

European Forum for Reciprocating Compressors



Special Topic 2005:
Hydrogen Compression

**4th EFRC-
Conference**

June 9th-10th, 2005

**Hotel Corinthia
Antwerp, Belgium**

Programme

Conference Goals

Exchange of Experience and Information

Manufacturing engineers and users of reciprocating compressors as well as scientists engaged in research shall be given the opportunity to report on their experience with such machines and to request solutions to problems of the concerned industry.

Improve the Image of Reciprocating Compressors

It shall be shown that reciprocating compressors meet all the requirements for modern machines and even offer expanded possibilities. Related Research & Development projects shall be presented, proposals for pre-competitive research can be made.

Conference Focus

The 4th EFRC-Conference concentrates on the fields of:

- Reliability and Economics of Compressors
- General Compression Systems
- Technologies for Reliability Increase
- **Special Topic 2005: Hydrogen Compression**

Subtopics

- Hydrogen for sustainable ground transportation - compression equipment in production, distribution and utilization of hydrogen
- Hydrogen compression in refining applications
- Condition monitoring of reciprocating compressors - user group meeting for the exchange of information
- Compressor upgrading and modernization



European Forum for Reciprocating Compressors

The European Forum for Reciprocating Compressors is an association with its seat in Dresden, Germany. The members are:

-  Ariel Corporation, USA
-  Ateliers Français, Belgium
-  BASF, Germany
-  Borsig ZM Compression, Germany
-  Peter Brotherhood Ltd Peter Brotherhood, UK
-  Burckhardt Compression Burckhardt Compression, Switzerland
-  HGC Hamburg Gas Consult, Germany
-  HOERBIGER Kompressortechnik Holding, Austria
-  Leobersdorfer Maschinenfabrik, Austria
-  Josef Mehrer, Germany
-  NEUMAN & ESSER, Germany
-  PROGNOT Systems, Germany
-  Technische Universität Dresden, Germany
-  Thomassen Compression Systems, The Netherlands
-  TNO Science & Industry, The Netherlands
-  Lehrstuhl für Verbrennungskraftmaschinen der RWTH Aachen, Germany

THURSDAY, June 9th

Room Margaux I

From Until

Room Margaux II

WELCOME ADDRESS BY EFRC

09:30 ↔ 09:35

WELCOME ADDRESS BY EFRC

Chairman: Prof. Gotthard Will

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KEYNOTE SPEECH

09:35 ↔ 10:00

KEYNOTE SPEECH

Coffee break & Exhibition

10:00 ↔ 10:30




Coffee break & Exhibition




HYDROGEN

Chairman: Hans Elferink

OPERATION & MAINTENANCE

Chairman: Heinrich Ochs

-  **Upgrading Hydrogen Booster Compressors at the BP Grangemouth Hydrocracker Complex** 10:30 ↔ 11:00
J.B. Jones, J. Campbell; BP Grangemouth Refinery
-  **Hydrogen Compression in Refining, Petrochemical and Chemical Applications** 11:05 ↔ 11:35
J. Khor Chooi Beng; BASF Petronas Chemicals Sdn Bhd
-  **Service Life Improvement of Piston Rod Sealing Systems by Means of Pressure-Balanced Sealing Elements** 11:40 ↔ 12:10
N. Feistel; Burckhardt Compression

- Large Reciprocating Compressors on the Glas Dowl FPSO: Concept Selection and Design Considerations** 
J. de Roos; Bluewater Energy Services A. Eijk; TNO Science & Industry
- Technical Improvement of Hyper Compressor in LDPE Plant** 
J. Bojan, St. Dragan; HIP-Petrohemija
- The Use of Stepless Capacity Control to Determine the Root Cause of Hydrogen Compressor Failure** 
P. Melvin G. Woodier; Shell UK, Stanlow Manufacturing Complex

