

# HEAT EXCHANGER FOULING & CLEANING CONFERENCE XIV

June 5 – 10, 2022 • Sporthotel Wagrain • Wagrain, Austria

## FINAL PROGRAM

### Conference Chair:

Dr.-Ing. Hans U. Zettler  
Heat Transfer Research, Inc., USA

### Honorary Conference Chair:

**PROF. HANS MÜLLER-STEINHAGEN**  
Dresden International University  
Germany

### Conference Secretary:

**DR. EDWARD ISHIYAMA**  
Heat Transfer Research, Inc.  
USA

### Conference Sponsors:



### Scientific Committee:

Dr.-Ing. Wolfgang Augustin  
TU Braunschweig, Germany

Dr. Guillaume Delaplace  
INRA, France

Dr.-Ing. Heike Glade  
Universität Bremen, Germany

Dr.-Ing. Les Jackowski  
Chevron Energy Technology Co, USA

Prof. Luis Melo  
University of Porto, Portugal

Dr. Aaron Smith  
Heat Transfer Research, Inc., USA

Ir. Edwin Van Doorn  
Fluor B.V., The Netherlands

Prof. Qi Zhao  
University of Dundee, UK

# FINAL PROGRAM

## Sunday, June 5, 2022

15:00 - 17:00 Registration (tea and coffee available)

17:00 - 17:30 Welcome and Opening Address

### **SESSION 1: INTRODUCTION**

**Chair: Dr. Hans Zettler**

17:30 - 18:00 **Talk by Prof. Luis Melo**

LEPABE-Laboratory for Process Engineering, Environment, Biotechnology and Energy, Department of Chemical Engineering, Faculty of Engineering, University of Porto, Porto, Portugal

18:00 - 18:30 **Crude oil fouling – field experience**

Himanshu Joshi

ALPH Heat Transfer, 398 North Rd., Chester NJ 07930 USA

18:30 - 19:00 **Generation of experimental data for model training to optimize fouling prediction**

N. Jarmatz, W. Augustin and S. Scholl

Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany

19:30 onwards Dinner (followed by Social Hour)

## Monday, June 6, 2022

7:00 - 9:00 Breakfast

### **SESSION 2: FOULING IN HYDROCARBON SYSTEMS (PART 1)**

**Chair: Dr.-Ing. Les Jackowski**

9:00 - 9:30 **Economic and environmental implications of fouling in crude preheat trains**

E. M. Ishiyama, S. J. Pugh and H. U. Zettler

HTRI, 40 Occam Road, Guildford, Surrey, GU2 7YG

9:30 - 10:00 **Impact of fouling on thermo-hydraulics of viscous coolers**

E. M. Ishiyama<sup>1</sup> and D. I. Wilson<sup>2</sup>

<sup>1</sup>HTRI, 40 Occam Road, Guildford, Surrey, GU2 7YG

<sup>2</sup>Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, CB3 0AS, UK

10:00 - 10:30 **Determining the fouling tendency of different feedstocks in the Fouling Assessment Setup (FAST)**

L. dos S. Vargette, N. Ristic, M. Geerts, G.J. Heynderickx and K.M. Van Geem  
Laboratory for Chemical Technology, Technologiepark 121, 9052 Zwijnaarde, Belgium

10:30 - 11:00 Break

**SESSION 3: FOULING IN HYDROCARBON SYSTEMS (PART 2)**

**Chair: Dr. Aaron Smith**

11:00 - 11:30 **Comparison of heat exchanger fouling test results for once-through and recirculating modes of operation at constant flowrate**

F. Cibotti, E. Rogel, E. Forbes and L. Jackowski  
Chevron Technical Center, Richmond, CA, USA

11:30 - 12:00 **Characterizing fouling tendency of crude oil on a surface using a High Temperature Variable Shear coupon test rig**

