



European Forum for Reciprocating Compressors

***The Recip – a State of the Art
Compressor***

November 4th and 5th, 1999

**Hotel Westin Bellevue
Dresden, Germany**

Conference Programme



The Forum

Background

The increasing demand for economic operation of plants has led to a critical discussion of the equipment as to selection, design, maintenance and automation. The well known advantages of the reciprocating compressor – high efficiency in most different operating conditions, comparatively easy regulation possibilities, fit for light gases, high compression ratios and many more – have led to a renaissance of this type of machinery. Nevertheless there are still many reservations concerning the relatively complex mechanic design and the prejudice that reciprocating compressors cause high maintenance costs and that they are not reliable enough.

Up to now specifications and standards prescribed in tenders for reciprocating compressors have been mostly based on US American recommendations like API 618 or NACE, sometimes resulting in unsuitable and unnecessary high priced executions. This is due to the fact that there are still no pertinent European regulations.

Exchange of information and experience

It is an essential goal of the symposium to create a forum where scientists and engineers engaged in the development of reciprocating compressors are given the opportunity to present the state of the art, to show that the mentioned prejudices can be overcome by progress in engineering and the possibilities how they can be overcome. Trends in design and operation of reciprocating compressors shall be presented and a „forum of ideas“ shall provide the opportunity to spread new ideas and/or to realise them.

The users in their turn can take the opportunity to report on their experience with such machines and to request the solution of problems of the industry concerned.

Improve the image of reciprocating compressors

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



Improved Specifications and Standards

The forum shall also give place to constructive criticism concerning the internationally used US standards. The aim should be to provide an interpretation and improvement of the above regulations adapting them to modern experience and specific European needs. Proposals based on scientific knowledge or practical experience shall be presented and subsequently be integrated into the international usage concerning tenders and final inspection.

European Forum for Reciprocating Compressors

The European Forum for Reciprocating Compressors will be organised by an Association bearing the same name which consists of the following founding members:

- TU Dresden – Institut f. Pumpen u. Verdichter, Germany
- TNO Delft – Institute of Applied Physics, Netherlands
- Leobersdorfer Maschinenfabrik AG, Austria
- Neuman und Esser GmbH & Co.KG, Germany
- Sulzer Burckhard Engineering Works Ltd., Switzerland
- Thomassen International B.V., Netherlands
- Wärtsilä Compression Systems GmbH, Germany
- Hoerbiger Ventilwerke GmbH, Austria

People or companies interested are invited to become members of the association. Details are to be found in the homepage of the association:

<http://www.recip.org>



Thursday, November 4th, 1999

REGISTRATION 8:00 h – 10.00 h in the Foyer
--

Room Bellevue I

SESSION 1: APPLICATIONS Chairman: Prof. G. Will/Technical University Dresden

10.00 – 10.15	Welcome Address by the Session Chairman
10.15 – 10.45	S. Cierniak / Wärtsilä, <u>G. Lampe</u> / KBB: Utilisation of Reciprocating Compressors in Natural Gas Underground Storage Applications
10.45 – 11.25	Coffee Break & SmallTalk
11.25 – 11.55	W.C. Wirz / Dresser-Rand: VIP - Compressor - a New Technology of Compression Systems develop more Applications
11.55 – 12.25	H. Kaiser / Bock: Refrigerating Compressor for Reciprocating Design – Compressors for High-Pressure Refrigerants

12.25 – 13.55	Lunch Break with Buffet Lunch
---------------	-------------------------------

SESSION 3: WEAR Chairman: Prof. H.-J. Kleinert/Technical University Dresden
--

13:55 – 14.25	G. Vetter / Universität Erlangen: Tribological Phenomena with Dry-Running Seal Elements of Reciprocating Compressors
14.25 – 14.55	E.Wissink, H.Vermeer, G.Bon, H.v.d.Linden/Grasso: A Systematic Approach to solve Intermediate Bearing Wear Problems in a Heavy Duty Industrial Refrigeration Compressor
14.55 – 15.40	Coffee Break & SmallTalk
15.40 – 16.10	W. Weil / Garlock: Monitoring of Rider Ring Wear with the Piston Clearance Monitor System
16.10 – 16.40	H.-J. Kleinert, <u>G. Will</u> / TU Dresden: Estimate of Seal Ring Wear and the Effects on the Operating Parameters of a Reciprocating Compressor
16.40 – 17.00	Closing Words by the Session Chairman

19 – ca. 22 h	Dinner
---------------	--------

Thursday, November 4th, 1999

REGISTRATION
8:00 h – 10.00 h in the Foyer

Room Bellevue III

SESSION 2: COMPONENTS
Chairman: **L. E. Keller/Sulzer-Burckhardt**

10.00 – 10.15	Welcome Address by the Session Chairman
10.15 – 10.45	J. Nickol / Neuman&Esser, H. Hefele / BASF: New Cylinder for CO High Pressure 700 bar in Shrunk Execution
10.45 – 11.25	Coffee Break & SmallTalk
11.25 – 11.55	C. Radcliffe / Hoerbiger Rings & Packings: Development of a New "Oil Tight" – OT, Oil Wiper Packing
11.55 – 12.25	E. Wissink, H. Vermeer, H. v. d. Linden / Grasso: Modern Valves in Reciprocating Compressors for Industrial Refrigeration