Lunch break & Exhibition

12:10 ↔ 13:40

Lunch break & Exhibition

FUNDAMENTALS

Chairman: René Peters

OPERATION & MAINTENANCE

Chairman: Jerry Jones

-  **CFD Simulation of the Two Phase Pulsating Flow in the Reciprocating Compressor Installation** 13:40 ↔ 14:10
P. Cyklis, K. Ryszard; University Politechnika Krakowska
-  **Innovative Simulation Methods for Piston Compressors** 14:15 ↔ 14:45
Th. Steidten, Prof. St. Pischinger; VKA - Technical University of Aachen M. Hopp; FEV Motorentchnik
-  **Fundamental Research on Tribology of PTFE Wear Parts Opens Windows of Opportunity for Improved Materials** 14:50 ↔ 15:20
A. Dittmann, B. Spiegl, P. Steinrück; HOERBIGER Ventilwerke

- Free Floating Piston™ - A Technology to Prevent Rider Ring Wear** 
L. Koop; Thomassen Compression Systems
- Construction Unit Damage and Corrosion Attack at CO₂ Reciprocating Compressors** 
J.Th. Titz, H. Ochs; BASF
- Detection of Concealed Damages in Early Stages on Reciprocating Machinery** 
E. Drewes; Prognost Systems

Coffee break & Exhibition

15:20 ↔ 15:50

Coffee break & Exhibition



INNOVATION & TECHNOLOGY

Chairman: Klaus Hoff

OPERATION & MAINTENANCE

Chairman: Siegmund Cierniak

-  **Solutions Developed to Meet Very Stringent Requirements for an Offshore Application of a Reciprocating Compressor System** 15:50 ↔ 16:20
H. Elferink; Thomassen Compression Systems, A. Eijk; TNO
-  **Advanced Monitoring and Diagnostic System of Reciprocating Compressors** 16:25 ↔ 16:55
E. Giacomelli, E. Calamai; Natascia Monachino; GE Energy
-  **Analysis of Torsional Vibrations in Reciprocating Compressors driven by Electric Motors and Gas Engines** 17:00 ↔ 17:30
A. Laschet; ARLA Maschinentechnik

- Increased Reliability and Extended Service Intervals in an Ethylene Oxide Plant** 
M. Seedorf, U. Bartsch; Sasol Germany
- An Old Product Still Fresh: Exchange of Crankcases on a 325 bar "CO-Einheitsverdichter"** 
B. Wagner; NEAC Compressor Service, H. Ochs, H. Zachmann; BASF
- Noise Reduction at a NAM Compressor Station** 
H. Korst; TNO Science & Industry W. Brocatus; Nederlandse Aardolie Maatschappij

Closing remarks by Klaus Hoff

17:30 ↔ 17:35

Closing remarks by Siegmund Cierniak

Exhibition

17:35 ↔ 18:30

Exhibition

Departure for Dinner

19:00

Departure for Dinner

FRIDAY, June 10th

Room Margaux I

JOINT RESEARCH AT EFRC

Peter Steinrück


EDUCATION AT EFRC

Siegmund Cierniak

Coffee break & Exhibition

EFRC RESEARCH

Chairman: Georg Samland

 **Thermodynamic Simulation of Reciprocating Compressors to Enable Diagnostics Based on Measured Temperatures and Pressures**