P. Singh<sup>1</sup>, S. Krishnaswamy<sup>1</sup>, K. Ponnani<sup>2</sup>, A. Verma<sup>3</sup> and J. Rawat<sup>3</sup>  
<sup>1</sup>Centre of Excellence in Process Engineering & Intensification (COE-PE&I),  
Department of Chemical Engineering, BITS-Pilani K K Birla Goa Campus, Goa,  
India  
<sup>2</sup>15/151 (old 7/383) Sreenivas, Sivan Kovil Street, Tharakkad, Palakkad, Kerala-  
678001, India  
<sup>3</sup>Bharat Petroleum Corporation Limited, Corporate R & D Center, Greater Noida,  
India

12:00 - 12:30 **Incorporation of fouling deposit measurements in crude oil fouling testing and data analysis**

A. Smith and E. Hitimana  
HTRI, P.O. Box 1390, Navasota, Texas 77868, USA

12:00 - 13:00 **Enhancement of refinery profitability via increasing the life-cycle of welded plate heat exchanger in the sour water stripping Process**

Ali Bani Kananah<sup>1</sup>, Bennat Drazner<sup>2</sup>, Arne Hannig<sup>1</sup>, Grant Firth<sup>3</sup> and Rosa Gilsanz<sup>4</sup>  
<sup>1</sup> Kelvion PHE, Karl-Schiller-Str. 1-3, D-31157 Sarstedt, Germany, ali.bani-  
kananeh@kelvion.com  
<sup>2</sup> Kelvion Inc - Thermal Engineered Solutions, 5202 West Channel Road, Catoosa,  
OK 74015, USA  
<sup>3</sup>Firth Engineering, Moststr. 10, D-93326 Abensberg, Germany  
<sup>4</sup> BAYERNOIL Raffineriegesellschaft GmbH, Raffineriestraße 100, D-93333  
Neustadt, Germany

13:00 - 14:00 Lunch

14:00 - 14:30 **Ethylene plant cracked gas compressor fouling mitigation**

Bhaskar Reddy Aluri  
SABIC Technology Centre, Jubail 31961, Saudi Arabia

**SESSION 4: POSTER SESSION**

**Chair: Prof. Luis Melo**

14:30 - 17:00 Poster session

19:30 onwards Dinner (followed by Social Hour)

## Tuesday, June 7, 2022

7:00 - 9:00 Breakfast

### **SESSION 5: FOULING IN FOOD PROCESSING**

**Chair: Guillaume Delaplace**

9:00 - 9:30 **Diffusive mass transfer in cleaning of a jellylike whey protein fouling layer**

H. Wiese, H. Geißler, W. Augustin and S. Scholl

Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany

9:30 - 10:00 **Ultrasonic coda wave interferometry (CWI) for detecting a change at interface of a solid surface - Applications for monitoring fouling, biofilm growth, cleaning and corrosion**

G. Delaplace<sup>1</sup>, P. Campistrone<sup>2</sup>, M. Abdallah<sup>1</sup>, A. Boutignon<sup>1</sup>, T. Danel<sup>1</sup>, S. Khelissa<sup>1</sup>, T. Six<sup>1</sup>, L. Wauquier<sup>1</sup>, T. Dubois<sup>1</sup>, N-E. Chihib<sup>1</sup>, P. Debreyne<sup>1</sup>, C. Nicard<sup>1</sup>, I. Proriol Serre<sup>1</sup>, D. Balloy, B. Chen<sup>1,2</sup>, M. Farin<sup>2</sup>, O. Brehault<sup>2</sup>, D. Callens<sup>2</sup>, L. Chehami<sup>2</sup>, F. Benmeddour<sup>2</sup> and E. Moulin<sup>2</sup>

<sup>1</sup>Univ. Lille, CNRS, INRAE, Centrale Lille, UMR 8207—UMET—Unité Matériaux Et Transformations, France

<sup>2</sup>Univ. Lille, CNRS, Centrale Lille, Junia, Univ. Polytechnique Hauts-de-France, UMR 8520 - IEMN - Institut d'Electronique de Microélectronique et de Nanotechnologie, France

