The design of electrostatic precipitators by use of physical models

WFC10 Discover the Future of Filtration & Separation

10th World Filtration Congress April 14–18, 2008 Leipzig, Germany

CONGRESS PROCEEDINGS

VOLUME III – G-Sessions

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WORLD FILTRATION CONGRESS 2008

SESSION SURVEY

Monday, 14.04.2008

08:00 – 09:00	Registration for Short Courses
09:00 – 18:00	Short Courses
16:00 – 18:00	Registration + Poster Installation

Tuesday, 15.04.2008

08:00 – 10:00	Registration						
10:00 – 11:00	**Opening Ceremony**						
11:00 – 12:00	**Plenary Lecture**						
12:00 – 13:15	Lunch						
13:15 – 14:30	**Invited Lecture 1**		**M 1**	**M 2**	**M 3**	**G 1**	**G 2**
14:30 – 15:00	Coffee Break						
15:00 – 16:15	**L 1**	**L 2**	**L 3**	**Invited Lecture 2**		**G 3**	**G 4**
16:15 – 16:45	Coffee Break						
16:45 – 18:00	**L 4**	**L 5**	**L 6**	**M 4**	**M 5**	**G5**	**G6**
18:00	Welcome Reception in the Exhibition Hall						

Wednesday, 16.04.2008

08:30 – 09:45	**L 7**	**L 8**	**L 9**	**M 6**	**M 7**	**G 7**	**G 8**
09:45 – 10:15	Coffee Break						
10:15 – 11:30	**PL 1**	**PL 2**	**L 10**	**PM 1**	**PM 2**	**PG 1**	**PG 2**
11:30 – 12:15	Poster Session	Poster Session		Poster Session	Poster Session	Poster Session	Poster Session
12:15 – 13:15	Lunch						
13:15 – 14:30	**L 11**	**L 12**	**L 13**	**M 8**	**M 9**	**Invited Lecture 3**	
14:30 – 15:00	Coffee Break						
15:00 – 16:15	**Invited Lecture 4**		**M 10**	**M 11**	**M 12**	**G 9**	**G 10**
16:15 – 16:45	Coffee Break						
16:45 – 18:00	**L 14**	**L 15**	**L 16**	**M 13**	**M 14**	**G 11**	**G 12**

WORLD FILTRATION CONGRESS 2008

SESSION SURVEY

Thursday, 17.04.2008

08:30 – 09:45	L 17	L 18	L 19	M 15	M 16	G 13	G 14
09:45 – 10:15	Coffee Break						
10:15 – 11:30	L 20	L 21	L 22	PM 3	PM 4	PG 3	PG 4
11:30 – 12:15				Poster Session	Poster Session	Poster Session	Poster Session
12:15 – 13:15	Lunch						
13:15 – 14:30	L 23	L 24	L 25	Invited Lecture 5		G 15	G 16
14:30 – 15:00	Coffee Break						
15:00 – 16:15	L 26	L 27	L 28	M 17	M 18	Invited Lecture 6	
16:15 – 16:45	Coffee Break						
16:45 – 18:00	L 29	L 30	L 31	M 19	M 20	G 17	G 18

Friday, 18.04.2008

08:30 – 09:45	L 32	L 133	M 21	M 22	M 23	G 19	G 20
09:45 – 10:15	Coffee Break						
10:15 – 11:30	L 34	L 35	M 24	M 25	M 26	G 21	G 22
11:45 – 12:15	Closing Session						
12:30 – 13:15	Lunch						
13:30 – 18:00	Post Congress Plant Tours						

Tuesday – April 15, 2008

Opening Ceremony 10:00-11:00

Plenary Lecture 11:00-12:00

Filtration in the Framework of Globalisation and Technical Innovation, Prof. Richard J. Wakeman, Loughborough University, Great Britain **(I-19)**

Invited Lecture 1 13:15-14:30

Solid-Liquid-Separation by Cake Filtration - State of the Art and Future Expectations, Dr. Harald Anlauf, Karlsruhe University, Germany **(I-21)**

M1 Gas Separation and Pervaporation 13:15-14:30

Gas separation with supported ionic liquid membranes, A. Seeberger*, C. Kern, A. Jess, University of Bayreuth, Germany **(II-40)**

Alternative permeate recovery systems for pervaporation, D. Shanahan*, C. O'Suilleabnain, I. O'Sullivan, Cork Institute of Technology, Ireland **(II-45)**

Concentration and dewatering of ethanol by organophilic and hydrophilic zeolite membranes, M. Weyd*, H. Richter, G. Fischer, P. Puhlfürß, I. Voigt, HITK Hermsdorfer Institute for Technical Ceramics; J. Kühnert, inocermic GmbH, Germany **(II-50)**

M2 Potable Water 13:15-14:30

Safe drinking water for everybody?! Membrane technology from small scale to large scale and vice versa, H. Futselaar*, J. Geluk, L. Broens, Norit Process Technology B.V.; J. Jacobs, Norit Membrane Technology B.V., Netherlands **(II-55)**

Two years experience with Germanys largest two stage ultrafiltration plant for drinking water production (7,000 m³/h), S. Panglisch*, R. Gimbel, IWW Water Center; W. Dautzenberg, WAG Nordeifel mbH, Germany **(II-59)**

Potable water production by membrane processes: Effect of bacterial deformation on microorganisms' removal, N. Lebleu*, C. Causserand, C. Roques, P. Aimar, University of Toulouse, France **(II-64)**

M3 New Fibrous Membranes 13:15-14:30

Functionalized and doped nanofiber filtration media with Ionex and antimicrobial properties, J. Marek*, J. Svobodova, M. Juklickova, Elmarco Ltd.; L. Jelinek, Institute of Chemical Engineering, Czech Republic **(II-69)**

The development of an enhanced surface filtration medium based on short metal fibres for applications in food & beverage, chemical & pharmaceutical industry, I. Schildermanns*; D. Santens, NV Bekaert SA, Belgium **(II-74)**

Commercial applications for Disruptor™ alumina nanofiber filter media, R. Komlenic*, Ahlstrom Filtration Inc.; F. Tepper, Argonide Corp., USA **(II-79)**

G1 Surface Filtration I 13:15-14:30

Assessment of the cleanable dust filtration behaviour of surface treated needle felts by characterisation parameter determined by image analysis, W. Höflinger*, G. Mauschitz, H. Rud, J. Schuberth, Vienna University, Austria **(III-37)**

Characteristics of bag filter pressure drop profiles, M. Koch*; G. Krammer, NTNU University, Norway **(III-42)**

Comparing gas and Liquid filtration of nonwovens transitional capacity and energy consumption, H. Kleizen*, IDEGO, Delft University, Parker Filtration B.V., Netherlands **(III-47)**

G2 Electrostatic Precipitation 13:15-14:30

Charge emission characteristics of a drained DBD electrode apparatus for nano-particle charging and precipitation, M. Wild, J. Meyer*, G. Kasper, Karlsruhe University, Germany **(III-52)**

Separation of oil mists from air flow by a space-charge electrostatic precipitator, A. Bologa*, H. Paur, H. Seifert, K. Woletz, Forschungszentrum Karlsruhe, Germany **(III-57)**

WeLo /MultiTron Premium – The new electrostatic precipitator, M. Sauer-Kunze*, GEA Delbag Lufttechnik GmbH, Germany **(III-62)**

L1 Vacuum and Pressure Cake Filtration Fundamentals I 15:00-16:15

Suspension typology and computer aided characterization of the suspension filterability, I. Nicolaou*, FOS Ltd., Cyprus **(I-37)**

Filter media resistance on continuous solid liquid filters, J. Tichy*, BHS-Sonthofen, Germany **(I-42)**

Experimental design and evaluation of filtration experiments allowing for superposed sedimentation, M. Longerich*, A. Damm, Bayer Technology Services GmbH, Germany **(I-47)**

L2 Sedimentation Fundamentals-Analytical Centrifugation I 15:00-16:15

Acquisition of compression-permeability data of soft and hard colloids based on centrifugation experiments, E. Iritani*, N. Katagiri, K. Aoki, M. Shimamoto, Nagoya University, Japan **(I-51)**

Separation behaviour of suspensions in polymer solutions studied by multisample analytical centrifugation, T. Sobisch*, T. Detloff, D. Lerche, L.U.M. GmbH, Germany **(I-56)**

Application of analytical centrifugation for studying solid-liquid separation in papermaking, H. Liimatainen*, J. Niinimäki, University of Oulu, Finland **(I-61)**

L3 Optimization of Solid-Liquid Separation Processes I 15:00-16:15

A multi-scale approach to solid-liquid separation task: a paradigm shift, T. Sheikhzeinoddin*, P. Sharratt, University of Manchester, Great Britain **(I-66)**

A product-centred approach to a multi-stage task in pharmaceuticals: isolation, T. Sheikhzeinoddin*, P. Sharratt, University of Manchester, Great Britain **(I-71)**

Continuous treatment and scrubbing of bottom ash from thermal waste treatment to produce improved granulate quality, R. Koralewska*, Martin GmbH; R. Grönnert, R. Hausdorf, Hans Huber AG, Germany; G. Zellinger, Kärntner GmbH; H. Gschaider, Binder+Co AG, Austria **(I-76)**

Invited Lecture 2 15:00 - 16:15

Advances relating to Filter Media Developments
Prof. Richard P. Lydon, Clear Edge Group, Great Britain **(II-19)**

G3 Surface Filtration II 15:00 - 16:15

Effects of PPS fibre intermixture on the surface structure and the filtration behaviour of PI needle felts for cleanable dust filters, G. Mauschitz*, J. Schuberth, W. Höflinger, Vienna University, Austria **(III-67)**

Effect of operating parameters on stability of jet pulsed bag filter - an experimental study, M. Saleem*, A. Ijaz, University of the Punjab, Pakistan; G. Krammer, NTNU University, Norway **(III-72)**

