

Registration



**Process
Intensification**

SUSTAINABLE (Bio)CHEMICAL PROCESS TECHNOLOGY

*Incorporating the 6th International Conference on
Process Intensification*

Delft, The Netherlands
27–29 September 2005

Cosponsored by:



BHRGroup
The Fluid Engineering Centre



Introduction

The process industries and governments widely recognise that sustainable growth can only be achieved by a well-balanced, simultaneous progress in three areas: economic, environmental and social. Sustainable Process Technology is the means for making such progress, where achieving improved environmental performance does not impose extra costs, but makes step changes to process performance which have simultaneous economic benefits and are viewed positively by society at large. Change is being driven by technical innovation and accelerated by a raft of legislation, in particular the Integrated Pollution Prevention Control (IPPC), which demands that owners and operators adopt Best Available Techniques (BATs).

Process development is stimulated and encouraged by bringing together the very latest techniques and thinking from across industry and academia. The conference will provide a forum for both practical solutions for today and potential ideas from across industry and academia which will become the BATs of tomorrow.

The event will incorporate BHR Group's Process Intensification conference which, since its inception in 1996, has brought together the latest innovative ideas in sustainable, intensified processes. With the support of TU Delft and Senter-Novem, this event will substantially expand its horizons, including areas such as Green Chemical Technology.

Delegates seeking an introductory overview on to the subject will be offered a half-day course before the conference begins and, following the conference close, technical visits are planned to provide practical examples of applications of the technology.

Who Should Attend

Chemical engineers and chemists working in industry and academia will benefit from attendance at this conference. Whether in bulk chemicals, fine or speciality chemicals, pharmaceuticals, biotechnology, polymers & plastics, water treatment, minerals & metals or in novel materials, delegates will receive valuable insights into innovative technologies and processes. Experienced managers are invited to share their knowledge with other delegates. Newcomers to this field of work will have the opportunity to learn the fundamentals at the introductory course before joining the conference itself.

Venue and Timing

The technical sessions will be held at the Aula Congress Centre at the Delft University of Technology in the Netherlands. The details are: Aula Congress Centre, Mekelweg 5, 2628 CC Delft, The Netherlands (tel: +15 278 80 22: www.fd.tudelft.nl).

Registration will take place at the Stadscafe De Waag from 18.00 hrs – 19.30 hrs on 26 September and at the Aula Congress Centre from 08.00 hrs on 27 September 2005.

The conference will open on the morning of Tuesday 27 September and will conclude after lunch on 29 September 2004.

Host City & Accommodation

The city of Delft is famous for its picturesque canals, unique architecture, monuments, museums and unforgettable atmosphere. There are no large hotels in the city centre so to help delegates, the organisers will issue a list of suggested hotels on registration. Delegates are responsible for booking their own accommodation in Delft.

Opening Address

We have pleasure in announcing that the Opening Address to the conference will be given by Professor Wim van Swaaij from TU Twente, The Netherlands.

Introductory Course

Preceding the conference, on Monday afternoon 26 September 2005, a short interactive course/workshop on Process Intensification will be offered exclusively to participants booked to attend the conference. The course will focus on practical aspects of application of PI-technologies ("How do I apply PI?") and will be given by a selected faculty of top experts in the field, including Colin Ramshaw, Andrew Green, Henk van der Berg and Andrzej Stankiewicz. The course will include updates on latest developments in Process Intensification, the business issues of PI including sustainability and safety aspects, as well as recent examples of successful commercial applications.

The course is intended for engineers, technologists and researchers in chemical, biochemical, pharmaceutical and engineering companies, large and small, who are involved in process design and development. It will also be beneficial for the managerial personnel interested in the methodology of translating the current technological developments into industrial practice. The course participants will have the opportunity to raise any questions and issues they have about PI with the faculty members, during a separate Q&A session.

The workshop will commence at 13.00 hrs in the Aula Centre and there is a nominal charge of €50 (+ VAT @ 19%). Places are strictly limited and delegates interested in attending the Workshop must reserve a place by booking on the Registration form.