*M. Huschenbett, Prof. G. Will;
Technical University of Dresden*

 **Valve Dynamics and Internal Waves in a Reciprocating Compressor**

H. Steinrück, R. Aigner, G. Meyer; Institute of Fluid Mechanics and Heat Transfer - Technical University of Vienna

 **Effect of Pulsations on Separator Efficiency**

G. Alberts, St. Belfroid; TNO Science & Industry


Lunch break & Exhibition

SELECTION & SIZING

Chairman: Prof. Stefan Pischinger

 **Automatic Strength Calculation of Pistons for Reciprocating Compressors**

K. Hoff, P. Houba, G. Knop, F. Ohler, E. Steinbusch; NEUMAN & ESSER

 **Operating History of Moderate-Speed API 618 Compressors in Refinery Service**

G.M. Kopschick; ARIEL Corporation

Coffee break & Exhibition

FUNDAMENTALS

Chairman: Leonhard Keller

 **Computational and Experimental Study of a Ring Plate Compressor Valve**

*R. Habing; University of Twente
J. Bolle, J. Smeulers; TNO Science & Industry*

 **Reciprocating Compressor Valve Plate Life and Performance Analysis**

*K. Brun, J. Platt, T. Smalley;
Southwest Research Institute, BP Company*

Closing remarks by Leonhard Keller

End of 4th EFRC Conference

From Until

09:00 ↔ 09:20

09:20 ↔ 09:45

09:45 ↔ 10:15

10:15 ↔ 10:45

10:50 ↔ 11:20

11:25 ↔ 11:55

11:55 ↔ 13:30

13:30 ↔ 14:00

14:05 ↔ 14:35

14:35 ↔ 14:55

14:55 ↔ 15:25

15:30 ↔ 16:00

16:00

16:10

Room Margaux II

JOINT RESEARCH AT EFRC

Peter Steinrück

EDUCATION AT EFRC

Siegmund Cierniak


Coffee break & Exhibition

OPERATION & MAINTENANCE


Chairman: Eike Drewes

Modification of a Reciprocating Compressor due to Process Changes in the TOTAL Refinery in Spergau/Germany 

*St. Gast; Borsig ZM Compression
P.M. Rainer, TRM Total Raffinerie Mitteldeutschland*

Oilwiper Packings - Case Histories After 5 Years of Market Experience 

*Ch. Bäuerlein; BASF
Ch. Radcliffe; HOERBIGER Ventilwerke*

Pulsation Study for Two 2250 bar Hyper Compressors - Measurement, Theory, Measures 

*A. Brümmer; KÖTTER Consulting Engineers
E. Riebe; DOW Leuna*


Lunch break & Exhibition

SELECTION & SIZING

Chairman: Ernst Huttar

Development of a New Gas Compressor - Design of a Crankshaft and Strength Test by Means of FEM 

G. Braun; Josef Mehrer Maschinenfabrik

Repair, Revamp or Replace Natural Gas Compressors for Underground Storage 

*S. Cierniak; HGC Hamburg Gas Consult
Th. Knebel; VNG Verbundnetz Gas*


Coffee break & Exhibition

SELECTION & SIZING

Chairman: Peter Steinrück

Sizing and Optimisation of Compressors and Accessories in LDPE Plants and Validation by Measurements 

*C. Krockner, A. Allenspach; Burckhardt Compression
J. van Veen, Bert Egas; TNO Science & Industry*