Experimental study of cake detachment in cake filtration and electrostatic enhanced cake filtration, H. Xu*, G. Xiong, Q. Yao, Tsinghua University, P.R. China **(III-77)**

G4 Mist and Droplet Separation 15:00 - 16:15

Development of a standardised test method on metalworking fluid mist collector elements, P. Wlaschitz*, W. Höflinger, Vienna University, Austria **(III-82)**

Filtration of liquid aerosols with a horizontal fibrous filter, A. Charvet*, Y. Gonthier, A. Bernis, E. Gonze, University of Savoie, France **(III-87)**

Numerical and experimental investigations on the development of oil droplet separators in crankcase ventilation systems, S. Schütz*, G. Gorbach, A. Zink, K. Kissling, M. Piesche, Stuttgart University, Germany **(III-92)**

L4 Vacuum and Pressure Cake Filtration Fundamentals II 16:45 - 18:00

Utilization of statistical design of experiments for improving the efficiency of test filtration tasks, A. Häkkinen*, M. Huhtanen, J. Kallas, Lappeenranta University; B. Ekberg, Larox Corp., Finland **(I-81)**

Study on the scalability of pressure filtration in pilot and bench scale test equipment, J. Palmer*, Larox Corp., Finland **(I-86)**

Layout of rotary filters on the basis of laboratory results, E. Ehrfeld*, R. Bott, T. Langeloh, Bokela GmbH, Germany **(I-91)**

L5 Sedimentation Fundamentals- Analytical Centrifugation II 16:45 - 18:00

Theoretical and experimental approach to the settling behaviour of particle-fiber-mixtures, M. Feist*, H. Nirschl, Karlsruhe University; J. Wagner, G. Hirsch, Darmstadt University, Germany **(I-96)**

Equation for fitting dispersed systems gravity & centrifuge settling data, A. Yelshin*, M. Mota, University of Minho, Portugal; I. Yelshyna, Polotsk University, Belarus **(I-101)**

Measurement of settling velocity enhancement by magnetic flocculation using manometric sedimentation centrifugation, M. Stolarski*, C. Eichholz, H. Nirschl, Karlsruhe University, Germany; B. Fuchs, DuPont, USA **(I-106)**

L6 Optimization of Solid-Liquid Separation Processes II 16:45 - 18:00

Life-cycle Cost Analysis for the Selection of the Optimal Equipment for Solid-Liquid Separation, S. Ripperger*, Kaiserslautern University, Germany **(I-111)**

Commercial aspects of solid liquid separations in salt separation applications, D.E. Keller*, KMPT AG, Germany **(I-116)**

Performance increase in solid-liquid separation, D. Steidl*, BHS-Sonthofen; J. Tichy, Consulting Engineer, Germany **(I-121)**

M4 Raw/Sea Water Pre-Treatment 16:45 - 18:00

Seawater intake and pre-filtration with Neodren®, T. Peters*, Consulting for Membrane Technology, Germany; D. Pinto, E. Pinto, Catalana de Perforacions S.A., Spain **(II-83)**

Comparison of options for seawater pre-treatment for SWRO plants, T. Peters*, Consulting for Membrane Technology; O. Schuster, B. von Harten, M. Ulbricht, Membrana GmbH; E. Schmidt, Wuppertal University, Germany; D. Pinto, E. Pinto, Catalana de Perforacions S.A., Spain **(II-88)**

Application of automatic backflushfilter to improve raw water pre-treatment of reverse osmosis desalination plants, B. Schlichter*, P. Mehlem, R. Wnuk, HYDAC Process Technology GmbH, Germany; M. Parker, HYDAC Technology Corp., USA **(II-93)**

M5 New Membranes 16:45 - 18:00

Composite membranes fabricated by plasma polymerization using organic compounds, D.-T. Tran*, L.V. Kim Ba, Hanoi University, Vietnam; S. Mori, M. Suzuki, Tokyo Institute of Technology, Japan **(II-98)**

Functional polymer materials to remove ions in conjunction with ultrafiltration membranes, B. Rivas*, A. Pooley, A. Maureira, E. Peireira, M. del Carmen Aguirre, University of Conception, Chile **(II-103)**

Clean edge micro sealing of filtration modules – the cut&weld method, A. Korz*, K. Herzer, A. Hubrich, Textile Fusion Technologies GmbH, Germany **(II-106)**

G5 Clogging of Candles and Cartridges 16:45 - 18:00

Modelling of the clogging of pleated filter for gas filtration, M. Rebai*, M. Prat, IMFT; M. Meireles, University of Toulouse; P. Schmitz, INSA; R. Baclet, S. Demeulemeester, Mecaplast Group, France **(III-97**

Study of pressure drop and aerosol penetration during clogging of mini-pleated air filters, A. Joubert*, S. Artous, L. Bouilloux, IRSN; S. Calle-Chazelet, D. Thomas, J. Remy, Nancy University, France **(III-102)**

Experimental study on flow through concentric porous filter candle, A. Ijaz*, M. Saleem, University of the Punjab, Pakistan **(III-107)**

G6 Fine Particle Precipitation 16:45 - 18:00

Fine dust precipitation in a Bayer-Reither venturi scrubber, M. Theis*, Bayer Technology Services GmbH; K. Reither, Reither Venturiwäscher GmbH, Germany **(III-112)**

Filtration of silver nanoparticle agglomerates, D.Y.H. Pui*, S.-C- Kim, J. Wang, M. Emery, University of Minnesota, USA **(III-117)**

Enhancement of the thermophoretic aerosol particles deposition efficiency in a turbulent annular flow configuration, B. Sagot*, F. Buron, ESTACA; G. Antonini, University of Compiègne, France **(III-122)**

Wednesday – April 16, 2008

L7 Vacuum and Pressure Cake Filtration Fundamentals III 08:30 - 09:45

Influence of synthetic suspension components on its physical behaviour, P. Ginisty*, N. Ahoyo, IFTS; J. Baudez, Cemagref, France; L. Spinosa, CNR, Italy **(I-126)**

Filtration properties in solvent-water mixtures, S. Neubauer*, U.A. Peuker, Clausthal University, Germany **(I-131)**

The influence of morphology and size on constant pressure filtration for two crystallizing systems, R. Beck*, D. Malthe-Sorenssen, J.-P. Andreassen, NTNU University, Norway; A. Häkkinen, M. Louhi-Kultanen, Lappeenranta University, Finland **(I-136)**

L8 Technical Centrifugal Filtration- Selection and Optimization 08:30 - 09:45

Systematic of filter centrifuges, P. Stelter*, HEINKEL Process Technology GmbH, Germany **(I-141)**

Selection of screen- and filter-centrifuges based on material and filtration properties, U. Esser*, D. Mrotzek, Bayer Technology Services GmbH, Germany **(I-146)**

Computer aided optimization of batch filtering centrifuges, I. Nicolaou*, FOS Ltd., Cyprus **(I-150)**

L9 Filter Media Cleaning 08:30 - 09:45

DEECOM™: A new eco-technology for cleaning metal filters, B. Longworth, J.P. Millington, J. Norris, P. Norris, C. Reid, B&M Longworth Ltd., Great Britain; S.L. Reynolds*, Carolina Filters, Inc., USA **(I-155)**

Process strategies avoiding impurities adhering to woven filter media used in inverting filter centrifuges, S. Stahl*, H. Nirschl, Karlsruhe University, Germany **(I-160)**

Comparison of regeneration methods for ceramic filter media, J. Puranen*, A. Häkkinen, J. Kallas, Lappeenranta University; B. Ekberg, Larox Corp., Finland **(I-165)**

M6 Process/Waste Water Treatment 08:30 - 09:45

Membrane technology for recycling and recovery of resources in industrial water and waste water applications – from lab testings to production experiences, C. Bohner*, EnviroChemie GmbH, Germany **(II-111)**

Field experiences with membrane filtration for reuse of biological wastewater effluents, T. Baum*, S. Theiss, H. Eipper, Pall GmbH, Germany **(II-115)**

Impacts of the influent toxicity on the efficiency of tertiary filtration of wastewater from petroleum industry, S. Heng*, N. Lesage, Q. Su, Total Petrochemicals, France **(II-120)**

M7 Reverse Osmosis 08:30 - 09:45

Investigations of silica scaling on reverse osmosis membranes, G. Braun*, T. Harrer, T.- Götz, Cologne University; W. Hater, C. zum Kolk, C. Dupoiron, BKG Water Solutions - BK Giulini GmbH, Germany **(II-125)**

Reverse osmosis pilot plant studies regarding a novel electrochemical method to control $CaCO_3$ scaling, M. Meinardus*, Grünbeck Wasseraufbereitung GmbH, Germany **(II-130)**

Characterisation of reverse osmosis (RO) membrane fouling by autopsy – A case study, I. M. El-Azizi*, R. G. Edyvean, Sheffield University, Great Britain **(II-135)**

G7 Depth Filtration & Particle Deposition 08:30 - 09:45

Simulation studies of deposition mechanisms for aerosol particles in fibrous filters including slip flow, A. Wiegmann*, K. Schmidt, S. Rief, L. Cheng, A. Latz, Fraunhofer Institute for Industrial Mathematics ITWM, Germany **(III-127)**

Particle capture by air filter media having truncated log-normal fiber diameter distributions and random spacing of fibers, P. Tronville*, Torino University, Italy; R. Rivers, EQS Inc., USA; Z. Bin, Tongji University, P.R. China **(III-132)**

Comparison of calculated and MRI determined 1-dimensional profiles of deposited particle material in depth filter media with ongoing loading, J. Hoferer*, S. Schollmeier, J. Meyer, G. Kasper, Karlsruhe University, Germany **(III-137)**

G8 Measurement Techniques 08:30 - 09:45

Evaluation of filter test rigs for fractional efficiency measurements according to filter test standards, S. Schütz*, M. Schmidt, L. Mölter, Palas GmbH, Germany **(III-142)**