Language

The language of both the Conference and the published Proceedings will be English.

Technical Visits

DSM NV and The Laboratory for Process Equipment, Delft University of Technology are offering delegates the opportunity to visit their sites immediately following the end of the conference. The visitors will get the opportunity to see the new 7-ADCA plant at the DSM plant, which is described at the conference. If you would like more details of these proposed visits, please mark the Registration form accordingly and details will be sent to you.

Registration Evening

Traditionally, registration for a BHR Group conference is on the evening before the conference or the first morning of the conference. For this event, the Committee has arranged an extra delight. Registration on Monday 26 September will take place at Stadscafe De Waag, a local bar/restaurant on the Market Square in the centre of historic Delft. Their full address is De Waag, Markt 11, 2611 GP Delft, Holland (tel: +15 213 0393; www.de-waag.nl). Delegates registering at De Waag on Monday evening will receive a voucher for a free drink at the bar. Why not begin the conference in a convivial atmosphere and meet fellow delegates over a glass of beer or wine?

Optional Medieval Dinner

On Tuesday night 27 September, there is an optional, informal dinner at a local medieval restaurant, Stadsherberg de Mol (www.stadsherbergdemol.nl). With an aperitif, a six-course banquet, unlimited local wine, beer and soft drinks, entertainment and the chance to participate in a Breughal experience, we think the evening will be both memorable and enjoyable. **The charge for this evening is €70 per person and reservations must be made on the Registration form.**

Conference Dinner

The Conference Dinner will take place in the Stadhuis, the City Hall of Delft. Delegates will be welcomed with a drinks reception followed by a buffet dinner. Additional partner tickets cost €75 (+ VAT @ 19%) each. Please fill in the Registration form if you wish to purchase extra tickets.

Exhibition Service

A table-top exhibition is planned alongside the Conference. The cost of each space is €1500 (+ VAT @ 19%) and includes:

- One exhibition space (exhibition boards or additional equipment must be provided by the exhibitor)
- 5 minute presentation to Conference Delegates
- Full address list of delegates after the Conference

And for 1 person:

- Attendance at all Technical Sessions
- Copy of the Proceedings and CD
- Lunch and refreshments daily
- Attendance at the Conference Dinner

Promotional Literature Service

There is an opportunity for companies to insert promotional literature in the delegate information packs at a cost of €600 (+VAT @ 17.5%). Material for insertion must be sent directly to BHR Group on or before 12 September 2005. A sample of literature must be sent when making your booking for this service.

Proceedings Publicity

Companies may also purchase a page of advertising in the book and CD version of the proceedings. The cost of each page is €600 (+ VAT @ 17.5%). The book is a bound volume, produced in Royal Octavo size. As well as being distributed to all attendees of the Conference, the proceedings and CD are sold worldwide after the event. Copy must reach the Conference Organiser by 25 July 2005 to meet the publishing deadline.

Proceedings & Publication

The papers from the Conference will be professionally published as a softbound volume, and will include a CD. They will be on sale from BHR Group once the Conference has closed. The proceedings are included as part of the delegate fee. To purchase additional copies, please contact Mrs Marian Rolfe at the BHR Group address, or by email at mrolfe@bhrgroup.com

A selection of the contributions on Research & Development will also be published in early 2006 in a special issue of Chemical Engineering Research & Design devoted to papers from this conference. More information on this can be obtained at www.icheme.org/journals.

OPCW sponsorship

The Organising Committee are delighted to announce that the Organisation for the Prohibition of Chemical Weapons (OPCW) has agreed to provide sponsorship for a limited number of delegates from developing countries or countries with economies in transition to attend the Conference. The OPCW's mission is to help promote the development and application of sustainable chemistry for peaceful purposes. It will consider applications from candidates who can demonstrate that their work/studies are relevant to the conference scope. Candidates who think they may be eligible for sponsorship should apply promptly in the first instance to Mrs Catriona Rolfe at BHR Group for further details.