10:00 - 10:30 **Influence of the rheological properties and pull-off forces of native and modified starches on cleaning in plane channel flow**

S. Kricke<sup>1\*</sup>, C. Berger<sup>2</sup>, S. Zahn<sup>2</sup>, H. Köhler<sup>1</sup>, H. Rohm<sup>2</sup> and J.-P. Majschak<sup>1</sup>

<sup>1</sup>Chair of Processing Machines/Processing Technology, Institute of Natural Materials Technology, Technische Universität Dresden, Germany

<sup>2</sup>Chair of Food Engineering, Institute of Natural Materials Technology, Technische Universität Dresden, Germany

10:30 - 11:00 Break

11:00 - 11:30 **Role of casein micelle on the whey protein fouling in a bench-scale fouling device**

W. Liu<sup>1,2,5</sup>, X. D. Chen<sup>1,5</sup>, R. Jeantet<sup>3,5</sup>, C. André<sup>4</sup>, and G. Delaplace<sup>1,5</sup>

<sup>1</sup>School of Chemical and Environmental Engineering, Soochow University, Suzhou, Jiangsu, P.R. China, 215123

<sup>2</sup>Univ.Lille, CNRS, INRAE, Centrale Lille, UMR 8207-UMET-Unité Matériaux et Transformations, F-59000, Lille, France

<sup>3</sup>STLO, INRAE, Institut Agro, 35042, Rennes, France

<sup>4</sup>HEI (Ecole des Hautes Etudes d'Ingénieur), Département Chimie, Textiles et Process Innovants, 13, rue de Toul, 59046 Lille Cedex, France

<sup>5</sup>International Joint Laboratory (INRAE Villeneuve d'Ascq – Soochow University-Agrocampus Rennes), School of Chemical and Environmental Engineering,

College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, Jiangsu Province 215123, China

- 11:30 - 12:00 **System for automated monitoring of local soil removal during cleaning in closed food processing lines with a quartz crystal sensor**  
S. Gottschall , R. Murcek , S. Städtler and M. Mauermann  
Fraunhofer IVV, Division Processing Technology
- SESSION 6: BIOFOULING**  
**Chair: Prof. Luis Melo**
- 12:00 - 12:30 **Flowing Foam: An eco-efficient strategy for cleaning of contaminated industrial equipment**  
H. Dallagi<sup>1</sup>, C. Faille<sup>1</sup>, L. Bouvier<sup>1</sup>, L. Wauquier<sup>1</sup>, C. Gruescu<sup>1</sup>, F. Aloui<sup>2</sup> and T. Bénézech<sup>1</sup>  
<sup>1</sup> Univ.Lille, CNRS, INRAE, Centrale Lille, UMR 8207-UMET-Unite Materiaux et Transformations, F-59000, Lille, France  
<sup>2</sup> LAMIH UMR CNRS 8201, Polytechnic University of Hauts-de-France (UPHF) Department of Mechanics, Campus Le Mont Houy 59313 Valenciennes Cedex 9 – France
- 12:30 - 13:00 **The effects of moisture, pH and paper chemicals on paper machine fouling**  
R. K. Challa<sup>1</sup> and K. D. Rausch<sup>2</sup>  
<sup>1</sup>Suominen Corporation. Research and Development. 500 Chestnut St, Bethune, SC USA 29009  
<sup>2</sup>University of Illinois at Urbana Champaign. Department of Agricultural and Biological Engineering. 1304 West Pennsylvania, Urbana IL USA 61801
- 13:00 - 14:00 Lunch
- 14:15 Conference Excursion including Dinner

