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Heat Exchanger Fouling and Cleaning:

Fundamentals and Applications

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Preface

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HEAT EXCHANGER FOULING AND CLEANING **- FUNDAMENTALS AND APPLICATIONS -**

PREFACE

The formation of deposits on the heat transfer surfaces (fouling), and the associated decrease in thermal and hydraulic performance, is probably the main problem in the design and operation of most industrial heat exchangers. Well-proven codes and correlations are now available for standard heat exchanger design and computational fluid dynamics simulation can be performed for complex, single-phase flow conditions. Nevertheless, all these sophisticated calculations are off-set by the need to add crudely estimated fouling resistances (less accurately termed *fouling factors*), which may increase the heat transfer surface calculated for clean conditions by 20-200%. Even worse is the situation for the prediction of pressure drop. Even though more heat exchangers are taken out of operation due to an excessive, fouling-related increase in flow restriction, there is basically no information about the potential effects of deposits on pressure drop.

On-line and off-line fouling mitigation methods have been developed over the past 30 years, using chemical and physical means of fouling reduction. Most of these techniques are well-proven and have found their way into regular plant operation, while some are still speculative and/or not well-understood. Nevertheless, regular plant shut-down and cleaning is still required for the majority of cases, where even minor deposits can not be tolerated for hygienic or operational reasons. Chemical and mechanical removal of deposits is even less understood than the deposition process itself. Hence, the concentration of cleaning agents and the cleaning time are mainly based on operational experience and far from optimal.

To improve and disseminate the knowledge about heat exchanger fouling problems, a two-yearly series of conferences has been initiated by United Engineering Conferences (now Engineering Conferences International) in 1995. It is the aim of these conferences to provide a forum where industrialists and academics can discuss their experience and results with deposit formation in various applications. As a result of the very interdisciplinary nature of fouling, topics covered in these conferences span from fundamental chemistry and physics, through materials, chemical and mechanical engineering, to plant operating and maintenance experience.

The 5th conference of this series took place from 18-22, May 2003 in Santa Fe, USA. The title of this conference was *Heat Exchanger Fouling and Cleaning - Fundamentals and Applications*. 47 participants from 12 countries presented 45 papers, including 3 invited keynote lectures. The following papers have been presented by the authors in Santa Fe and have been recommended for publication in the conference proceedings after a careful refereeing and revising process. The next Engineering Conferences International meeting on heat exchanger fouling will be held in Irsee/Germany, June 5-10, 2005.

We wish to thank everybody who contributed towards the conference and the conference proceedings,

- All the authors and participants who invested substantial efforts to produce high-quality papers and to come to the meeting
- The technical referees who helped to improve the quality of these papers even more, by providing valuable and helpful comments
- The Conference Advisory Committee and the Session Chairmen
- Barbara Hickernell and Frank Schmidt, and their team from Engineering Conferences International, for a very effective organization.

The conference chairmen wish to acknowledge in particular the efforts of the Conference Scientific Secretary, Dr. Reza Malayeri, who was the focal point behind all matters relating to the contents of the meeting, and who was not provided with a visa to travel to Santa Fe.

Conference Chairmen:

A. Paul Watkinson

University of British Columbia (Canada)

Hans Müller-Steinhagen

German Aerospace Centre and Stuttgart University (Germany)

Conference Scientific Secretary

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