Sponsoring Organisations

The conference is co-sponsored by: Delft Centre for Sustainable Industrial Processes – TU Delft, The Netherlands; Senter-Novem, The Netherlands; DSM, The Netherlands; EPSRC, UK; OPCW, The Netherlands; TNO, The Netherlands; Feyecon, The Netherlands; EFCE 660, NPT, The Netherlands; ECN, The Netherlands.

Full details of the sponsoring organisations will be available at the conference.

PROVISIONAL PROGRAMME

MONDAY 26 SEPTEMBER 2005

INTRODUCTORY WORKSHOP (half day)

Conference Registration – De Waag Restaurant, Delft

TUESDAY 27 SEPTEMBER 2005

Conference Registration – Aula Centre, Delft

PLENARY LECTURE:

New developments in thermo chemical conversion of biomass

Professor W van Swaaij, TU Twente, The Netherlands

SESSION A: GREEN CHEMISTRY

Chairman: *Professor P Jansens*

Breaking azeotrops efficiently by extractive distillation

Y A Beste, M Eggersmann, H Schoenmakers, BASF AG, Germany

Economical and ecological attractiveness of using ionic liquids as combined reaction and separation media

M C Kroon, C J Peters, R A Sheldon, J van Spronsen, G J Witkamp, Delft University of Technology, The Netherlands

SESSION B: INTENSIFIED EQUIPMENT AND PROCESSES

Chairman: *Professor E Drioli*

Design of a heat-integrated distillation column based on a plate-fin heat exchanger

J Hugill, Energy Research Centre of The Netherlands, The Netherlands

Heat transfer enhancement by thermomagnetic convection

W G Fruh, Heriot Watt University, UK

Ceramic catalytic plate heat exchanger for heterogeneously catalysed gas phase reactions

*C Schmitt, D W Agar, F Platte, S Turek, University of Dortmund, Germany;
B Pawlawski, Hermsdorfer Institute for Technical Ceramics, Germany;
M Duisberg, Umicore AG & Co, Germany*

SESSION C: INTEGRATED DESIGN FOR SUSTAINABLE PROCESSES

Chairman: *Dr H Schoenmakers*

Sustainable processing opportunities for the food industry

P de Jong, G Huijs, M Vissers, M Verschueren, R Verdumen, NIZO food research, The Netherlands

To integrate or not to integrate? A systematic method to identify benefits of integrated reaction and separation processes

S Tlatlik, H G Schembecker, Process Design Center BV, The Netherlands

Method for chemical route selection – a design tool for sustainable intensified processes

G Korevaar, G Jan Harmsen, Delft University of Technology, The Netherlands

SESSION D: POSTER PAPERS

SESSION E: INTENSIFIED EQUIPMENT AND PROCESSES

Chairman: *Dr R Jachuck*

Operation of an exothermic reaction in a continuous intensified reactor

*W Benaïssa, S Elgue, M Cabassud, N Gabas, Laboratoire de Genie Chimique, France;
D Carson, M Demissy, Ineris, France*

Hydrodynamic and mass transfer performance of modular catalytic structured packings