### **Wednesday, June 8, 2022**

- 7:00 - 9:00 Breakfast
- SESSION 7: FOULING MITIGATION**  
**Chair: Aaron Smith**
- 9:00 - 9:30 **Software-guided clamp-on power ultrasound solution for fouling mitigation in tubular heat exchangers**  
P. Moilanen, T. Rauhala, S. Ahmadzai  
Altum Technologies, Helsinki, Finland
- 9:30 - 10:00 **Interaction of heat transfer enhancement and fouling in operating heat exchangers**  
E. M. Ishiyama<sup>1</sup>, S. J. Pugh<sup>1</sup> and A. P. Watkinson<sup>2</sup>  
<sup>1</sup>Heat Transfer Research Inc., The Surrey Technology Centre, 40 Occam Road, Guildford, Surrey GU2 7YG, UK

<sup>2</sup>Department of Chemical and Biological Engineering, University of British Columbia, Vancouver, BC, Canada V6T 1Z3

10:00 - 10:30 **Using Continuous Helical Flow Electric Heat Exchangers to Reduce Fouling**  
D. P. Long, J. Wilson  
Society of Petroleum Engineers (SPE), Watlow Electric Manufacturing Company,  
6 Industrial Loop Road, Hannibal, MO, USA 63401

10:30 - 11:00 Break

#### **SESSION 8: CFD MODELLING**

**Chair: Dr.-Ing. Heike Glade**

11:00 - 11:30 **CFD-based Modelling of a Cohesively Separating Soil Layer in consideration of local soil distribution**

C. Golla<sup>1</sup>, H. Köhler<sup>2</sup> and F. Rüdiger<sup>1</sup>

<sup>1</sup>Institute of Fluid Mechanics, Technische Universität Dresden, Germany

<sup>2</sup>Institute of Natural Materials Technology, Technische Universität Dresden, Germany

11:30 - 12:00 **Optimization of macro-structured pipe surfaces to improve the cleaning performance**

T. Hanisch, M. Joppa, V. Eisenrauch, S. Jacob and M. Mauermann

Fraunhofer Institute for Process Engineering and Packaging IVV, Dresden, Germany

12:00 - 12:30 **Maldistribution in shell-and-tube heat exchangers and its effect on fouling and performance**

R. Schab, A. Kutschabsky, S. Unz and M. Beckmann

Technische Universität Dresden, Dresden, Germany

12:30 - 13:00 **CFD modelling of an initial powdery layer on cooled tubular surfaces**

J. Strouhal, T. Juřena, Z. Jegla

Brno University of Technology, Institute of Process Engineering, Technická 2, 61669 Brno, Czech Republic

13:00 - 14:00 Lunch

#### **SESSION 9: CRYSTALLIZATION FOULING**

**Chair: Dr.-Ing. Augustin Wolfgang**

14:00 - 14:30 **The potential of thermally conductive polymer composites regarding crystallization fouling mitigation**

H. Kieper<sup>1</sup>, H.-J. Bart<sup>1</sup>, P. Stannek<sup>2</sup>, M. Kuypers<sup>2</sup>, M. Grundler<sup>2</sup>

<sup>1</sup>Laboratory of Reaction and Fluid Process Engineering, TU Kaiserslautern, 67663 Kaiserslautern, Germany

