

PROGRAM

Sunday, April 21, 2024

15:00 – 16:30 **Registration** (tea and coffee available)

16:30 – 16:50 **Welcome and Opening Address**

SESSION 1: INTRODUCTION

Chair: Dr. Hans Zettler

16:50 – 17:15 **Local thermal resistance measurement device for fouling detection**

Q. T. Pham, F. Ducros, and Z. Anxionnaz-Minvielle

Univ. Grenoble Alpes, CEA, LITEN, F-38000, Grenoble, France

17:15 – 17:40 **A conceptual mechanism for how crude oils foul in heat exchangers**

H. Joshi

Clean As New Gulf Coast, 1303 Thompson Park Dr., Baytown, TX 77521, USA

17:40 – 18:05 **Advance in morphology of fouling in the exhaust gas recirculation (EGR) coolers**

Y. Yao^{1,2,3}, Z. Han^{2,3,4}, W. Tian^{2,3,4}, L. Luo², J. Ding⁵, B. Su⁶, M.-E. Duprez¹, and G. De Weireld¹

¹ Thermodynamics and Mathematical Physics Unit, Faculty of Engineering, University of Mons, Place du Parc 20, Mons, 7000, Belgium

² Key Laboratory of Fluid and Power Machinery, Ministry of Education, Xihua University, Chengdu 610039, China

³ Vehicle Measurement, Control and Safety Key Laboratory of Sichuan Province, Xihua University, Chengdu, 610039, China

⁴ Engineering Research Center of Ministry of Education for Intelligent Air-Ground Fusion Vehicles and Control, Xihua University, Chengdu 610039, China

⁵ Guizhou Communication Vocational College, Guiyang, 551400, China

⁶ AVL List Technical Center (Shanghai) Co., Ltd., Shanghai, 201206, China

18:05 – 18:30 **Fouling investigation in plate heat exchangers using unsupervised machine learning algorithms**

S. A. Kuzucanli and C. Vatansever

Department of Hydraulic Module R&D, Bosch Home Comfort, 45030, Manisa, Turkey

19:00 – 22:00 **Dinner** (followed by social hour)

Monday, April 22, 2024

7:00 – 8:30 **Breakfast**

SESSION 2: FOULING IN HYDROCARBON SYSTEMS

Chair: Dr. Les Jackowski

8:30 – 8:55 **Unraveling the impact of temperature and feedstock composition on coke formation in steam cracking reactors**

H. Mohamadzadeh Shirazi¹, L. dos S. Vargette¹, G. Bellos², G. Heynderickx¹, M. F. Reyniers¹, and K. M. Van Geem¹

¹Laboratory for Chemical Technology, Technologiepark 121, 9052 Zwijnaarde, Belgium

²Dow Benelux B.V., Dowweg 5, 4542NM Hoek, The Netherlands

8:55 – 9:20 **Impact of fuel selection on gas-side fouling in fired heaters:
A techno-economic-environmental analysis**

E. Petropoulou¹, D. Giamalakis¹, G. Spiridaki¹, A. Aristeidopoulou¹, C. Plessis¹, S. Loukopoulos¹, D. Oakley², J. Kennedy², S. J. Pugh², H. U. Zettler² and E. M. Ishiyama²

¹Hellenic Petroleum R.S.S.O.P.P S.A., 17th km National Rd. Athens – Corinthos, Aspropyrgos, 193 00, Greece

²Heat Transfer Research, Inc., Surrey Technology Centre, 40 Occam Road, Guildford, Surrey GU2 7YG, UK

9:20 – 9:45 **Precipitation index: A potential alternative to predicting crude stability of petroleum oils**

P. Singh¹, S. Krishnaswamy¹, K. Ponnani^{1,3}, A. Verma², and J. Rawat²

¹Centre of Excellence in Process Engineering & Intensification (COE-PE&I), Department of Chemical Engineering, BITS – Pilani, K K Birla Goa Campus, Zuarinagar, Goa, India

²Bharat Petroleum Corporation Limited, Corporate R & D Center, Greater Noida, India