M Behrens, Z. Olujic, P J Jansens, TU Delft, The Netherlands

SESSION F: EXHIBITORS PRESENTATIONS

Chairman: *Mr A Muir*

Medieval Dinner – Stadsherberg de Mol, Delft

WEDNESDAY 28 SEPTEMBER 2005

PLENARY LECTURE:**Reactive and hybrid separations: modelling, applications and challenges***Professor A Gorak, University of Dortmund, Germany***SESSION G: GREEN CHEMISTRY***Chairman: Mr J Harmsen***Structured reactors for enzyme immobilization: application in a monolithic stirrer reactor***K M de Lathouder, J Bakker, F Katpeijn, S A Wallin, Delft University of Technology, The Netherlands***Process intensification: microwave-enhanced continuous solvent-free oxidation of alcohol***D K Selvaraj, P Leveson, R J J Jachuck, Clarkson University, USA***SESSION H: INTEGRATED DESIGN FOR SUSTAINABLE PROCESSES***Chairman: Professor G Casmatta***Sustainable biodiesel production by integrated process design***A Kiss, A C Dimian, G Rothenberg, University of Amsterdam, The Netherlands***Biodiesel intensifications options***R Jackson, A Green, BHR Group Limited, UK***Intensified integrated biomass gasification and power generation technology***G Akey, O F Calkan, M Dogru, University of Newcastle, UK; O K Salman, Ecoprotech Ltd, UK***SESSION I: INTENSIFIED LABORATORY***Chairman: Professor I Turunen***Hydrodynamics of liquid-liquid slug flow capillary microreactor***M N Kashid, D W Agar, University of Dortmund, Germany***Thermophoretic separation in microfluidics***P F Geelhoed, J Westerweel, Delft University of Technology, The Netherlands***SESSION I: INTENSIFIED****LABORATORY cont:****Mixing characterization and fast reactions in micro-drops***F Sarrazin, L Prat, G Casamatta, Laboratoire de Genie Chimique, France; C Gourdon, M Joanicot; Rhodia Laboratoire du Futur, France***SESSION J: POSTER PAPERS****SESSION K: INTENSIFIED EQUIPMENT AND PROCESSES***Chairman: Mr A Green***Performances evaluation of a new concept "open plate reactor" in non conventional experimental domain***L Prat, P Cognet, M Cabassud, C Gourdon, Laboratoire de Genie Chimique, France; S Elgue, F Chopard, Alfa Lavel Vicarb, France***A novel method to separate organic compounds through ultrasonic automization***S Nii, Nagoya University, Japan***Improved method for aerobic fermentation intensification***D J Groen, H J Noorman, A Stankiewicz, DSM, The Netherlands***Measurement & correlation of mass transport through zeolite membranes***J Kuhn, J Gross, P J Jansens, J C Jansen, Delft University, The Netherlands***Conference Civic Reception & Dinner – City Hall Delft**

THURSDAY 29 SEPTEMBER 2005

R Pohorecki (Scientific Vice-President of the EFCE, Warsaw University of Technology)

Opening Address on

Process Intensification within the European Federation of Chemical Engineering

**SESSION L: ENGINEERING FOR
GREEN CHEMISTRY**

Chairman: *Dr A Stankiewicz*

Experimental validation of membrane assisted fluidised bed reactor for H₂ production by steam reforming of CH₄
C S Patil, M Van Sint Annaland, J A Kuipers, University of Twente, The Netherlands

An exergetic analysis of membrane unit operations integrated in the ethylene production cycle

G Barbieri, P Bernardo, Research Institute on Membrane Technology, Italy; E Drioli, Department of Chemical Engineering and Materials, University of Calabria, Italy

A sustainable technology: eutectic freeze crystallization – from batch laboratory to continuous industry applications

F E Geneceli, R Gartner, D Trambitas, G J Witkamp, TU Delft, The Netherlands

SESSION M: MISCELLANEOUS

Chairman: *Dr H Hahn*

A systematic and efficient tool for the transition from the batch to the continuous process?

S Lomel, L Falk, J M Commenge, J L Houzelot, Laboratoire des Sciences du Genie Chimique, France; K Ramdani, Rhodia, Centre de Recherches de Lyon, France

Green chemicals: conversion of biomass to levulinic acid

B Girisuta, L P B M Janssen, H J Heeres, Stratingh Institute RijksUniversiteit Groningen, The Netherlands

Process intensification in a fermentation production process: a new direct fermentation route to an antibiotic intermediate

E J A X van de Sandt, DSM Anti-Infectives BV, The Netherlands

POSTER PRESENTATIONS

Photocatalytic mineralization of phenoxyacetic acid using concentrated solar radiation in slurry photoreactor

S Kamble, S B Sawant, V G Pangarkar, University of Mumbai, India

Concepts of nature in organic synthesis: cascade catalysis and multi-step conversions in concert