<sup>2</sup>Zentrum für BrennstoffzellenTechnik, 47057 Duisburg, Germany

- 14:30 - 15:00     **Crystallisation fouling from aqueous solutions of clathrate hydrates**  
A. Karela<sup>1,3</sup>, S.M. Clarke<sup>2,3</sup>, G. Kawaley<sup>4</sup>, A.F. Routh<sup>1,3</sup> and D.I. Wilson<sup>1</sup>  
<sup>1</sup>Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, CB3 0AS, UK  
<sup>2</sup>Department of Chemistry, University of Cambridge, Cambridge, CB2 1EW, UK  
<sup>3</sup>Centre for Environmental and Industrial Flows, University of Cambridge, Cambridge, CB3 0EZ, UK  
<sup>4</sup>Mitsubishi Electric R&D Centre Europe BV, 17 Firth Road, Houston Industrial Estate, Livingston, UK, EH54 5DJ
- 15:00 - 15:30     **Investigations of crystallization fouling in columns**  
K. Inderwies, H. Klein and S. Rehfeldt  
Technical University of Munich, TUM School of Engineering and Design, Department of Energy and Process Engineering, Institute of Plant and Process Technology, Garching/Germany
- 15:30 - 16:00     Break
- 16:00 - 16:30     **Impact of a Surfactant on Film Flow and Crystallization Fouling in Falling Film Evaporators**  
M. Waack<sup>1</sup>, S. Nied<sup>2</sup> and H. Glade<sup>1</sup>,  
<sup>1</sup>University of Bremen, Engineering Thermodynamics, Badgasteiner Str. 1, 28359 Bremen, Germany  
<sup>2</sup>BASF SE, 67056 Ludwigshafen, Germany
- 16:30 - 17:00     **Role of Zinc in Bulk Precipitation from Steaming Process of Potable Water**  
A. Al-Gailani\*<sup>1</sup> and R. Barker<sup>2</sup>  
<sup>1</sup>Department of Chemical Engineering, University of Hull, Hull, HU6 7RX, England  
<sup>2</sup>School of Mechanical Engineering, University of Leeds, Leeds, LS2 9JT, England
- 19:30 onwards     Dinner (followed by Social Hour)

## Thursday, June 9, 2022

7:00 - 9:00     Breakfast

### **SESSION 10: HEAT EXCHANGER NETWORKS AND DIGITAL TWIN TECHNOLOGIES**

**Chair: Dr. Edward Ishiyama**

- 9:00 - 9:30     **HEATTRAX: A new approach to exchanger fouling management**  
K. Vann<sup>1</sup>, T. Matthews<sup>1</sup>, N. Wang<sup>1</sup>, B. Busker<sup>1</sup>, M. Bagajewicz<sup>2</sup>, D. Oliva<sup>3</sup> and R. Vargas<sup>4</sup>  
<sup>1</sup>Refined Technologies, Houston, TX, USA  
<sup>2</sup>OK-Solutions, Norman, OK, USA  
<sup>3</sup>INGAR, Santa Fe, Santa Fe, Argentina  
<sup>4</sup>UAP, Libertador General San Martin, Entre Rios, Argentina

- 9:30 - 10:00      **Fouling thickness modeling for refinery cleaning schedule optimization**  
M. J. Bagajewicz<sup>1,2,3</sup>, A. L. M. Nahes<sup>4</sup> and A. L. H. Costa<sup>4</sup>  
<sup>1</sup>OK-Solutions, Norman OK, USA (corresponding author)  
<sup>2</sup>Refined Technologies, Houston, TX, USA  
<sup>3</sup>Federal University of Rio de Janeiro, Rio de Janeiro, Brazil.  
<sup>4</sup>State University of Rio de Janeiro, Rio de Janeiro, Brazil.
- 10:00 - 10:30      **Fouling management through digital transformation**  
E. M. Ishiyama, J. Kennedy, H. U. Zettler and S. J. Pugh  
Heat Transfer Research, Inc., 40 Occam Road, Guildford, Surrey, GU2 7YG, UK
- 10:30 - 11:00      Break
- 11:00 - 11:30      **TotalEnergies Fouling Management Program**  
E. Gomez<sup>1</sup>, L. France<sup>1</sup>, E. M. Ishiyama<sup>2</sup>, J. Kennedy<sup>2</sup> and S. J. Pugh<sup>2</sup>  
<sup>1</sup>TotalEnergies, Heat Transfer Research, Inc., 40 Occam Road, Guildford, Surrey, GU2 7YG, UK  
<sup>2</sup>Heat Transfer Research, Inc., 40 Occam Road, Guildford, Surrey, GU2 7YG, UK
- SESSION 11: INDUSTRIAL CLEANING**  
**Chair: Simon Pugh**
- 11:30 - 12:00      **Thermal heat exchanger cleaning**  
R. Mol  
Thermo-Clean Group, Dellestraat 45, B-3550 Heusden-Zolder
- 12:00 - 12:30      **Developments personal safety for Industrial Cleaning**  
H. Borgt  
Dow Benelux b.v., P.O. Box 48, 4530AA, Terneuzen, The Netherlands
- 12:30 - 13:00      **Simultaneous Effective Removal of Iron Polysulfide and Polyolefin Fouling from Twisted Tube Heat Exchangers in Hydrocracker Process using Ultrasonic Chemical Cleaning**  
R. A. Shank<sup>1</sup> and T. R. McCartney<sup>2</sup>  
<sup>1</sup>136-26 Westlake Glen; Strathmore, AB; T1P 1X5, Canada  
<sup>2</sup>2-321 37 Ave NE; Calgary, AB; T2E 6P6, Canada
- 13:00 - 14:00      Lunch
- 14:00 - 14:30      **The economic impact of better heat exchanger cleaning on an oil refinery – theoretical, expected and actual results**  
B.N. Kieser<sup>1</sup>, R. Tomotaki<sup>2</sup>, J. Loyola-Fuentes<sup>3</sup>, E. Diaz-Bejarano<sup>3</sup> and F. Coletti<sup>3</sup>  
<sup>1</sup>TechSonic LP, 8703 - 98 Street, Morinville, Alberta Canada T8R 1K6,  
<sup>2</sup>Clean As New, 1303 Thompson Park Drive, Baytown, Texas 77521 USA  
<sup>3</sup>Hexxcell Ltd., Foundry Building, 77 Fulham Palace Road, London, UK W6 8AF
- 14:30 - 15:00      **Chemical Cleaning of Crude Oil Fouling Deposits; Applying the Coke Spectrum**