Real time tunnel ventilation and filter control systems, F. Schneider*, Grimm Aerosol Technik GmbH, Germany **(III-147)**

Dust measuring technology for the monitoring of particulate emissions, H. Födisch*, P. Schengber, Dr. Födisch Umweltmesstechnik AG, Germany **(III-151)**

PL1 – Poster Session 10:15 - 12:15

Deep Bed Filtration for Water and Wastewater

Water depuration by means of fibrous filter medium, A. Budyka*, A. Shepelev, V. Rykunov, K. Lukanina, Karpov Institute of Physical Chemistry, Russia **(I-553)**

Rice hull ash and its filtration and separation applications, W. Li, C. Berthold*, C. Kiser, Q. Richard, Agrilectric Research Company, USA **(I-557)**

Filter Aids - Press Filtration

Influences on the wort flow in the lautering process during beer production, J. Tippmann*, J. Voigt, K. Sommer; Munich University, Germany **(I-562)**

Sedimentation Fundamentals-Analytical Centrifugation

Stability prediction of concentrated suspensions: Comparison of NMR and analytical centrifuge measurements, S. M. Pancera*, N. Nestle, V. Boyko, Y. Liu, BASG AG, Germany **(I-567)**

Centrifugal Sedimentation and Filtration

CFD multiphase flow simulation of a solid bowl centrifuge with radial compartments, X. Romaní Fernández*, H. Nirschl, Karlsruhe University, Germany **(I-572)**

Modelling of centrifugal drainage: effect of filter medium resistance, B. Leger, M. Valat, W. Jomaa, J.-R. Puigali, University Bordeaux 1; S. Couturier, P. Ginisty*, IFTS, France **(I-577)**

Hydrocyclones

Multiphase flow simulation of a hydrocyclone, R.-M. Wu*, C.-Y. Hsu, Tamkang University, Taiwan **(I-582)**

Particle Measurement - Contamination Control

Granulometry and morphology by microscopy and image analysis, O. Huin*, Microvision Instruments SAS, France **(I-586)**

Microbes verification on oxygen consumption rate measurement of biofilm in drinking water, L.-F. Chen*, W.-L. Lai, Shu-Te University, Taiwan **(I-591)**

Separation Enhancement by Magnetic Forces

Using Magnetic Filtration for Removal of Heavy Metals from Water by Nanomagnetic Extractants, S. M. Alfadul*, King Abdulaziz City for Science Technology, Saudi Arabia; A. W. Apblett, Oklahoma State University, USA **(I-596)**

Separation of pharmaceutical products with reverse micelles, S.H. Mohd-Setapar, R.J. Wakeman, E.S. Tarleton, Loughborough University, Great Britain **(I-601)**

PL2 – Poster Session 10:15 - 12:15

Separation Enhancement by Electric Forces

Electrofiltration of PHB, G. Gözke*, I. Perner-Nochta, C. Posten, Kalrsruhe University, Germany **(I-606)**

Separation Enhancement by Chemical Additives

Charge effects determine the filtration resistance in cake filtration and crossflow filtration experiments, H. Saveyn*, D. Curvers, P. Van der Meeren, Ghent University, Belgium **(I-611)**

Laboratory Vacuum and Pressure Cake Filtration

Miniaturisation of filtration processes - A necessity for the pharmaceutical industry, A. Schreiner*, R. Schneeberger, Novartis Pharma; S. Jerman, ETH Zurich, Switzerland **(I-615)**

Are standards in designing industrial filters for solid liquid filtration wisely and necessary?, J. Tichy*, H.-P. Schmid, BHS-Sonthofen GmbH; S. Ripperger, Kaiserslautern University, Germany **(I-616)**

Filtration Properties in Organic Solvents, S. Neubauer*, U.A. Peuker, Clausthal University, Germany **(I-620)**

Technical Vacuum and Pressure Cake Filtration

Study on parameters affecting belt filtration of a metal precipitate suspension, S. Hirvisaari*, A. Häkkinen, J. Kallas, Lappeenranta University; B. Ekberg, Larox Corp.; A. Rautanen, Tamfelt Corp.; S. Storbacka, OMG, Finland **(I-625)**

Development of an automated online quotation tool, O. Sieking, E. Eenovaara, S. Henttu, Larox Corp., Finland; H. Brezina*, Larox GmbH, Germany **(I-630)**

Technical Vacuum and Pressure Cake Filtration – Media and Components

Easy installation and improved performance with a new filter press cloth design for applications in e.g. waste water, B. Maurer*, R. Gaiser, H. Dür, Sefar AG, Switzerland **(I-633)**

Press Filtration Fundamentals

Mass transfer from porous particles during the pressing of biological materials, M. Petryk, Ternopil University, Ukraine; E. Vorobiev*, University of Compiègne, France **(I-636)**

Slurry Pretreatment by Precipitation and Crystallization

Enhancing phosphogypsum filtration with sorbitan sesquioleate additive: Theory and practice, E.A. Abdel-Aal*, M.M. Rashad, CMRDI, Egypt; H. El-Shall, University of Florida, USA **(I-641)**

Boron recovery from the clay wastes of boron industry by solid-liquid extraction, I. Kipcak*, M. Özdemir, Eskisehir Osmangazi University, Turkey **(I-646)**

Boron recovery from borax sludge using solid-liquid extraction followed by precipitation, I. Kipcak*, M. Özdemir, Eskisehir Osmangazi University, Turkey **(I-651)**

L10 Filter Media Blockage – Initial Stage of Cake Filtration 10:15 - 11:30

Pore fouling behaviors in constant pressure and constant flux filtration of very dilute suspension, E. Iritani*, N. Katagiri, Y. Sugiyama, Nagoya University; K. Yagishita, Sanshin Mfg. Co., Ltd., Japan **(I-170)**

Zeta potential of filter media and its influence on the initial stages of cake filtration, C. Schnitzer*, S. Ripperger, Kaiserslautern University, Germany **(I-175)**

Fouling of filter media: Solubility of oxalate solutions, R. Salmimies*, M. Louhi-Kultanen, A. Häkkinen, J. Kallas, M. Huhtanen, Lappeenranta University; Bjarne Ekberg, Larox Corp., Finland **(I-180)**

PM1 Membrane Fouling 10:15 - 12:15

Resonance pulsed flow in cross flow filtration, C. Pflieger*, D. Lisicki, D. Beckmann, Institute for Bioprocessing and Analytical Measurement Techniques; J. Briesovsky, BB ResoPuls; E. Flindt, T. Reischl, membraPure GmbH; U. Metzler, Dingslebener Privatbrauerei Metzler GmbH, Germany **(II-416)**

Analysis of particle fouling in different kinds of membranes during microfiltration, K.-J. Hwang*, C.-Y. Liao, Tamkang University, Taiwan **(II-421)**

Application of electric field to reduce the fouling in crossflow microfiltration, C.-J. Chuang* , C.-C. Hsiung, Z.-H. Cheng, Chung Yuan University, Taiwan **(II-426)**

Flow Manipulation for Performance Enhancement in Crossflow Filtration, B. Olayiwola*, P. Walzel, Technical University of Dortmund, Germany **(II-431)**

Effect of membrane material-cum-morphology on the dead-end micro-filtration of protein solution during filtration cycles, K.-L. Tung*, S. Wang, D. Nanda, C.-C. Hu, C.-L. Li, Y.-L. Li, Chung Yuan University; J. Huang, Yeu Ming Tai Chemical Industrial Co. Ltd., Taiwan **(II-436)**

Modified UF/NF membranes by LBL polyelectrolytes films for easy handling biofouling, M. Pontié*, E. Joudren, Angers University, France **(II-441)**

Relative effect of osmotic pressure and fouling on flux decline in nanofiltration of whey and skimmed milk, B. Chaufer, H. El Khabbaze, B. Balannec, M. Rabiller-Baudry*, University Rennes 1, France; K. Elkacemi, University Mohamed V-Agdal, Morocco **(II-442)**

Performances of an out-of-basin MBR for treating TFT-LCD wastewater, C.-H. Hsieh*, C.-M. Feng, C. Chou, S. Tan, Topco Scientific Co., Ltd.; C.-Y. Chung, J. C. Liu, Taiwan University, Taiwan **(II-447)**

PM2 Mechanism, Modellling Simulation, Design 10:15 - 12:15

Modelling of the mass transfer in a hollow fiber dialyzer coupled with ultrafiltration operations, C.-D. Ho*, J.-W. Tu, Tamkang University, Taiwan **(II-452)**

Investigation of mass transport in membrane-based separation of aqueous protein mixture, O. Trifunovic*, P. M. Bongers, Unilever, Netherlands **(II-xxx)**

Lattice Boltzmann simulation on flow in porous medium of ceramic filter, Z. Ji*, M. Sun, H. Chen, University of Petroleum Beijing, P.R. China **(II-457)**

CFD simulation of a flat membrane module as a tool to explain fouling distribution, M. Rabiller-Baudry*, B. Balannec, D. Delaunay, University Rennes 1, France; J.M. Gozálvez-Zafrilla, University of Valencia, Spain **(II-462)**

Investigation of dynamic filters using CFD, L. Steinke*, Y. Taamneh, S. Ripperger, Kaiserslautern University, Germany **(II-467)**

Mathematical modeling of the simultaneous absorption of CO2 and H2S in a hollow fiber membrane contactor, J. Fathikalajahi*, P. Keshavarz, S. Ayatollahi, Shiraz University, Iran **(II-477)**

Using fractional factorial design to determine the effect of the operational parameters on water flux in ultrafiltration, W.-L. Lai*, S.-W. Liao, J.-J. Chen, Tajen University; Li-Fu Chen, Shu-Te University, Taiwan **(II-482)**

PG1 Surface Filtration 10:15 - 12:15

Filtration performance characteristics of high temperature pleatead filters which operated in conventional bag filter and Cybag filter, Y.-O. Park*, N. Hasolli, KIER; H.-J. Roh, Chung-Nam University, Korea **(III-362)**