T Kieboom, Leiden University, The Netherlands

In-situ product recovery (ISPR) in bioconversions

J Walpot, TNO Environment, Energy and Process Innovation, The Netherlands

Conceptual process design fitting in a sustainable technological world

H H Kleizen, G J Harmsen, Delft University of Technology, The Netherlands

Supercritical carbon dioxide for the synthesis and environmentally benign production of aliphatic polycarbonates

M van Schilt, M Kemmere, J Keurentjes, Eindhoven University of Technology, The Netherlands

MINLP-optimization in the integration of reaction and separation processes

G Sand, S Barkmann, P Scherpien, M Tylko, S Engell, Universität Dortmund, Germany

Monitoring dispersed multiphase reactors for optimum process operation

J R van Ommen, J Nijenhuis, Delft University of Technology, The Netherlands

Application of acoustic cavitation in sustainable chemical processing

M M van Iersel, N E Benes, J T F Keurentjes, Eindhoven University of Technology, The Netherlands

Evaluation of a new concept of pulsed column applied to solid-liquid contacting

L Brunet, L Prat, G Casamatta, Laboratoire de Genie Chimique, France; P Carvin, Rhodia Recherche, France

Ionic liquid based integrated procedures for biocatalytic transformations

A Shariati, M C Kroon, C J Peters, G J Witkamp, R A Sheldon, Delft University of Technology, The Netherlands

Bioprocess intensification in flow through monolithic micro-bioreactors with immobilized bacteria or enzymes

G Akay, M Dogru, E Erhan, B Keskinler, Newcastle University, UK

Adsorptive separation of light olefin/paraffin mixtures

A Van Miltenburg, W Zhu, F Kapteijn, J A Moulijn, Delft University of Technology, The Netherlands

HIDiC versus vapor recompression – an irreversible thermodynamic and economic analysis

P Schmal, TU Delft, The Netherlands

Simulating viscous fluid flow in static mixers

M Shariati, D Brett, P Grabinski, A Sood, E Cheluget, Nova Chemicals Research Centre, Canada

The quest for intensified steam cracking process

M W M van Goethem, S Barendregt, J Grievink, M A Moulijn, P J T Verheijen, TU Delft, The Netherlands

Continuous production of biodiesel using intensified process technology

G Pherwani, P Leveson, R J J Jachuck, Clarkson University, USA

Measurement of turbulent mixing in an axis-symmetric oil-water jet of micro-droplets

R Delfos, R Kaijen, J Westerweel, Delft University of Technology, The Netherlands

Acknowledgements

We would like to thank the Organising Committee, the Scientific Committee, the panel of referees, the sponsors and cosponsoring organisations for their help and support.

Organising Committee

P J Jansens (*Chairman*)

A Green (*Co-Chairman*)

A Stankiewicz (*Co-Chairman*)

TU Delft, The Netherlands

BHR Group Limited, UK

DSM Research, The Netherlands, on behalf of
Process Intensification Network NL (Senter Novem)

Scientific Committee

Academic

A Renken (Lausanne, CH)

E Drioli (Calabria, IT)

M Moo-Young (Waterloo, Canada)

J A Moulijn (Delft, NL)

J Bertrand (Toulouse, FRA)

R Pohorecki (Warsaw, PL)

R Jachuck (Clarkson, USA)

C Ramshaw (Protensive, UK)

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C Zheng (Beijing, China)

G Akay (Newcastle, UK)

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About BHR Group

BHR Group is a leading centre of expertise in engineering with fluids, which has performed contract research, development and consultancy for international clients since 1947.

BHR Group has been active in the field of Process Intensification for over 15 years, and provides a range of services and products to help industry implement PI solutions. Its Fluid Mixing Processes (FMP) consortium, supported by most of the major chemical and pharmaceutical companies worldwide, provides its members with design data, guides and software for both batch and high intensity, inline mixing and reactor equipment. BHR Group has been instrumental in developing and promoting combined chemical reactor heat exchanger technologies, and more recently has developed the FlexReactor technology. Consultancy services range from PI audits and modelling to full process and plant design.