- R. A. Shank<sup>1</sup> and T. R. McCartney<sup>2</sup>  
<sup>1</sup>136-26 Westlake Glen; Strathmore, AB; T1P 1X5, Canada  
<sup>2</sup>2-321 37 Ave NE; Calgary, AB; T2E 6P6, Canada
- 15:00 - 15:30 **Multistage fouling fracturing method**  
 E. Cherednik<sup>1</sup> and A. Belomestnykh<sup>2</sup>  
<sup>1</sup>Angara Global, Plantagekade 58, 1018 ZV, Amsterdam, Netherlands  
<sup>2</sup>Alnair Mineral Services DMCC, 1104, Reef Tower, Cluster O, Jumeirah Lakes Towers, Dubai, UAE, 5003335
- 15:30 - 16:00 Break
- SESSION 12: SURFACE MODIFICATIONS (PART 1)**  
**Chair: Dr.-Ing. Les Jackowski**
- 16:00 - 16:30 **Accelerated Decarbonization Through In-Place Surface Treatment Technologies**  
 V. Veedu<sup>1</sup>, M. Nakatsuka<sup>2</sup>, S. Thapa<sup>3</sup>  
<sup>1</sup>Oceanit, 8402 Scranton St, Houston, TX, 77061, United States  
<sup>2</sup>Oceanit, 828 Fort Street Mall, Suite 600, Honolulu, HI, 96813, United States  
<sup>3</sup>Oceanit, 8402 Scranton St, Houston, TX, 77061, United States
- 16:30 - 17:00 **Butadiene chemical reaction fouling in Steam Cracker and butadiene unit, overview and control by surface modification**  
 J.-P. Thoret-Bauchet<sup>1</sup>, Lionel Renaud<sup>2</sup>, Ludovic Galliot<sup>3</sup>  
<sup>1</sup>TotalEnergies One Tech Belgium, Zone Industrielle Feluy C, B-7181 Seneffe – Belgium  
<sup>2</sup>TotalEnergies TRTG - Zone Industrielle du Port Autonome du Havre – 76700 – Harfleur – France  
<sup>3</sup>TotalEnergies CSTJF - Avenue Larribau - 64018 - PAU - France
- 19:30 onwards Conference Banquet (followed by Social Hour)