Economical Pipe Stress Analysis by Using of Design Standards 

V. Kacani, E. Huttar, Leobersdorfer Maschinenfabrik

Closing remarks by Peter Steinrück

End of 4th EFRC Conference

Authors, lecturers and session chairmen from:**ARIEL Corporation, Mt. Vernon, Ohio, USA:** *George M. Kopscick***ARLA Maschinentechnik GmbH, Wipperfürth, Germany:***Dr.-Ing. Andreas Laschet***BASF AG, Ludwigshafen, Germany:** *Christine Bäuerlein,**Heinrich Ochs, Dr. Jörg Thomas Titz, Harry Zachmann,***BASF Petronas Chemicals Sdn Bhd, Kuantan, Malaysia:***Jeffrey Khor Chooi Beng***Bluewater Energy Services B.V., Hoofddorp, The Netherlands:***Jan de Roos***Borsig ZM Compression GmbH, Zwickau, Germany:** *Steffen Gast***BP Grangemouth Refinery, Scotland:** *James Campbell, Jerry B. Jones***Peter Brotherhood Ltd., Peterborough, UK:** *Tony Murphy***Burckhardt Compression AG, Winterthur, Switzerland:***Andreas Allenspach, Dr. Norbert Feistel, Dr. Carsten Krockner,***DOW Olefinverbund GmbH, Leuna, Germany:** *Eckhard Riebe***FEV Motorentechnik GmbH, Aachen, Germany:** *Dr.-Ing. Martin Hopp***GE Energy, Florence, Italy:** *Enzo Giacomelli, Enrico Calamai,**Natascia Monachino***HGC Hamburg Gas Consult GmbH, Germany:***Dr.-Ing. Siegmund Cierniak***HIP-Petrohemija, Pancevo, Serbia and Montenegro:***Janjic Bojan, Stojakov Dragan***HOERBIGER Ventilwerke GmbH, Vienna, Austria:** *Andreas Dittmann,**Dr. Chris Radcliffe, Dr. Bernhard Spiegl, Dr. Peter Steinrück***KÖTTER Consulting Engineers, Rheine, Germany:***Dr.-Ing. Andreas Brümmer***Leobersdorfer Maschinenfabrik AG, Leobersdorf, Austria:***Dr.-Ing. Ernst Huttar, Dr. Vasillaq Kacani***Josef Mehrer GmbH & Co Maschinenfabrik, Balingen, Germany:***Georg Braun***NEAC Compressor Service GmbH & Co KG, Übach-Palenberg,****Germany:** *Bernd Wagner***Nederlandse Aardolie Maatschappij B.V., Assen, The Netherlands:***Willem Brocatus***NEUMAN & ESSER GmbH & Co KG, Übach-Palenberg, Germany:***Dr.-Ing. Klaus Hoff, Peter Houba, Gerhard Knop, Frank Ohler,**Egidius Steinbusch***Politechnika Krakowska, Krakow, Poland:** *Piotr Cyklis, Kantor Ryszard***PROGNOST Systems GmbH, Rheine, Germany:** *Eike Drewes***Sasol Germany GmbH, Marl:** *Ulrich Bartsch, Dr. Michael Seedorf***Shell UK, Stanlow Manufacturing Complex, Ellesmere Port, UK:***Paul Melvin, Gary Woodier***Southwest Research Institute, BP Company, San Antonio, TX, USA:***Klaus Brun, Ph.D., John Platt, Tony Smalley, Ph.D.,***Technical University of Aachen, Lehrstuhl für Verbrennungskraft-****maschinen (VKA):** *Prof. Dr.-Ing. Stefan Pischinger, Thomas Steidten***Technical University of Dresden, Germany:***Matthias Huschenbett, Prof. Dr.-Ing. habil Gotthard Will***Technical University of Vienna, Institute of Fluid Mechanics and****Heat Transfer, Austria:** *Roland Aigner, Georg Meyer, Herbert Steinrück***Thomassen Compression Systems B.V., Rheden, The Netherlands:***Hans Elferink, Lau Koop***TNO Science & Industry, Delft, The Netherlands:***Garrelt Alberts, Stefan Belfroid, Jeroen Bolle, Bert Egas, André Eijk,**Harry Korst, Dr. René Peters, Jan Smeulders, Jan van Veen***TRM Total Raffinerie Mitteldeutschland GmbH, Spergau, Germany:***Peter Michael Rainer***University of Twente, Enschede, The Netherlands:***Remco Habing***VNG Verbundnetz Gas AG, Leipzig, Germany:** *Thomas Knebel***Conference: €850,- incl. 21% VAT**

The conference fee includes conference proceedings (binder), 2 buffet lunches, all conference beverages and the conference dinner on June 9th, 2005.

Hotel accomodation: €99,- night incl. VAT

Includes accommodation in Corinthia Antwerp Hotel in single (€99,-) or double room (€112,-) within the limited amount of rooms, incl. breakfast buffet.

Accompanying person: €95,- each incl. VAT

For private persons only, no conference participation, no proceedings, including breakfast buffet and conference dinner on June 9th, 2005.

Promotion:**Exhibition : €450,- incl. VAT**

Exhibition space of 2x3 m (without booth equipment).

The person named for the exhibition must register to the EFRC conference.

Advertisement in the conference binder:

The advertising rates are:

1/1 page 4C	€1,500,- incl. VAT
1/2 page 4C	€1,000,- incl. VAT
1/1 page b/w	€1,000,- incl. VAT
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If you are interested in one of these promotion offers we are happy to send you more information.

**Peter Huber
Member Task Force EFRC
Conference Organisation
c/o Burckhardt Compression AG**

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 CH-8404 Winterthur, Switzerland
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Registration also possible via Internet:

www.arcaneo.com/metron/forms/EFRC.form

Registration form European Forum for Reciprocating Compressors

**4th EFRC-Conference
June 9th-10th, 2005 Antwerp**

In CAPITAL LETTERS, please
(one form per registration only)

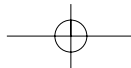
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 I am a lecturer at EUR 50,- (incl. VAT)
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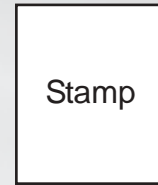
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