BHR Group transfers technology and information to a wide range of industries through Software, Publications, Technical Information Services, Conferences, Seminars, Specialist Training and the Process Technologies Post-Graduate Training Centre.

Visit us at: www.bhrgroup.com

Enquiries

Enquiries should be addressed to:

The Conference Organiser

E-mail: conforg2@bhrgroup.com

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Web: www.bhrgroup.com

Conference Fee

To ensure a place at the Conference, please complete and return the attached Registration Form together with appropriate payment.

The Conference Fee of €1,000 (+ VAT @ 19%) includes:

- Participation in all Technical Sessions on 27, 28 & 29 September 2005
- Bound book and CD of the Conference Proceedings
- Lunches and refreshments daily
- Attendance at Conference Dinner on 28 September
- Drink at Welcome Reception Stadscafe De Waag on 26 September

Discounted Rates

Early booking discount – A discount is offered on all bookings received **with payment** on or before 30 August 2005. This discount is not applicable to bookings for the Exhibition Service, Promotional Literature Service or Proceedings Publicity.

Presenting authors – Each presenting author is entitled to a discount of 25% on the conference fee.

Rising Stars – Recognising the need to foster young graduates, engineers and managers and to encourage their development and interaction with experienced technical managers, the organisers will offer full paying delegates the option of a second place at a discounted price of €500 (+ VAT @ 19%) specifically for a colleague under the age of 30. It is hoped that this will encourage companies to bring a member of their younger generation of technical leaders to the conference.

Students – There are a limited number of places for bona fide students at 50% of the full conference fee.

Please note:

Please quote **PI05** and the **name of the delegate and company** on all correspondence.

Methods of Payment

Full payment must accompany the registration form. Please submit one form for each delegate. Photocopies of a blank form may be used.

Please note that bookings for discounted fees must reach BHR Group by Tuesday 30th August. You will automatically be invoiced for the full fee if the card authorisation, cheque or bank transfer payment is not received at BHR Group by this date.

- **Credit card** payment details should be entered on the Registration Form by completing the appropriate boxes and signing the form.
- **Cheques** should be made payable to BHR Group Limited.
- **Bank transfers** should be paid to:
BANK OF SCOTLAND
c/o Beaulerc House
Reading
Berkshire RG1 4AR, UK

For Sterling payments:

Account number: 06003741
Bank sort code: 12 18 05
IBAN: GB51 BOFS 1218 0506 0037 41
SWIFT BIC: BOFSGB21378

For Euro payments:

Account number: 1683301
Bank sort code: 12 20 10
IBAN: GB40 BOFS 1220 1016 8330 01
SWIFT BIC: BOFSGB21EUL

For US dollar payments:

Account number: 16833USD01
Bank sort code number: 12 20 12
IBAN: GB47 BOFS 1220 12176 8331 01
SWIFT BIC: BOFSGB2LXXX

- **Sterling bank drafts** should be used by delegates wishing to attend from countries with currency restrictions.

Cancellations

Cancellation charges and refunds:

Before 16 August 2005	<i>Full refund</i>
17 August –	<i>£50 administration</i>
30 August 2005	<i>charge incurred</i>
After 30 August 2005	<i>No refund</i>

Substitutions may be made at any time.

INVOICE AND REGISTRATION FORM

SUSTAINABLE (Bio)CHEMICAL PROCESS TECHNOLOGY

Incorporating the 6th International Conference on

Process Intensification

Delft, The Netherlands: 27–29 September 2005

Your details

Please complete in block letters ticking appropriate boxes

Prof Dr Mr Mrs Miss Ms

Surname Forename

Position

Company

Company VAT number

Address

Post/Zip Code Country

Telephone Fax

Email

Signature Date

- I am unable to attend the conference but am interested in purchasing the Proceedings
- I am interested in participating in the site visit on Thursday 29 September
- I am interested in a Partner Programme

Return to:

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