³15/151 Sreenivas, Sivan Kovil Street, Tharakkad, Palakkad, Kerala-678001, India

09:45 – 10:10 **Representative crude oil fouling in a micro-reactor using multi-factor experimental design**

C. Russell

Flow Assurance RD&E, ChampionX, Sugar Land, TX, USA

SESSION 3: CRYSTALLIZATION FOULING (PART 1)

Chair: Dr. Heike Glade

10:10 – 10:35 **Design and characterisation of a thin plate heat transfer and fouling apparatus**

J. Brown¹, S. M. Clarke², G. Kawaley³, M. J. Sargent², M. Turner², and D. I. Wilson¹

¹ Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, CB3 0AS, UK

² Institute for Energy and Environmental Flows, University of Cambridge, CB3 0EZ, UK

³ Mitsubishi Electric R&D Centre Europe B.V., Livingston, EH54 5DJ, UK

- 10:35 – 11:00 **Coffee**
- 11:00 – 11:25 **Reviewing detachment processes in crystallization fouling: Implications for accurate predictions**
I. Appelquist Løge and B. U. Anabaraonye
Center for Energy Resource Engineering (CERE), DTU Chemical Engineering, Denmark
- 11:25 – 11:50 **Investigation of fouling roughness induced heat transfer improvement using a Stereoscopic Micro PIV**
L. Rohwer, W. Augustin, and S. Scholl
Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany
- SESSION 4: FOULING PREDICTION**
Chair: Dr. Wolfgang Augustin
- 11:50 – 12:15 **Predictive fouling detection in food production using machine learning models based on real data**
J. Yin¹, N. Jarmatz², M. Mauermann¹, W. Augustin², and S. Scholl²
¹ Institut for Process Engineering and Packaging IVV, Division Processing Technology, Heidelberger Str. 20, 01189 Dresden, Germany
² Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Braunschweig, Germany
- 12:15 – 12:40 **Improving the efficiency of hybrid cooling towers: The integration of artificial intelligence for enhanced fouling prediction**
A. Zaza and E. G. Bennouna
Thermal Systems Department, Green Energy Park (IRESEN, UM6P), Km2 Route Regional R206, Benguerir, Morocco
- 12:40 – 13:05 **Prognostics of heat exchanger fouling via inference with symbolic regression**
E. Safikou¹ and G. Bollas²
¹ Department of Electrical & Computer Engineering, University of Connecticut, Storrs, CT 06269, USA
² Department of Chemical & Biomolecular Engineering, University of Connecticut, Storrs, CT, 06269, USA
- 13:05 – 13:15 **SESSION 5: FOULING SCIENCE (Part 1)**
Chair: Dr. Wolfgang Augustin
- Towards a common taxonomy for heat exchanger fouling and cleaning (Introduction)**
W. Augustin¹, L. F. Melo², and D. I. Wilson³
¹ Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany
² LEPABE-ALICE, Faculty of Engineering, University of Porto, Portugal
³ Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, CB3 0AS, UK

- 13:20 – 14:15 **Lunch**
- 14:15 – 16:00 **Networking and recreation**
- 15:30 – 16:00 **Coffee**

SESSION 6: CRYSTALLIZATION FOULING (PART 2)

Chair: Dr. Heike Glade

- 16:00 – 16:25 **Calcium scales – scrap scaling indexes and the concept of super-saturation**
D. Hawthorn
Fairham, Grange Mews, Wilford Road, Ruddington, Nottingham, NG11 6NB, UK

- 16:25 – 16:50 **From fundamentals of crystallization fouling on nanomaterials to rational design of scalephobic surfaces**
T. M. Schutzius¹, T. Armstrong², and J. Schmid²
¹Laboratory for Multiphase Thermofluidics and Surface Nanoengineering, Department of Mechanical Engineering, University of California, Berkeley, CA 94720, USA
²Department of Mechanical and Process Engineering, ETH Zurich, Sonneggstrasse 3, CH-8092 Zurich, Switzerland

SESSION 7: POSTER SESSION

Chair: Dr. Edward Ishiyama

- 16:50 – 18:30 Poster pitch and poster sessions

Vapor infusion with nanobubbles to mitigate heat exchanger fouling and reduce its environmental impact