12.25 – 13.55 Lunch Break with Buffet Lunch

SESSION 4: VIBRATIONS AND PULSATIONS
Chairman: **Prof. L. Böswirth**

13:55 – 14.25	<u>E. Huttar</u> , V. Kacani, H. Stibi / LMF: Torsional Vibrations in Reciprocating Compressor Systems
14.25 – 14.55	<u>A. Eijk</u> / TNO; L. Blodget / Southwest Res. Inst.: Improvements and Extensions on the API 618 Related to Pulsation and Mechanical Response Studies
14.55 – 15.40	Coffee Break & SmallTalk
15.40 – 16.10	P. Harrell, <u>T. Smalley</u> / Southwest Research Inst.: Integrity of Reciprocating Compressor Crankshafts and Foundations
16.10 – 16.40	<u>H. Stehr</u> , V. Werth / TU Dresden: Simulation System PURO 98 – Pulsation Flows in Fluidic Networks
16.40 – 17.00	Closing Words by the Session Chairman

19 – ca. 22 h Dinner

Friday, November 5th, 1999

Room Bellevue I

SESSION 5: OPERATION AND AVAILABILITY (1)

Chairman: Prof. G. Vetter/University of Erlangen

09.00 – 09.10	Welcome Address by the Session Chairman
09.10 – 09.40	J. Lenz / Kötter Beratende Ingenieure: Diagnostic Methods for Condition Monitoring of Reciprocating Compressors
09.40 – 10.10	J. Nickol / Neuman&Esser: Reciprocating Compressors in Process Plants – 24 000 Operating Hours of Availability; Utopia or Reality?
10.10 – 11.10	Coffee Break & SmallTalk
11.10 – 11.40	P. Steinrück / Hoerbiger Ventilwerke: How to improve Reliability of Compressor Valves for Hydrogen Applications
11.40 – 12.10	I. Mackenzie / Peter Brotherhood: Availability, Reliability and Maintainability

12.10 – 13.40	Lunch Break with Buffet Lunch
---------------	-------------------------------

SESSION 7: OPERATION AND AVAILABILITY (2)

Chairman: W. Bauer/Leobersdorfer Maschinenfabrik

13.40 – 14.10	<u>U. Adolph</u> , W.E. Kraus / TU Dresden: Reciprocating Compressors in Refrigeration Engineering and ist Current Reliability Problems
14.10 – 14.40	P. Steinrück / Hoerbiger Ventilwerke: Mechatronics in Compressor Valves – Operating Experience
14.40 – 15.00	Closing Words by the Session Chairman

15.00	End of Conference
-------	-------------------

Friday, November 5th, 1999

Room Bellevue III

SESSION 6: SIMULATION AND DESIGN Chairman: T. Smalley/Southwest Research Institute	
09.00 – 09.10	Welcome Address by the Session Chairman
09.10 – 09.40	D. Ninkovic / Sulzer-Burckhardt: The Effects of considering Unsteady Real Gas Flow in a Reciprocating Compressor Plant Model upon the Accuracy of Performance Prediction
09.40 – 10.10	<u>R. Harris</u> , Ch. Gehri / Southwest Research Inst.: Technology for the Design and Evaluation of High-Speed Reciprocating Compressor Installations
10.10 – 11.10	Coffee Break & SmallTalk
11.10 – 11.40	B.S. Khroustalev; A.G. Krasnikov / University of St. Petersburg: Modeling of Non-stable Processes of the Parameters Change of the Real Gas in Suction Systems of a Piston-Type Compressor
11.40 – 12.10	M. Deramchi / DEWCO: Design of Compressors - Design of Components

12.10 – 13.40	Lunch Break with Buffet Lunch
---------------	-------------------------------

SESSION 8: NEW CONCEPTS Chairman: Prof. K. Heinrichs/WTZ Roßlau	
13.40 – 14.10	R. Schutter / Thomassen: Free Floating Piston™ :A technology to Prevent Rider Ring Wear
14.10 – 14.40	<u>P. Heyl</u> , M. Kühne / TU Dresden: Combined Expansion-Compression-Machine for Carbon Dioxide in Free-Piston Construction
14.40 – 15.00	Closing Words by the Session Chairman
15.00	End of Conference

Conference languages: English and German

Lectures will be given in either of the two languages, simultaneous translation into the other language will be provided. The documentation will contain the presentation in the original language. Abstracts will be published in both languages.