Efficient and economic particulate collection from the flue gas by the advanced hybrid particulate collectors, Y.-O. Park*, N. Hasolli, H.-K. Choi, KIER; Korea **(III-367)**

Particle layer detachment under consideration of transient kinetic effects, Q. Zhang*, E. Schmidt, University of Wuppertal, Germany **(III-372)**

Aspects of nozzle effect on the pulse-jet cleaning of a ceramic filter, J.-H. Choi*, K.-M. Sakong, Gyeongsang University, Korea; H. Chi, Z. Ji, University of Petroleum , P.R. China **(III-378)**

Permeability of ceramic filters for high temperature gas filtration, G.M.C. Silva, E.A. Moreira, M.D.M. Innocentini, J.R. Coury*, University of Sao Carlos; C.R. Rambo, D. Hotza, University of Santa Catarina, Brazil **(III-383)**

Performance evaluation of cellular ceramic membranes for hot aerosol filtration, M.D.M. Innocentini, V.P. Rodrigues, University of Ribeirao Preto; G.M.C. Silva, R.C.O. Romano, J.R. Coury*, University of Sao Carlos; R.G. Pileggi, University of Sao Paulo, Brazil **(III-388)**

Gas filtration: Influence of operational variables on cake formation and detachment in different filter types, M.L. Aguiar*, P.A. Paschoal, University of Sao Carlos, Brazil **(III-393)**

Study on gas-solid filtration using cellulose fiber filtering media, D.F. Torre, M.L. Aguiar*, E.H. Tanabe, University of Sao Carlos, Brazil **(III-398)**

Study of the profundity of particles penetration in different fabric filters, M.L. Aguiar*, E.H. Tanabe, E.J. Ricco, K.B. Rodriguez, University of Sao Carlos, Brazil **(III-403)**

Effects of corona electrified solid particles on the efficiency and pressure drop of a fabric filter, M.V. Rodriguez*, M.A.S. Barrozo, University of Uberlandia; J.R. Coury, University of Sao Carlos, Brazil **(III-408)**

PG2 Solid Gas Separation 10:15 - 12:15

Investigations into the collection of fine dust by plants, D. Bracke*, G. Reznik, H. Mölleken, E. Schmidt, University of Wuppertal, Germany **(III-413)**

Development of a model equation for dust suppression by using a water-spraying system, W. Höflinger*, P. Grundnig, G. Mauschitz, J. Gao, Vienna University, Austria **(III-418)**

Use of water sprays for reduction of airborne dust pollution, U. Klenk*, E. Schmidt, University of Wuppertal, Germany **(III-423)**

Experimental study on the multi-orifice injection of liquid in a venturi scrubber, J.A.S. Goncalves*, V.G. Guerra, J.R. Coury, University of Sao Carlos, Brazil **(III-428)**

Trace heavy metals emission control through enhanced submicrometer range filtration: Experimental determination of performance, C. Gutierrez-Canas*, J.A. Legarreta, University of the Basque Country; Sapin; D.Y.H. Pui, S.-C- Kim, University of Minnesota, USA **(III-433)**

Experimental study of gas-solid two-phase flow in the guide vane cyclone tube, J.-J. Wang*, Y. Guo, Y.-H. Jin, University of Petroleum Dongying, P.R. China **(III-438)**

Personal impactor to measurements aerosol inhalation dose, D.A. Pripachkin*, A.K. Budyka, Karpov Institute of Physical Chemistry; A.G. Tsovyanov, Institute of Biological Physics, Russia **(III-443)**

L11 Technical Vacuum and Pressure Cake Filtration 13:15 - 14:30

Optimizing industrial filters at Pyhäsalmi mine in Finland, P. Rantala*, S. Lähteenmäki, Helsinki University, Finland **(I-185)**

Advanced filtration of PTA (Pure Terephthalic Acid): Separation, washing and demoisturing in a single process unit with the hi-bar filtration R. Bott*, T. Langeloh, M. Schiessl, Bokela GmbH, Germany **(I-190)**

The multi-purpose rotary drum filter, T. Langeloh*, R. Bott, Bokela GmbH, Germany **(I-195)**

L12 Technical Centrifugal Sedimentation for Ultrafine Particles 13:15 - 14:30

Centrifugal separation in biopharmaceutical processing, W.-F. Leung*, The Hong Kong Polytechnic University, Hong Kong **(I-200)**

A case study - from lab-scale testing to industrial scale processing using a disk stack centrifuge, B. Fuchs*, A. Trasatti, S. Reddell, T. Pryor, DuPont Engineering, USA **(I-205)**

Fine solids separation within biodiesel process, M. Kopf*, G. Bergjohann, Pieralisi Deutschland GmbH, Germany **(I-210)**

L13 Filter Media Characterization – Porometry – Integrity Testing I 13:15 - 14:30

Homogeneity of commercial filter cartridges, K. Gupta*, A. Jena, Pourous Materials, Inc., USA **(I-215)**

Bubble point and pore size distribution measurements of filter papers, wovens and nonwovens using a pore size meter PSM 165, S. Große*, A. Rudolph, Topas GmbH, Germany **(I-220)**

Filter media pore size comparison between porometry and glass bead challenge testing, G. Rideal*, Whitehouse Scientific Ltd., Great Britain; E. Mayer, DuPont Engineering, USA **(I-225)**

M8 Produced Water Treatment 13:15 - 14:30

Feasibility of using ceramic ultra- and nanofiltration membranes for efficient treatment of produced water, P. Czermak*, M. Ebrahimi, K. Shams Ashaghi, University of Giessen-Friedberg; P. Mund, Atech Innovations GmbH, Germany **(II-140)**

Crossflow microfiltration of oil from synthetic produced water, Y.H.D. Alanezi*, R.J. Wakeman, R.G. Holdich, Loughborough University, Great Britain **(II-145)**

Preparation of nano-sized particles modified PVDF/Al_2O_3/TiO_2 ultrafiltration membrane and study on its performances for oilfield wastewater treatment, S.-L. Yu*, Q. Zhao, H. Lu, J. Yang, D. Wang, Harbin Institute of Technology, P.R. China **(II-150)**

M9 Nanofiltration 13:15 - 14:30

Nanofiltration: A method for solute removal from non-aqueous solvents, E.S. Tarleton*, Loughborough University, Great Britain **(II-155)**

Organophilic nanofiltration by polymeric membranes, T. Beeskow*, GMT Membrantechnik GmbH; J. Stegger, Borsig Membrane Technology GmbH, Germany **(II-160)**

Pre-oxidation effect on TOC removal in surface water treatment by nanofiltration, G.H.R. Nabi Bidhendi*, A.Torabian, H. Etemadi, A.A. Ghadimkhani, Tehran University, Iran **(II-165)**

Invited Lecture 3 13:15 - 14:30

Gas Cleaning Technology, Prof. Gernot Krammer NTNU - University of Science and Technology, Norway **(III-19)**

Invited Lecture 4 13:15 - 14:30

Solid-Liquid-Separation by Deep Bed Filtration, Prof. Rolf Gimbel University of Duisburg Essen, Germany **(I-29)**

M10 Characterisation by SAXS 15:00- 16:15

Modifying a small-angle X-ray scattering-camera for a time-reduced characterisation of nanoparticles, V. Goertz*, H. Nirschl, Karlsruhe University, R. Wengeler, BASF AG, Germany **(II-170)**

Spatial and temporal in-situ evolution of concentration profile probed by SAXS during ultrafiltration of casein micelles, C. David, F. Pignon*, A. Magnin, University of Grenoble; M. Sztucki, European Synchrotron Radiation Facility; G. Gésan-Guiziou, INRA Agrocampus Rennes, France **(II-175)**

In-situ characterization of anisotropic colloids deposition by SAXS during crossflow ultrafiltration, F. Pignon*, C. David, A. Magnin, University of Grenoble; M. Sztucki, European Synchrotron Radiation Facility, France **(II-180)**

M11 Dynamic Filtration 15:00- 16:15

Rotation filtration with ceramic membrane discs: presentation of industrial and municipal applications, C. Münch*, F. Koppe, Kerafol GmbH, Germany **(II-185)**

Dynamic cross-flow filtration of biological suspensions, e.g. bakers yeast, S. Neubauer*, U.A. Peuker, Clausthal University, Germany **(II-190)**

Classification using dynamic filtration, Y. Taamneh*, S. Ripperger, Kaiserslautern University, Germany **(II-195)**

M12 Dairy Products I 15:00 - 16:15

Impact of physico-chemical feed properties on deposit layer formation and filtration in the microfiltration of milk proteins, W. Kühnl*, A. Piry, A. Tolkach, U. Kulozik, Munich University; T. Grein, S. Ripperger, Kaiserslautern University, Germany **(II-200)**

Effect of physico-chemical changes on critical hydrodynamic conditions and protein transmission during microfiltration (0.1 µm) of skimmed milk, G. Gésan-Guiziou*, F. Garnier, F. Rousseau, INRA Agrocampus Rennes; A. Jimenez, SOREDAB SAS, France **(II-204)**

Role of physico-chemical environment on limiting and critical fluxes in ultrafiltration, nanofiltration and reverse osmosis of modified skim milks, M. Rabiller-Baudry*, H. Bouzid, L. Paugam, University Rennes 1, France **(II-209)**

G9 Depth Filtration & Nanofibre Layers 15:00 - 16:15

Experimental investigation on air filtration of submicron particulates by nanofiber filter, W.-F. Leung*, C.-H. Hung, The Hong Kong Polytechnic University, Hong Kong **(III-156)**

Investigation of filters with a single nanofiber layer on a substrate, J. Wang*, D.Y.H. Pui, S.C. Kim, University of Minnesota, USA **(III-161)**