M. Radicone
I₂ Air Fluid Innovations, Inc., 14 Valleywood Drive, Huntington Station, New York, NY 11746, USA

Investigation of flow pulsation to mitigate crude oil fouling

R. Schab¹, H. Joshi², M. R. Malayeri³, S. Unz¹, and M. Beckmann¹
¹ Technische Universität Dresden, Dresden, Germany
² ALPH Heat Transfer, Chester, NJ, USA
³ Shiraz University, Shiraz, Iran

Investigating freezing fouling using a novel spinning disc apparatus (SDA)

A. Karela^{1,2}, S. M. Clarke², G. Kawaley³, A. F. Routh², and D. I. Wilson¹
¹ Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, CB3 0AS, UK
² Institute for Energy and Environmental Flows, University of Cambridge, CB3 0EZ, UK
³ Mitsubishi Electric R&D Centre Europe B.V., Livingston, EH54 5DJ, UK

Hollow fiber polytetrafluoroethylene membrane heat exchanger with anti-corrosion properties

G. Yi¹, X. Tang², L. Du², X. Li¹, and S. Zhao¹

¹ Deakin University, Institute for Frontier Materials, VIC 3216, Australia

² Nanjing CAS Bidun Newmem Technology Co. Ltd, Nanjing, China

Local temperature distribution of a plate heat exchanger undergoing crystallization fouling

J. Berce, M. Može, M. Zupančič, and I. Golobič

University of Ljubljana, Faculty of Mechanical Engineering, Aškerčeva cesta 6, SI-1000 Ljubljana, Slovenia

Experimental studies of the flushing process of chocolate masses on a test facility

M. Heide¹, V. Liebmann², F. Rüdiger², J.-P. Majschak¹, and H. Köhler¹

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

² Chair of Fluid Mechanics, Institute of Fluid Mechanics, Technische Universität Dresden, Germany

A cleaning model for film-like soils with transition between cleaning mechanisms

C. Golla¹, S. Jena¹, V. Liebmann¹, J. Fröhlich¹, F. Rüdiger¹, and H. Köhler²

¹ Institute of Fluid Mechanics, Technische Universität Dresden, Germany

² Institute of Natural Materials Technology, Technische Universität Dresden, Germany

Can sound stop scaling: A NIR spectroscopy study of ultrasound treated water

M. Bache and I. A. Løge

Center for Energy Resource Engineering (CERE), DTU Chemical Engineering, Denmark

Evaluating chemical inhibitors for crystallisation fouling mitigation: Bulk vs. surface dynamics

I. A. Løgea and B. U. Anabaraonye

Center for Energy Resource Engineering (CERE), DTU Chemical Engineering, Denmark

Hydraulic and thermal development of water fouling layer

E. Crosby, M. Berger, B. Houston, and L. Bishop

Heat Transfer Research, Inc., P.O. Box 3290, Navasota, TX 77868, USA

Impact of fouling on energy management in column heat recovery system

M. Iijima¹ and R. Suzuki²

¹ ENEOS Corporation, 7-1, Ukishima-cho, Kawasaki-ku, Kawasaki, Kanagawa, 210-8523, Japan

² Heat Transfer Research, Inc., 20F Yokohama Landmark Tower, 2-2-1 Minatomirai, Nishi-ku, Yokohama, Kanagawa, 220-8120, Japan

19:30 – 22:30

Dinner (followed by social hour)

Tuesday, April 23, 2024

7:00 – 8:30 **Breakfast**

SESSION 8: BIOFOULING

Chair: Prof. Luis Melo

8:30 – 8:55 **Hurdle technology using encapsulated enzymes and essential oils to fight bacterial biofilms**

N.-E. Chihib¹, S. Mechmechani¹, A. Gharsallaoui², and G. Delaplace¹

¹ Univ. Lille, CNRS, INRAE, Centrale Lille, UMR 8207 – UMET – Unité Matériaux et Transformations, Lille, France

² Univ. Lyon, Université Claude Bernard Lyon 1, CNRS, LAGEPP UMR 5007, Villeurbanne, France

