grevenbroich/DE, G. Berming, Hamburg/DE, H. Janssen and V. Sass, Bonn/DE | |
| Next generation header materials for corrosion resistant heat exchangers | 48 |
| List of authors | 52 |