Filtration properties of cellulose filter media with polymer nanofiber layer, M. Maly*, S. Petrik, J. Duchoslav, L. Plistil, Elmarco Ltd.; J. Hruza, University of Liberec, Czech Republic **(III-166)**

G10 Hot Gas Cleaning 15:00 - 16:15

Predicting the long term filtration behaviour on the basis of cycle times measured over a limited number of filtration cycles: Problems and approaches in high temperature gas filtration, N. Döring*, J. Meyer, G. Kasper, Karlsruhe University, Germany **(III-171)**

Blow back system for hot gas filter installations using sintered metal fibre filter elements, I. Schildermans*, V. Kuijken, S. Vandendijk, A. Aust, NV Bekaert SA, Belgium **(III-176)**

High temperature granular bed filtration of biomass gasification gas, D. Stanghelle*, A. Norheim, O.K. Sonju, J. Hustad, NTNU University, Norway **(III-181)**

L14 Large Scale Treatment of Water and Wastewater 16:45 - 18:00

Large scale experiences in wastewater filtration: A practical insight, M. Barjenbruch*, Berlin University, Germany **(I-230)**

Experience from world's largest sea water filtration plant for oil reservoir injection, M.H. Al-Ghamdi*, N.P. Isaias, Saudi Aramco, Saudi Arabia **(I-235)**

The impact of wastewater quality on receiving water bodies in Eastern Cape, South Africa, A.N. Osode, University of Fort Hare; M. Sibewu; M.N.B., Tshwane University, South Africa **(I-240)**

L15 Centrifugal Filtration Fundamentals 16:45 - 18:00

Advances in mathematical models and numerical methods for gravity and centrifugal sedimentation and filtration of polydisperse suspensions, R. Bürger*, University of Conception; A. Garcia, University del Norte, Chile **(I-245)**

Steam enhanced centrifugation of compressible products, U.A. Peuker*, Clausthal University, Germany **(I-250)**

Purification of particulate solids on centrifuges, F. Ruslim*, H. Nirschl, W. Stahl, Karlsruhe University, Germany; P. Carvin, Rhodia, France **(I-255)**

L16 Filter Media Characterization Porometry – Integrity Testing II 16:45 - 18:00

A study of the mechanism of wet and dry filtration using NIST traceable glass microspheres, G.R. Rideal*, E.A. Roberts, A. Stewart, J. Storey, Whitehouse Scientific Ltd., Great Britain **(I-260)**

Monitoring of cleanliness level in hydraulic and lube fluids using the mesh blockage technique, H. Karl*, Pall GmbH, Germany; M.J. Day, Pall Europe Ltd., Great Britain **(I-265)**

Filterability of mineral based gear lubrication oils, K. Farooq*, Pall Corporation, USA **(I-270)**

M13 Dynamic Filtration II 16:45 - 18:00

Dynamic cross flow microfiltration of viscous suspensions, S. Mirza*, Somicon AG, Switzerland; R. Bott, E. Ehrfeld, Bokela GmbH, Germany **(II-214)**

Dynamic cross-flow filtration with ceramic filter membranes, B. Hegnauer*, KMPT AG, Germany **(II-219)**

Influence of different parameters on membrane flux and nutrient retention of digester effluent filtrate in a single-shaft-disk-filter, R. Maas*, V. Bagehorn, E. Friedrich, H. Friedrich, Fraunhofer Institute for Ceramic Technologies & Systems IKTS, Germany **(II-224)**

M14 Dairy Products II 16:45 - 18:00

Microfiltration for the reduction of microorganisms in complex food systems: Effect of operating conditions and ingredient interactions, V. Kaufmann*, V. Schmidt, S. Scherer, U. Kulozik, Munich University, Germany **(II-229)**

Effect of membrane length, membrane resistances and process conditions on the fractionation of milk proteins by microfiltration, A. Piry*, W. Kühnl, A. Tolkach, U. Kulozik, Munich University, T. Grein, S. Ripperger, Kaiserslautern University, Germany; A. Heino, University of Helsinki, Finland **(II-233)**

Membrane adsorption chromatography – A novel hybrid technology for the separation of high value bioactive molecules such as glycosylated peptides, M. Kreuß*, U. Kulozik, Munich University, Germany **(II-238)**

G11 Depth Filtration & Modelling 16:45 - 18:00

Simulation of dust filtration in consideration of the incident flow using a coupling of analytical filtration models with CFD code, P. Kopf*, M. Piesche, Stuttgart University, Germany **(III-186)**

Initial collection efficiency of neutral aerosol particles in bipolarly charged fibrous filters, A. Podgorski*, Warsaw University, Poland; A. Balazy, Cummins Filtration, Inc., USA **(III-191)**

Nonsteady-state performance of mechanical fibrous filters, A. Balazy*, Cummins Filtration, Inc., USA; A. Podgorski, Warsaw University, Poland **(III-196)**

G12 Industrial (Hot) Gas Cleaning 16:45 - 18:00

Star-BagsTM – Application of an advanced filter media construction for greater filtration efficiency and production capacity, M.J. Neate*, Albany International Pty Ltd, P.R. China; B. Currwell, Albany International Pty Ltd, Australia **(III-201)**

Backpulse cleaned filtration system for the retention of alumina particles in NOx-gas streams, I. Schildermans*, H. Verbauwhede, S. Vandendijk, NV Bekaert SA, Belgium **(III-206)**

Recent advances in particulate filtration technologies for coal gasification based power generation plants, S.D. Sharma*, D. Chase, M. Dolan, A. Ilyusheckin, K. McLennan, T. Nguyen, CSIRO Energy Technology, Australia **(III-211)**

Thursday – April 17, 2008

L17 Deep Bed Filtration – Modelling, Test and Simulation I 08:30 - 09:45

Basic model for suspension transport in porous media (for petroleum and environmental engineering), A. Shapiro*, University of Denmark DTU, Denmark; P. Bedrikovetsky, University of Rio de Janeiro/Petrobras, Brazil **(I-275)**

Optimization of non-woven metallic filter media based on probability model, S. Ishikawa*, Kansai Wire Netting Co., Ltd.; A. Shimosaka, Y. Shirakawa, J. Hidaka, Doshisha University, Japan **(I-280)**

On coupled micro- and macro simulation for filtration processes, Z. Lakdawala*, O. Iliev, A. Wiegmann, Fraunhofer Institute for Industrial Mathematics ITWM, Germany **(I-285)**

L18 Technical Vacuum and Pressure Cake Filtration – Media & Components 08:30 - 09:45

Sefar hybrid technology (SHT) - A new approach to extend durability of filter fabrics, K.-U. Hömann*, C. Maurer, Sefar AG, Switzerland **(I-290)**

Latest developments in woven filter media for gypsum dewatering in modern FGD, A. Aust*, O. Steffen, C. Gurtner, C. Maurer, Sefar AG, Switzerland **(I-291)**

Pigments getting finer and finer - A new answer to this challenge, C. Maurer*, Sefar AG, Switzerland **(II-296)**

L19 Separation Enhancement by Electric Forces 08:30 - 09:45

Comparative analysis of electro-osmotic dewatering and electroforced sedimentaion, M.S. Jami,* Islamic University Malaysia; Malaysia; M. Iwata, Suzuka National College, Japan **(I-301)**

Electrohydrodynamic transport in nanoporous filter cakes, B. Schäfer*, H. Nirschl, Karlsruhe University, Germany **(I-306)**

Solid-liquid expression enhancement from plant tissues by pulsed electric fields, E. Vorobiev*, N. Grimia, N. Lebovka, University of Compiègne; J. Vaxelaire, ENSGTI, France **(I-311)**

M15 Modelling of Membrane Processes 08:30 - 09:45

Modelling and optimization of multi-stage membrane filtration processes, Z. Kovacs*, W. Samhaber, University of Linz, Austria **(II-241)**

Dynamical modelling and optimization of wastewater filtration process by submerged membrane bioreactors, C. Albasi*, A. Zarragoitia, S. Schetrite, U. Jauregui, University of Toulouse, France **(II-246**

Modelling the separation of protein solutions by means of cross-flow filtration, T. Grein*, S. Ripperger, Kaiserslautern University; A. Piry, W. Kühnl, U. Kulozik, Munich University, Germany **(II-251)**

M16 Membrane Fouling 08:30 - 09:45

Determining fouling parameters from microfiltration tests, W.-F. Leung, The Hong Kong Polytechnic University, Hong Kong **(II-256)**

Core-shell particles as model compound for studying fouling, M.L. Christensen*, M.B.O. Andersen, T.B. Nielsen, K. Keiding, Aalborg University, Denmark **(II-261)**

Characterization of fouling membrane in different integrated microfiltration systems, X.-J. Yan, S.-L. Yu*, S.-T. Fu, X. Yang, Y.-T. An, Harbin Institute of Technology, P.R. China **(II-266)**

G13 Particles and Filter Tests 08:30 - 09:45

Filter test with soot generation from 7.5 nm up to 200 nm and a mass concentration from 100 mg/h up to 3 g/h, G. Lindenthal*, Consulting for Particle Technology; M. Schmidt, L. Mölter, Palas GmbH, Germany **(III-216)**

The influence of test aerosol parameters on the filtration efficiency of electret filters, I.L. Tuinman*, C. van Gulijk, TNO Defense Security and Safety, Netherlands **(III-221)**

Separation behaviour of airborne particles and bioaerosols on particulate respirators and respirator filter media, T. Voigt*, S. Ripperger, Kaiserslautern University; G. Helmke, B. Ahlert, Fulda University, K.W. Müller, BGN, Germany **(III-226)**

G14 Fibrous Filter 08:30 - 09:45

Experimental investigations concerning the origin of particle penetration during dust filtration with nonwoven filter media, T. Häusle*, H. Rieger, H. Sauter, Mahle Filtersysteme GmbH, Germany **(III-231)**

Collection of nanoparticles on fibrous media: Filtration efficiency and clogging effect, G. Mouret*, D. Thomas, S. Calle-Chazelet, Nancy University; D. Bemer, INRS, France **(III-236)**