8:55 – 9:20 **How biofilm history affects the impact of thermal disinfection on biofilm control and regrowth**

A. R. Silva^{1,2}, L. F. Melo^{1,2}, and A. Pereira^{1,2}

¹LEPABE – Laboratory for Process Engineering, Environment, Biotechnology and Energy, Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

²ALiCE – Associate Laboratory in Chemical Engineering, Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

SESSION 9: FOULING IN FOOD PROCESSING

Chair: Prof. Ian Wilson

9:20 – 9:45 **A fouling predictive model-based solution for sustainable dairy heat treatment and cleaning-in-place (CIP) processes**

M. I. Malliaroudaki¹, N. J. Watson¹, L. N. Nchari², S. S. Bhonsale³, J. F.M. Van Impe³, K. van Koerten², I. Dimitriou¹, Z. J. Glover⁴, and R. L. Gomes¹

¹ Food Water Waste Research Group, Faculty of Engineering, University of Nottingham, NG7 2RD, UK

² NIZO, Kernhemseweg 2, Ede, 6718 ZB, The Netherlands

³ BioTeC+, Department of Chemical Engineering, KU Leuven, Ghent, Belgium

⁴ Arla Foods Ltd., Arla House, Leeds LS10 1AB, UK

09:45 – 10:10 **The dynamic fouling behavior of whey proteins throughout a plate heat exchanger: Utilizing a validated kinetic fouling model**

J. Zha^{1,2}, L. Bouvier¹, J. Xiao², and G. Delaplace¹

¹ UMET – Unité Matériaux et Transformations, UMR 8207 (Univ. Lille, CNRS, INRAE, Centrale Lille), 59000 Lille, France

² School of Chemical and Environmental Engineering, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, Jiangsu Province 215123 China

10:10 – 10:35 **Predictive modeling for fouling and cleaning in heat exchangers during milk pasteurization**

D. Yilmaz^{1,2}, K. K. Nguen¹, and G. Delaplace²

¹ THRASOS AI, Research and Development Department, St. Malo, France

²UMET – Unité Matériaux et Transformations, UMR 8207 (Univ. Lille, CNRS, INRAE, Centrale Lille), 59000 Lille, France

10:35 – 11:00 **Coffee**

11:00 – 11:25 **The effect of rheological properties of concentrated milk on fouling of falling film evaporators**

I. Hashemizadeh, D. Zare, and C. Brown
Fonterra Research and Development Center, Dairy Farm Road, Massey University, Palmerston North 4472, New Zealand

SESSION 10: REACTION FOULING

Chair: Dr. Ana Pereira

11:25 – 11:50 **Differences in emulsion polymerization fouling between acrylates and vinyl acetates studied in-situ with a Quartz Crystal Microbalance (QCM)**

K. M. Hoffmann¹, A. Langhoff¹, J. Adams¹, H. A. Huellemeier², W. Augustin², S. Scholl², and D. Johannsmann¹

¹Institute of Physical Chemistry, Clausthal University of Technology, Arnold-Sommerfeld-Str. 4, 38678 Clausthal-Zellerfeld, Germany

²Institute of Chemical and Thermal Process Engineering, Technical University of Braunschweig, Langer Kamp 7, 38106 Braunschweig, Germany

11:50 – 12:15 **Fouling monitoring with a heated finger during polymer synthesis**

H. Huellemeier, W. Augustin, and S. Scholl
Technische Universität Braunschweig, Institute for Chemical and Thermal Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany

SESSION 11: PERFORMANCE MONITORING

Chair: Dr. Marc Mauermann

12:15 – 12:40 **Integrated automation for comprehensive cooling water heat exchanger health monitoring**

K. T. How, L. B. Lin, and Sy M Hafiz B Al-Idrus
Mechanical Section, Engineering Department, Group Technical Solutions, Project Delivery & Technology (PD&T), PETROLIAM NASIONAL BERHAD (PETRONAS), 50088 Kuala Lumpur, Malaysia

12:40 – 13:05 **Tackling fouling challenges with the alfa laval smart heat exchanger**