## **Friday, June 10, 2022**

- 7:00 - 9:00 Breakfast
- SESSION 13: SURFACE MODIFICATIONS (PART 2)**  
**Chair: Dr. Hans Zettler**
- 9:00 - 9:30 **Anti-fouling coatings: A critical review and development roadmap**  
 Simone Mancin<sup>1,2</sup> and Francesco Coletti<sup>2,3</sup>  
<sup>1</sup>University of Padova, Dept. Management and Engineering, Str.IIIa S. Nicola 3 36100 Padova  
<sup>2</sup>Brunel University London, Chemical Engineering Department, Uxbridge, UK  
<sup>3</sup>Hexxcell Ltd, Foundry Building, 77 Fulham Palace Road, W6 8AF, London, UK
- 9:30 - 10:00 **Investigation of icephobic coatings for supercooling heat exchangers under submerged conditions using ice detection equipment**  
 Jens R. Frandsen<sup>1</sup>, Ricardo Losada<sup>1</sup>, Daniel Carbonell<sup>2</sup>  
<sup>1</sup>Danish Technological Institute, Kongsvang Allé 29, 8000 Aarhus C, Denmark

<sup>2</sup>SPF Institut für Solartechnik, OST Fachhochschule Ostschweiz, Oberseestrasse 10, 8640 Rapperswil-Jona, Switzerland

- 10:00 - 10:30 **Novel surface treatment to mitigate fouling in heat exchangers and process equipment**  
J. Ayutsede<sup>1</sup>, S. Kerber<sup>2</sup>, E. Curran<sup>3</sup>, B. Dooley<sup>4</sup>, I. Luna,<sup>5</sup> L. Jackowski<sup>5</sup>  
<sup>1</sup>Chevron Products Company, Richmond, CA, USA  
<sup>2</sup>Material Interface Inc., N73W22301 Willow View Drive, Sussex, WI 53089 USA  
<sup>3</sup>Curran International, 4610 Vicksburg St, Dickinson, TX 77539 USA  
<sup>4</sup>Chevron Technical Center, 1400 Smith St, Houston, TX 77002 USA  
<sup>5</sup>Chevron Technical Center, Richmond, CA, USA
- 10:30 - 11:00 Break
- SESSION 14: SURFACE MODIFICATIONS (PART 3)**  
**Chair: Dr. Hans Zettler**
- 11:00 - 11:30 **Reduce OPEX and CAPEX in refining process unit fired heaters and heat exchangers using tubacoat technology**  
S. Lodha  
Tubacoat S.L., Parque Científico y Tecnológico de Bizkaia Ibaizabal Bidea, Edificio 702, 1ª planta, Derio, Bizkaia, 48160, Spain
- 11:30 - 12:00 **Coatings to reduce fouling in plate heat exchangers: Two case studies**  
O. Santos<sup>1</sup>, Y. Adriaenssens<sup>2</sup>, C. Wictor<sup>3</sup> and M. Nilsson<sup>3</sup>  
<sup>1</sup>Materials Technology and Chemistry, Alfa Laval Lund AB, PO Box 74, SE-221 00 Lund, Sweden.  
<sup>2</sup>Chemours Belgium BVBA, Antoon Spinostraat 6A, 2800 Mechelen, Belgium.  
<sup>3</sup>Gasketed Plate Heat Exchangers – Technology Development, Alfa Laval Lund AB, PO Box 74, SE-221 00 Lund, Sweden.
- 12:00 - 12:30 **Pigmented antifouling coatings for improved on-site inspection**  
C. Bischoff<sup>1</sup>, J. R. Frandsen<sup>1</sup>, I. Luna<sup>2</sup>, L. Jackowski<sup>2</sup>  
<sup>1</sup>Danish Technological Institute, Kongsvang Allé, DK-8000 Aarhus C  
<sup>2</sup>Chevron Energy Technical Center, 100 Chevron Way, Richmond, CA 94801
- 12:30 - 13:00 **Final Discussion**
- 13:00 - 14:00 Lunch