Air filtration performance of fine to nano size fibrous materials formed from polymeric film stretch, K.-J. Choi*, AAF International, USA **(III-241)**

L20 Deep Bed Filtration – Modelling, Test and Simulation II 10:15 - 11:30

On new challenges for CFD simulation in filtration, O. Iliev*, Z. Lakdawala, Fraunhofer Institute for Industrial Mathematics ITWM; M. Dedering, W. Stausberg, IBS Filtran, Germany; R. Ciegis, V. Starikovicius, Vilnius University, Lithuania **(I-316)**

Importance of the CFD simulations for the design of efficient filters, W. Stausberg*, M. Dedering, IBS Filtran; O. Iliev, Z. Lakdawala, P. Popov, Fraunhofer Institute for Industrial Mathematics ITWM, Germany **(I-321)**

Setting a new milestone in filter media design: Simulating performance according multipass test based on 3D fiber structures, M.J. Lehmann*, H. Banzhaf, G.-M. Klein, M. Durst, Mann+Hummel GmbH; S. Rief, A. Wiegmann, Fraunhofer Institute for Industrial Mathematics ITWM, Germany **(I-326)**

L21 Press Filtration Fundamentals I 10:15 - 11:30

Describing the shear and compressive behavior of fine particulate filter cakes using characteristic solids volume fractions, A. Erk*, BASF AG, W. Stahl, H. Anlauf, Karlsruhe University, Germany **(I-331)**

Dewatering and flow behaviour of fine limestone particle packings, T. Mladenchev*, J. Tomas, University of Magdeburg, Germany **(I-336)**

Dewatering and fluidity behaviour of kaolin suspensions in the presence of a dispersant, O. Larue*, E. Vorobiev, University of Compiègne; M. Loginov, Nikolai Lebovka, Institute of Biocolloidal Chemistry, Ukraine **(I-341)**

L22 Separation Enhancement by Magnetic Forces 10:15 - 11:30

Existing and potential applications of magnetic fields in particle technology, C. Eichholz, M. Stolarski, H. Nirschl, Karlsruhe University, Germany; K. Keller*, Solae/Dupont, USA **(I-346)**

Magnetic filtration processes in selective bio separation, H. Nirschl*, M. Stolarski, C. Eichholz, Karlsruhe University, Germany **(I-351)**

Continuous selective high gradient magnetic bio separation using novel rotating matrix centrifugation, M. Stolarski*, C. Eichholz, H. Nirschl, Karlsruhe University, Germany; K. Keller, Solae; B. Fuchs, DuPont, USA **(I-356)**

PM3 Inorganic/Ceramic Membranes 10:15 - 12:15

Feasibility of ceramic ultra- and nanofiltration membranes for removal of endotoxins, P. Czermak*, M. Ebrahimi, University of Giessen-Friedberg; G. Catapano, University of Calabria, Italy **(II-487)**

Two stage integrated ceramic membrane reactor system for the continuous enzymatic synthesis of oligosaccharides, M. Ebrahimi*, L. Placido, L. Engel, K. Shams Ashagi, University of Giessen-Friedberg, Germany; P. Czermak, Kansas State University, USA **(II-492)**

MEMBRALOX® IC A new range of high compactness ceramic Crossflow filtration membranes, J. Guibaud*, P. Chanaud, J.M. Cayrey V. Lasserre, Pall Exekia, France **(II-497)**

Goat milk fractionation and protein concentration by ceramic and polymeric membranes, B. Cancino*, C. Astudillo, Pontificia Universidad Catolica de Valparaiso, Chile **(II-500)**

Filtration of BSA and ß-cyclodextrin solutions by using inorganic membrane, T.-W. Cheng*, K.-W. Lin, Y.-L. Chiu, Tamkang University, Taiwan **(II-505)**

Preparation of nano-sized alumina modified ultrafiltration membrane and its antifouling research , S.-L. Yu*, D. G. Wang, Y. Lu, W. X. SHi, H. Lv, Harbin Institute of Technology, P.R. China **(II-510)**

Adhesion of particles on ceramic membranes, T. Quadt*, E. Schmidt, University of Wuppertal, Germany **(II-515)**

PM4 Special Membranes and Complex Systems 10:15 - 12:15

Enhanced membrane separation process for biogas upgrading – Operating experiences of feeding biomethane into the Austrian gas grid, M. Harasek*, A. Makaruk, M. Miltener, R. Schlager, Vienna University, Austria **(II-520)**

Investigation of He/CO_2 selectivity in palladium composite membranes, M. Dogan*, O. Altinisik, G. Dogu, Gazi University, Turkey **(II-525)**

Ionic liquid recovery from aqueous solutions by cross-flow nanofiltration, J.F. Fernández*, E. Chilyumova, D. Waterkamp, J. Thöming, University of Bremen, Germany **(II-528)**

Linseed oil extraction by high voltage electrical discharges followed by separation oil-in-water emulsions by dynamic microfiltration, J.-L. Lanoisellé, L. Li, L. Ding, X. Liao, E. Vorobiev*, University of Compiègne, France **(II-533)**

Chromatography membrane reactor system (CMCRS) for the continuous synthesis of galactosyl-oligosaccharides, L. Engel*, M. Ebrahimi, K. Schams, P. Czermak, University of Giessen-Friedberg, Germany **(II-538)**

Homogeneous catalysts recycling by nanofiltration: one step further to the sustainable production, T. Renouard*, A. Keraani, M. Rabiller-Baudry, C. Fischmeister, University Rennes 1, France **(II-543)**

Nanofiltration membrane performances in concentrated and diluted phosphoric acid media, H. Diallo*, B. Chaufer, M. Rabiller-Baudry, University Rennes 1, France **(II-548)**

The effect of feed solution pH on membrane microstructure and performance: An inside understanding by PALS analysis and molecular dynamic simulation, K.-S. Chang*, K.-L. Tung, D. Nanda, J.Y.-C. Jean, Chung Yuan University, Taiwan **(II-553)**

Removing natural organic matters from raw water using PACl coagulation & membrane filtration, D.-J. Lee, B.N. Tsai, J.Y. Lai, National Taiwan University, Taiwan **(II-558)**

A MEMS-based wet-wet differential pressure sensor for aggressive media with integrated temperature sensor, G. Drews*, Grundfos GmbH, Germany **(II-560)**

PG3 Depth Filtration 10:15 - 12:15

Improved CFD modeling of fibrous media for air cleaning applications, P. Tronville*, Torino University, Italy; R. Rivers, EQS, Inc, USA; Z. Bin, Tongji University, P.R. China **(III-448)**

Influence of unevenness of porous structure of filtration papers on distributing of stream in pores, A.G. Denysenko*, Kharkiv University, Ukraine **(III-453)**

Dispersion of aerosol particles in inhomogeneous fibrous filter media, A. Podgorski*, A. Jackiewicz, Warsaw University, Poland; A. Balazy, Cummins Filtration, Inc., USA **(III-456)**

Deposition of charged submicron aerosol particles in fibrous filters, V.A. Kirsch*, Frumkin Institute of Physical Chemistry; A.K. Budyka, Karpov Institute of Physical Chemistry, Russia **(III-461)**

Orthogonal test and regression analysis on granular bed filter, H.-M. Fu*, X. Su, Z. Lo, X. Zhou, Donghua University, P.R. China **(III-466)**

Hot Cleaning of Fuel Gas from Biomass Gasification, S. Thomas*, A. Herrmann, E. Schotte, Fraunhofer Institute for Factory Operation and Automation, Germany **(III-471)**

PG4 Combined Processes 10:15 - 12:15

Examination of effectivity of the CRT- DPF based on Ti_4O_7, P. Fuc*, Poznan University, Poland **(III-474)**

High porosity sinters TiO 2-xNx as an active carrier used in DPF Filter, J. Merkisz*, P. Fuc, Poznan University; D. Oblakowska, Crakow University, Poland **(III-479)**

Non Pt catalyst group in active part of new PM filter, J. Merkisz*, P. Fuc, Poznan University; D. Oblakowska, M. Gramatyka, Crakow University, Poland **(III-484)**

Reliability of particle emissions measurement on engine test stand, J. Merkisz*, J. Pielecha, Poznan University, Poland **(III-489)**

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L23 Deep Bed Filtration – Modelling, Test and Simulation III 13:15 - 14:30

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Pore pressure measurement during cake filtration, E. Chantoiseau*, P. Arlabosse, Mining University d'Albi-Carmaux, France **(I-381)**

Thermodynamic solution of filtration and expression, S. Kuri*, Kuri Chemical Engineers Inc., H. Ohya, Yokohama University, Japan **(I-386)**

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Effect of particle size on particle capture performance of polypropylene non-woven fibrous filter, T. Oshita*, Yamashin-Filter Corp.; K. Nakamura, K. Matsumoto, Yokohama University, Japan **(I-410)**

Modification of diatomaceous earth-based depth filters with nanosized basic or amphoteric metal oxides to promote virus removal from water, B. Michen*, M. Wegmann, T. Graule, Swiss Federal Laboratories for Materials Testing and Research, Switzerland; C.G. Aneziris, Freiberg University, Germany **(I-415)**

L27 Technical Mechanical-Thermal Press Filtration 15:00 - 16:15

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Hot filter presses - Industrial and international experiences with Rollfit®, A. Reisser*, Reisser Eilers & Partner AG, Switzerland **(I-425)**

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The effect of pH on the separation of manure nutrients with reverse osmosis membranes, L. Masse*, D.I. Massé, Agriculture and Agri-Food Canada; Y. Pellerin, Technologies Osmosys, Canada **(II-276)**

Influence of extractant molar volume on the alkali metal membrane extraction in closed system, Z. Albaraka*, D. Trebouet, M. Burgard, Strasbourg University, France; J.M. Loureiro, University of Porto, Portugal **(II-281)**