L. G. Nilsson
Alfa Laval Technologies AB, P.O. Box 74, SE-221 00 Lund, Sweden

13:05 – 14:00 **Lunch**

14:00 **Conference excursion (including dinner)**

Wednesday, April 24, 2024

7:00 – 8:30 **Breakfast**

SESSION 12: SURFACE MODIFICATIONS

Chair: Prof. Stephan Scholl

- 8:30 – 8:55 **Biomimetic coatings to mitigate dairy fouling adhesion**
M. Saget^{1,2}, F. Braud², N. Nuns³, G. Delaplace¹, V. Thomy², Y. Coffinier², M. Jimenez^{1,4}
¹ Univ. Lille, CNRS, INRAE, Centrale Lille Institut, UMR 8207 - UMET - Unité Matériaux et Transformations, F-59000 Lille, France
² Université de Lille, Institute of Electronics, Microelectronics and Nanotechnology (IEMN), UMR CNRS 8520, F-59000 Lille, France
³ Univ. Lille, UMR 8181 – UCCS – Unité Catalyse et Chimie du Solide, F-59000, Lille, France
⁴ Institut Universitaire de France, Paris, France
- 8:55 – 9:20 **Crystallization fouling on polymer composite heat exchanger tubes and the effects of surface treatments**
J.-H. Imholze and H. Glade
University of Bremen, Engineering Thermodynamics, Badgasteiner Str. 1, 28359 Bremen, Germany
- 9:20 – 9:45 **Experiences with application of anti-fouling low surface energy coatings on industrial heat exchangers**
K. S. Chunangad¹ and R. Pratt²
¹ ExxonMobil Technology and Engineering Co., Spring, TX, USA,
² ExxonMobil Beaumont Refinery, 1795 Burt Street, Beaumont, TX 77701, USA
- 09:45 – 10:10 **Unlocking new efficiency gain in pre-heat trains with high temperature compatible surface treatments**
K. B. Uttley, M. Nakatsuka, and J. D. McHenry
Oceanit, 828 Fort Street Mall, Honolulu, HI 96813, USA
- 10:10 – 10:35 **“No inspection – no maintenance” : A disruptive technology to mitigate fouling in tubular heat exchangers by the use of streamax coatings inside the tubes**
M. Akkad
Ami Polymers, 182, G.I.D.C.Estate, Ankleshwar, Gujarat, India
- 10:35 – 11:00 **Coffee**
- 11:00 – 11:25 **Reduce opex and capex in refining process unit fired heaters using ceramic coating technology**
S. Lodha
Tubacoat S.L., Parque Científico y Tecnológico de Bizkaia Ibaizabal Bidea, Edificio 702, 1ª planta, Derio, Bizkaia, 48160, Spain
- 11:25 – 11:50 **Production process for heat exchanger tubes with DLC-type inner coating**

A. Angerbauer¹, N. Wailzer¹, C. Übleis², B. Petter³, M. Schachinger¹, C. Forsich¹,
and D. Heim¹

¹ FH OOE, University of Applied Sciences Upper Austria, Stelzhamerstrasse 23,
A-4600 Wels, Austria

² RÜBIG Härtetechnik, Griesmühlstrasse 10, A-4614 Marchtrenk, Austria

³ POLYSOUDE Austria GmbH, Hall / Grieshof 673, A-8911 Admont, Austria

SESSION 13: FOULING MITIGATION

Chair: Dr. Giamalakis Dimitrios

- 11:50 – 12:15 **Utilizing turbulator technology for enhanced CPHT performance and fouling mitigation**
H. Jhaveri
Concept Engineering International, 2nd Floor, KK Chambers, Sir PT Marg, Fort, Mumbai 400001, India
- 12:15 – 12:40 **Quick win on carbon footprint by improving existing assets via the use of tube inserts in shell and tube exchangers.**
N. Aubin
Petroval, Parc Eco-Normandie, 76430, St-Romain-De-Colbosc, France
- 12:40 – 13:05 **Re-thinking the design of closed-loop cooling stations to mitigate fouling**
H. Kockum
Alfa Laval Technologies AB, P.O. Box 74, SE-221 00 Lund, Sweden
- 13:05 – 14:00 **Lunch**
- 14:00 – 15:20 **Networking and recreation**
- 15:20 – 15:45 **Impact of triangular tube pitch on air-cooler external fouling**
J. P. Swart and M. R. Ellmer
Elbrons B.V., Driemanssteeweg 660a, Rotterdam, 3084CB, The Netherlands
- 15:45 – 16:10 **Influence of process parameters on the behavior of the heat and mass exchanger under fouling**
M. Markowski, S. Alabrudzinski, and M. Trafczynski
Warsaw University of Technology, Faculty of Civil Engineering, Mechanics and Petrochemistry, Institute of Mechanical Engineering, Department of Process Equipment, St. Lukasiewiczza 17, 09-400 Plock, Poland
- 16:10 – 16:35 **Propelling fouling mitigation by design to the forefront**
N. D. Divina
Fluor Daniel Inc. – Philippines, Alabang, Muntinlupa, Philippines
- 16:35 – 16:55 **Coffee**
- 16:55 – 17:20 **Industrial practices for heat exchanger reliability improvement**
F. A. Al-Khuliawi
Saudi Arabian Oil Company, Dhahran, Saudi Arabia
- 17:20 – 17:45 **Analysis of fouling's impact on heat transfer in plate heat exchangers**

C. Vatansever and A. Kuzucanli
Department of Hydraulic Module R&D, Bosch Home Comfort, 45030, Manisa,
Turkey

SESSION 14: FOULING SCIENCE (Part 2)

Chair: Dr. Hans Zettler

- 17:45 – 18:30 **Towards a common taxonomy for heat exchanger fouling and cleaning
(Discussion)**
W. Augustin¹, L. F. Melo², and D. I. Wilson³
¹ Technische Universität Braunschweig, Institute for Chemical and Thermal
Process Engineering, Langer Kamp 7, 38106 Braunschweig, Germany
² LEPABE-ALICE, Faculty of Engineering, University of Porto, Portugal
³ Department of Chemical Engineering and Biotechnology, University of
Cambridge, Cambridge, CB3 0AS, UK
- 19:30 – 22:30 **Dinner** (followed by social hour)

Thursday, April 25, 2024

7:00 – 8:30 **Breakfast**

SESSION 15: CLEANING SCIENCE

Chair: Dr. Guillaume Delaplace

8:30 – 8:55 **Experimental and numerical investigations of cleaning based on fundamental models**

K. Deshmukh¹, R. S. Cant², D. Arlov³, and D. I. Wilson¹

¹ Department of Chemical Engineering and Biotechnology, University of Cambridge, Philippa Fawcett Drive, Cambridge, CB3 0AS, UK

² Department of Engineering, University of Cambridge, Trumpington Street, Cambridge, CB2 1PZ, UK

³ Tetra Pak Processing Systems AB, Research & Technology, Ruben Rausing Gata, 221 86 Lund, Sweden

8:55 – 9:20 **Investigation of blocking phenomena in cleaning of micro heat exchangers**

F. Aselmeyer, W. Augustin, and S. Scholl

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

9:20 – 9:45 **Development of novel cleaning systems for improving immersion cleaning based on the hunting behaviour of the pistol shrimp**

R. Murcek¹, M. Finster², A. T. Georgi¹, S. Prabhu¹, E. Fuchs¹, and M. Mauermann¹

¹ Fraunhofer IVV, Heidelberger Str. 20, 01189 Dresden, Germany

² TU-Bergakademie Freiberg, Lampadiusstr. 4, 09599 Freiberg, Germany

09:45 – 10:10 **Analysis of complex interdependencies between soil-specific properties and cleaning behavior in the food industry by using a decision tree**

S. Kricke¹, C. Drechsel², C. Schmidt², S. Zahn², H. Rohm², J.-P. Majschak¹, and H. Köhler¹

¹ Chair of Processing Machines/Processing Technology, Institute of Natural Materials Technology, TUD Dresden University of Technology, Germany