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Measurement of water separation efficiency of diesel fuel filters, C. Peuchot*, N. Petillon, IFTS, France **(I-474)**

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G17 Filter Media Fabrication 16:45 - 18:00

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Framework for selecting thin-cake candle filter technology for removing solid contaminant fines from recirculating acid gas scrubbing fluid streams, B.A. Perlmutter*, G.E. Schlager, BHS-Filtration Inc., USA **(I-499)**

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M21 New Separation Concepts 08:30 - 09:45

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Al2O3 microporous membranes prepared on wet substrate by plasma spray coating technology, C.-C. Hsiung*, K.-L. Tung, C.-J. Chuang, T.-C. Ling; Chung Yuan University, Taiwan **(II-335)**

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Microsieves – Low filter area, high performance, A. Damm*, Bayer Technology Services GmbH, Germany; B. Brocades, Fluxxion B.V., Belgium **(II-350)**

Micro filtration with silicon nitride micro sieves and high frequency back pulsing, C.N. Koh*, T. Wintgens, T. Melin, Aachen University, Germany; F. Pronk, B. Brocades, Fluxxion B.V., Belgium **(II-354)**

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Ceramic membrane bio reactor for industrial waste water treatment a case study, J. Guibaud*, S. Paranthoen, A. Balaire, Pall Corp, France **(II-364)**

AirLift MBR: large-scale side-stream system for municipal waste water treatment, H. Futselaar*, L. Broens, Norit Process Technology B.V.; R. Rosberg, Norit X-Flow B.V.; J. Jacobs, Norit Membrane Technology B.V., Netherlands **(II-367)**

G19 Filter Classification and Standardisation 08:30 - 09:45

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Which filter class is requested in a typical HVAC system?, T. Carlsson*, Scandfilter AB, Sweden **(III-308)**

Energy-efficiency-classification of air filters, M. Mayer*, T. Caesar, J. Klaus, Freudenberg Vliesstoffe KG, Germany **(III-313)**

G20 Simulation of Diesel Particulate Filters 08:30 - 09:45

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Numerical investigations of diesel particulate filter systems with 2D and 3D simulation models, T. Deuschle*, M. Piesche, Stuttgart University, Germany **(III-323)**

Computational fluid dynamics simulation of soot filtration in wall-flow diesel particulate traps for automotive applications, S. Bensaid*, D. Marchisio, D. Fino, G. Saracco, V. Specchia, Torino University, Italy **(III-328)**

L34 Water Separation from Biodiesel by Filtration and Coalescence 10:15 - 11:30

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The Effects of diesel fuel additives on water separation performance, S. Hutzler*, G.B. Bessee, Southwest Research Institute, USA **(I-529)**

Factors of influence in water separation from biodiesel-ultra low sulfur diesel blends, C. M. Stanfel*, Ahlstrom Engine Filtration LLC, USA **(I-534)**

L35 Gravity Sedimentation/ Flotation 10:15 - 11:30

BayFlotech – Make things clearer, D. Ulrich*, Bayer Technology Services GmbH, Germany **(I-539)**

Fine particles separation in recovered paper suspensions, G. Hirsch*; J. Wagner; S. Schabel, Darmstadt University; M. Feist, Karlsruhe University, Germany **(I-544)**

Removal of arsenic from wastewaters by batch airlift electrocoagulation, H.K. Hansen*, P. Nunez, C. Jil, G. Technical University Federico Sta. Maria, Chile **(I-548)**

M24 Special Membrane Applications 10:15 - 11:30

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Properties of downward and upward ultrafiltration of nanoparticle suspensions, Y. Mukai*, S. Shida, E. Iritani, Nagoya University, Japan **(II-377)**

Experimental study on the desalination of polymer-flooding oil-extraction wastewater with UF-EDR combined system, S.-L. Yu*, J. Xu, X. Zuo, D. Wang, J. Liu, H. Lu, Harbin Institute of Technology, P.R. China **(II-382)**

M25 Product Processing 10:15 - 11:30

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Application of binary packing for polysaccharides separation by hydrodynamic chromatography, A. Yelshin*, M. Mota, J.A. Teixeira, A. Yelshin, University of Minho; R. Diash, University of Bragança, Portugal **(II-392)**

Improved virus retention assurance using novel high productivity parvovirus retentive filters, G. Tkacik*, M. Krishnan, Millipore Corp., USA; G. Kern, Millipore SAS, France **(II-397)**

M26 Membrane Bio Reactor II 10:15 - 11:30

Development and operation of a submerged flat sheet membrane system for wastewater treatment in MBR, W. Lamparter*, S. Krause, U. Meyer-Blumenroth, R. Voigt, Microdyn-Nadir GmbH, Germany **(II-401)**

Mechanism of enhanced biological nitrogen and phosphorus removal in ICAS-MBR System, Y. Wang, S.-L. Yu*, F. Zhao, D. Wang, Harbin Institute of Technology, P.R. China **(II-406)**

Effect of cyclophosphamide and its main metabolites on the performance of a membrane bioreactor, C. Albasi*, L.F. Delgado, V. Faucet-Marquis, A. Leszkowicz, University of Toulouse; M. Audran, Lapeyronie Hospital, M. Castegnaro, CDS, France **(II-411)**

G21 Filter Element Production 10:15 - 11:30a

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Low pressure plasma coatings allows to produce in an economical, environmental friendly way, M. Pauwels*, Europlasma N.V., Belgium **(III-338)**

High efficient cleanable depth filter media for process gas filtration and a inno-vative all-purpose compact filter apparatus, E. Schmalz*, STFI e.V., Germany **(III-343)**

G22 Simulation of Particle Separation 10:15 - 11:30

Flow phenomena in mechanical separation technology, C. Seyfert*, N. Sautter, S. Schütz, M. Piesche, Stuttgart University, Germany **(III-348)**

CFD numerical flow simulation of particulate-laden and bulk solid flows - A state of the art, M. Lotfey*, ANSYS Fluent Deutschland GmbH, Germany **(III-353)**

The design of electrostatic precipitators by use of physical models, P. Tronville*, Torino University; G. Bacchiega, R. Sala, IRS s.r.l.; I. Gallimberti, Padova University; F. Zatti, Area Impianti .s.p.a., Italy **(III-357)**

Closing Session 11:45

Announcement of the Host of the next WFC.

Additional Paper

Effect filter performance under various contaminants, X. Tao*, Southwest Research Institute; P. Madhavan, L. Bensch, Pall Corporation, USA

The Programme lists countries and regions and is subject to amendments. Errors and obmissions excepted.

THE DESIGN OF ELECTROSTATIC PRECIPITATORS BY USE OF PHYSICAL MODELS

G. Bacchiega, R. Sala, IRS s.r.l. - Italy;
I. Gallimberti, Padova University - Italy
P. Tronville, Torino University - Italy
F. Zatti, Area Impianti s.p.a. - Italy

ABSTRACT

This paper describes how physical models can be successfully employed in the design of Electrostatic Precipitators (ESP). The development of the computational power of personal computers has made possible the development of mathematical models of complex systems, like ESP, that can be used at relatively low cost. These mathematical models simulate the non linear coupling of the different physical processes inside the ESP: turbulent gas flow, electrical field and discharge phenomena, particle charging and transport, particle collection and re-entrainment.
With the physical models it is possible to avoid empirical correlations, and to optimize the ESP characteristics on the basis of physical and geometrical parameters, taking into account the balance between costs and performances.
In this paper the model characteristics and results will be presented, together with the procedure used in the design of an electrostatic precipitator, to treat the flue gas from an industrial plant. The most critical design characteristics of the precipitator will be discussed.

KEYWORDS

Electrostatic Precipitation, Process Optimisation, Particle Size Distribution, Software

1. Introduction

The design of Electrostatic Precipitators has been mainly based on empirical knowledge of specialized manufacturers. Thanks to the advancements in computer technology and in physical processes description [1], it is now possible to conceive, optimise and design an Electrostatic Precipitator by of use physical models.
The design procedure follows different steps:

- the first step is the draft design: it is based on general specification analysis, expected outlet particle density, site specific physical constraints. To obtain the draft ESP characteristics and dimensions, the Deutsch law and the manufacturer empirical information are mainly used;
- the second step is the physical simulation and optimisation of the gas flow in the ESP collection body: it is realized by placing flow control devices in the inlet and outlet ducts of the ESP;
- the third step is the physical simulation of the particle collection processes, in order to verify the draft design efficiency, and eventually make the necessary modifications to comply the costumer specifications,
- the fourth step is the detailed engineering design and the construction drawings. It includes complete mechanical specifications, cost evaluation and construction scheduling.

In the next chapters this paper will describe the design steps in detail for a real industrial ESP. The software used in the example is an ESP simulation program

called ORCHIDEE [2], which includes a 3D fluid-dynamic simulation program called FLUPE [3].

2. Electrostatic precipitator draft design

The design of Electrostatic Precipitators is typically based on customer specifications: they include expected performances under different operating conditions of the industrial process. The design analysis starts from these operating conditions, to choose one or two worst cases: then the main geometrical and electrical characteristics of the ESP are defined by use of simplified collection efficiency calculations, basically derived by the manufacturer empirical measurements and experience.
This paper will illustrate the example of a real industrial Electrostatic Precipitator designed by Area Impianti and IRS for a Glass Factory.
The worst case main operating conditions are reported in table 1: the customer specifications require a particle density at the ESP outlet lower then 30 mg/Nm^3 (dry at 8% of O_2). The particle size distribution is characterised by a double distribution: fine particles from the furnace, and course particles from the process reactions with the additives. The ESP draft characteristics are reported in the second part of table 1.