² Chair of Food Engineering, Institute of Natural Materials Technology, TUD Dresden University of Technology, Germany

10:10 – 10:35 **Numerical model for the cleaning of a film-like soil by viscous shifting under non-isothermal conditions**

C. Golla¹, V. Liebmann¹, R. Rebel¹, H. Köhler², J. Fröhlich¹, and F. Rüdiger¹

¹ Institute of Fluid Mechanics, Technische Universität Dresden, Germany

² Institute of Natural Materials Technology, Technische Universität Dresden, Germany

10:35 – 11:00 **Coffee**

11:00 – 11:25 **Extension of a simplified physical flushing process model to realistic fluid property variation of chocolates**

V. Liebmann¹, M. Heide², C. Golla¹, H. Köhler², F. Rüdiger¹, and J. Fröhlich¹

¹ Institute of Fluid Mechanics, TUD Dresden University of Technology, Germany

² Institute of Natural Materials Technology, TUD Dresden University of Technology, Germany

- 11:25 – 11:50 **Influence of surface texture on the cleanability of 3D-printed stainless-steel components**
T. Hanisch¹, S. Stelzer², V. Eisenrauch¹, N. Milaev², J. Thielsch², J. Sebastian¹, E. Fuchs¹, and M. Mauermann¹
¹ Fraunhofer Institute for Process Engineering and Packaging IVV, Division Processing Technology, Heidelberger Str. 20, 01189 Dresden, Germany
² Fraunhofer Institute for Machine Tools and Forming Technology IWU, Dresden, Germany

SESSION 16: INDUSTRIAL CLEANING (Part 1)

Chair: Mr. Simon Pugh

- 11:50 – 12:15 **Cleaning method effectiveness and the cost of incomplete cleaning**
R. Tomotaki, B. Kieser, and H. M. Joshi
Clean As New Gulf Coast, 1303 Thompson Park Dr., Baytown, TX 77521, USA
- 12:15 – 12:40 **Effects of various alkali materials on the surface properties of aqueous surfactant solutions**
J. Idowu, T. R. McCartney, and F. Forouzandeh
Clean Harbors Energy & Industrial Services, #2-321 37 Ave NE Calgary, Alberta T2E 6P6, Canada

12:45 – 13:45 **Lunch**

13:45 – 14:45 **Networking and recreation**

SESSION 17: INDUSTRIAL CLEANING (Part 2)

Chair: Mr. Byron Kieser

- 14:45 – 15:10 **Selenium and unusual sulfides: A chemical cleaning challenge**
T. R. McCartney and J. Jardine
Clean Harbors, #2 321 37 Ave. NE Calgary AB, T2E6P6, Canada
- 15:10 – 15:35 **New cleaning method enables plate and shell heat exchangers (PSHEs) to be utilized in higher fouling applications**
V. Haavisto
Vahterus Oy, Pruukintie 7, 23600 Kalanti, Finland
- 15:35 – 16:00 **Thermal cleaning of heat exchangers, an improved total care service for an optimal cleaning**
R. A. J. Mol
Thermo-Clean Group, Dellestraat 45, B-3550 Heusden-Zolder, Belgium
- 16:00 – 16:15 **Coffee**
- 16:15 – 16:40 **Understanding the delivery of ultrasonic cleaning effect in a heat exchanger tube**
M. Järvinen^{1,2}, S. Ahmadzai¹, T. Rauhala¹, and P. Moilanen^{1,2}

¹ Altum Technologies, Eteläranta 8, 00130 Helsinki, Finland

² Electronics Research Laboratory, Physics Department, University of Helsinki, Helsinki, Finland

SESSION 18: FOULING SCIENCE (Part 3)

Chair: Dr. Hans Zettler

- 16:40 – 17:10 **Prof. Norman Epstein - a tribute, by Prof. Ian Wilson**
Department of Chemical Engineering and Biotechnology, University of
Cambridge, Cambridge, CB3 0AS, UK
- 17:10 – 17:30 **Concluding remarks**
- 19:30 – 22:30 **CONFERENCE BANQUET** (followed by social hour)