FLUE GAS OPERATING CONDITIONS		
Gas flow (on wet)	Nm^3/h	124000.
Operating temperature	°C	402.
Operating Pressure	KPa	98.7
O_2 Concentration	%vol	11.25
Relative humidity	%vol	8.7
INLET PARTICLE CHARACTERISTICS		
Particle concentration (dry at 8% O_2)	mg/Nm^3	4707
Furnace particles (average diameter 0.25 micron)	% in weight	4.2
Reaction particles (average diameter 6.0 micron)	% in weight	95.8
DRAFT ESP CHARACTERISTICS		
N° of fields		3
N° of gas passages (d = 400 mm)		19
N° of plates per field (h = 13.35 m, l = 0.5 m)		8
N° of emitting electrodes per plate (RDE type)		1

Table 1 Main operating parameters and draft ESP characteristics.

3. Gas fluid-dynamic simulation and optimisation

Electrostatic Precipitators require almost uniform gas velocity distributions, to collect particles at the highest efficiency. This is realised by placing flow control devices and perforated plates at inlet and outlet of the precipitator.
The position and shape of these devices can be defined and optimised by use of the gas flow fluid-dynamic simulations, and a trial and error procedure.
The 3D simulation software FLUPE [3] uses a multidomain Cartesian PISO algorithm and a two dimensional turbulence model: internal mechanical devices and perforated plates may be inserted in the input file as flow limiting conditions or local pressure drops. A 3D graphic description of the mesh for the case example (about 300 000 non uniform cells) is given in figure 1 left, that includes the cylindrical reaction chamber before ESP inlet. The applied boundary conditions are: uniform velocity at the inlet section, zero pressure at the outlet section, and symmetry condition on the YZ plane at x=0.

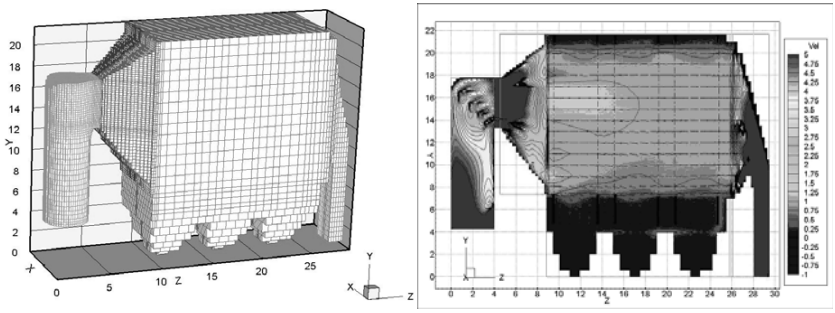

Fig. 1- left) ESP Fluid dynamic 3D mesh;-right) velocity contours (m/s) in the middle section of the ESP (YZ axis)

The computed results are represented as velocity contours, on a side view, in fig.1 right. The optimised flow control devices and the perforated plates (see fig. 2) create an almost uniform velocity region inside the ESP collection body.
The uniformity degree is evaluated by using statistical indexes, as standard deviation and moment of the velocity, in the grid points at the inlet and outlet of each field.

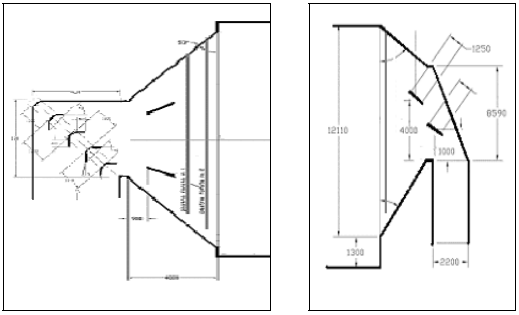

Fig. 2 Flow control devices and perforated plates at the ESP inlet (left) and ESP outlet (right)

4. Particle collection physical simulation and optimisation

The particle collection simulation ORCHIDEE [2] is used to verify the efficiency of the draft design, and to estimate eventual necessary modifications to comply with the customer specifications. The physical models avoid empirical correlations, by solving the strongly non-linear system of differential equations, representing each of the coupled physical phenomena involved in the particle collection:

- Gas flow distribution inside the electrostatic precipitator ;
- Electric field between high voltage electrodes and grounded plates;
- Ion production at the emitting electrodes by corona discharges;
- Migration of negative ions from the ionisation region to the collecting plates;
- Electric particle charging, depending of their size and volume distribution;
- Particle migration under the action of electric, viscous and gravitational forces;
- Particle collection on the plates;
- Plate rapping and particle evacuation into the hoppers.

The first phase of the design simulation process, is the analysis of the electrical ESP characteristics at room temperature, without dust load: under these conditions the current emission capacity of the H.V. electrodes is tested and compared with basic experimental results. In Fig. 3, left, the computed electric field distribution between high voltage electrodes and grounded plates is reported; it includes the negative ion production by corona discharges, and their migration from the ionisation region to the collecting plates. In Fig. 3, right, the corresponding Voltage-Current characteristics are compared with experimental measurements at room temperature, and extrapolated to the operating temperature of 400°C.

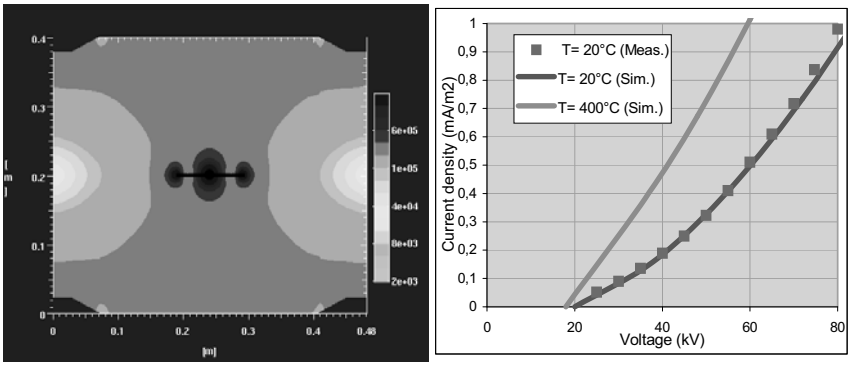

Fig.3 left) Electric field contour in a collection cell;
right) Voltage-Current characteristics at ambient and operating temperature.

The second phase is the simulation of the precipitator under the real operating conditions (flow rate, gas density and composition, dust load, etc) The particles are subdivided in specific mass classes, and treated in any point of the finite difference grid depending on their specific mass and charging process. In Fig 4, left, the particle size distribution used in the simulations is reported, according to the furnace and reaction particle characteristics (see table 1).

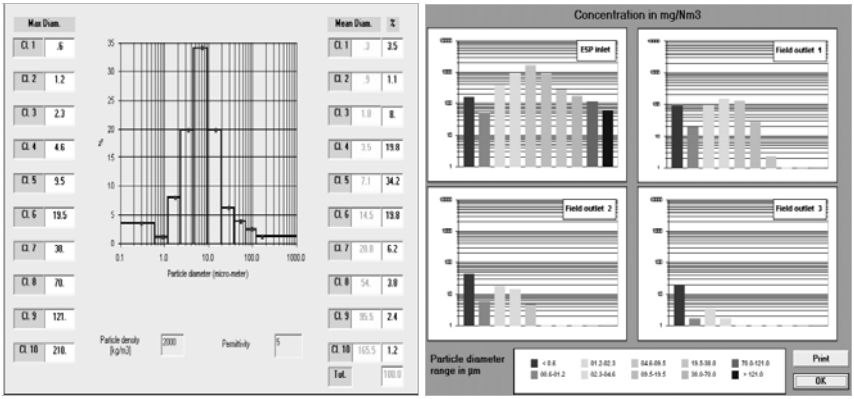

Fig.4 left) Particle size distribution (max diameter, mean diameter and %in mass per class);
right) Size distribution at the inlet and outlet of each ESP field

An example of the simulated results is shown in figure 4, right, which gives the particle density at inlet and outlet of each field, for any of the mass classes. Particle concentrations decrease along each field with an efficiency that depends on their size: the fine particles are more difficult to collect, and therefore survive longer along the precipitator; at the ESP outlet the particles are mainly sub-micron particles.

4. Mechanical and detailed layout

After the particle collection verification and optimisation, the ESP design proceeds to the detailed electrical and mechanical description of the precipitator. The detailed layout drawings will take into account the mechanical sizing, as well as the constraints for construction, security and maintenance of the precipitator (foundations, thermal insulation, internal devices and passages, etc.).
The electrical and mechanical detailed description then allows costs evaluation and constructions scheduling.

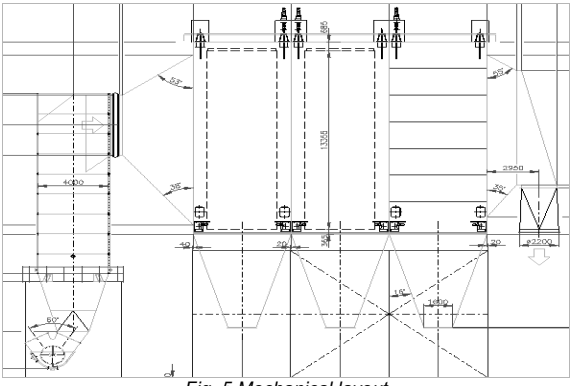

Fig. 5 Mechanical layout

4. Conclusions

The design of electrostatic precipitators can be successfully realized by the use of physical models, to verify and optimize the geometrical and operating parameter of the collection process.

5. References

[1] I. GALLIMBERTI: "Recent advancements in the physical modelling of electrostatic precipitators", Journal of Electrostatics 43 (1998) 219-247.
[2] V. ARRONDEL, G. BACCHIEGA, I. GALLIMBERTI, "ESP modelling: from University to Industrial Application", VIII International Conference on Electrostatic Precipitation, Birmingham , USA, 2001
[3] R. SALA: "Application of FLUPE code to Marghera power plant", European Community co-funded ABRICOS Project, ENK6-CT2000-00324, 2001
[4] G. BACCHIEGA et al., Experimental study of the mass balance in a pilot industrial electrostatic precipitator, Journal of Electrostatics 64 (2006) 297–309