Session Chairmen and Lecturers:

Adolph, Ulrich, Dr. Ing. – Technical University (TU) Dresden, Germany
Bauer, Walter R., Dipl. Ing. - Leobersdorfer Maschinenfabrik AG, Leobersdorf, Austria
Blodget, L. - Southwest Research Institute, San Antonio, Texas, USA
Bon, George - Grasso Products B.V., s'Hertogenbosch, Netherlands
Böswirth, Leopold, Prof. Dr. techn. i.R., Mödling, Austria
Cierniak, Siegmund, Dr. Ing. - Wärtsilä Compression Systems GmbH, Berlin, Germany
Deramchi, Maamar - DEWCO, Paris, France
Eijk, Andre - TNO Delft, Flow and Structural Dynamics (PULSIM), Netherlands
Gehri, Christine - Southwest Research Institute, San Antonio, Texas, USA
Harell, Pete - Southwest Research Institute, San Antonio, Texas, USA
Harris, Ralph PhD - Southwest Research Institute, San Antonio, Texas, USA
Hefele, Heinz, Dipl. Ing. (FH) - BASF Ludwigshafen, Ludwigshafen, Germany
Heinrichs, Klaus, Prof. Dr. Ing. habil. - Wissenschaftlich-Technisches Zentrum für Motoren- und Maschinenforschung Roßlau GmbH, Roßlau, Germany
Heyl, Peter - Institut für Energiemaschinen und Maschinenlabor, TU Dresden, Germany
Huttar, Ernst, Dr. techn. - Leobersdorfer Maschinenfabrik AG, Leobersdorf, Austria
Kacani, Vasillaq, Dr. techn. - Leobersdorfer Maschinenfabrik AG, Leobersdorf, Austria
Kaiser, Harald, Dr. - Bock GmbH & Co. Kältemaschinenfabrik, Frickenhausen, Germany
Keller, Leonhard E., Dr. - Sulzer-Burckhardt Engineering Works Ltd., Winterthur, Switzerland
Khroustalev, Boris, Prof. S. Ph.D. - St. Petersburg State Technical University, Russia
Kleinert, Hans-Joachim (em.), Prof. Dr.Ing. - TU Dresden, Institut f. Maschinenwesen, Germany
Krasnikov, Andrei G. - St. Petersburg State Technical University, Russia
Kraus, Wolf Eberhard, Dr.Ing. - Inst. f. Energiemaschinen u. Maschinenlabor, TU Dresden, Germany
Kühne, Maik, Dipl.-Ing. - Inst. f. Energiemaschinen u. Maschinenlabor, TU Dresden, Germany
Lampe, Günter, Dipl. Ing. - Kavernen Bau- und Betriebs-GmbH, Hannover, Germany
Lenz, Johann, Dr. Ing. - Kötter Consulting Engineers GmbH, Rheine, Germany
Mackenzie, Ian - Peter Brotherhood, Peterborough, Great Britain
Nickol, Johannes, OBERINGENIEUR Dr. Ing. - Neuman & Esser Maschinenfabrik, Übach-Palenberg, Germany
Ninkovic, Dobrovoje, Dr. - Sulzer-Burckhardt Engineering Works Ltd., Winterthur, Switzerland
Radcliffe, Chris, Dr. - Hoerbiger Rings & Packings Ltd., Bradford, Great Britain
Schutter, Rene - Thomassen Compression Systems, Rheden, Netherlands
Smalley, Tony - Southwest Research Institute, San Antonio, Texas, USA
Stehr, Hermann, Prof. Dr. Ing. habil.- Inst. f. Grundlagen d. Elektrotechnik, TU Dresden, Germany
Steinrück, Peter, Dr. techn. - Hoerbiger Ventilwerke GmbH, Wien, Austria
Stibi, Hans, Dr. techn. - Leobersdorfer Maschinenfabrik AG, Leobersdorf, Austria
Van der Linden, Henk - Grasso Products B.V., s'Hertogenbosch, Netherlands
Vermeer, Hans - Grasso Products B.V., s'Hertogenbosch, Netherlands
Vetter, Gerhard, Prof. Dipl. Ing. - Lehrstuhl für Apparatechnik und Chemiemaschinenbau, Institut für Verfahrenstechnik, Universität Erlangen-Nürnberg, Germany
Vissers, Hans - Grasso Products B.V., s'Hertogenbosch, Netherlands
Weil, Wolfgang - Garlock France, Groß-Gerau, Germany
Werth, Volkmar - Institut für Grundlagen der Elektrotechnik, TU Dresden, Germany
Will, Gotthard, Prof. Dr. Ing. - TU Dresden, Institut für Maschinenwesen, Germany
Wirz, William, C. - Dresser-Rand Company, New York, USA
Wissink, Edo - Grasso Products B.V., s'Hertogenbosch, Netherlands

Organising Committee

Vorsitz: Dr. Peter Steinrück, Manager R&D, Hoerbiger Ventilwerke GmbH
Konferenzsekretär: Johannes Wunderlich, Marketing Manager, Hoerbiger Ventilwerke GmbH
Prof. Dr. Gotthard Will - TU Dresden – Institut für Pumpen und Verdichter
Dr. Sigmund Cierniak, Vice President, Wärtsilä Compression Systems GmbH
Dr. Leonhard Keller, Vice President Engineering, Sulzer Burckhardt Ltd.
Dr. Johannes Nickol, Manager R&D, Neuman und Esser GmbH & Co.KG

Fees:

Conference

Registration until September 6th, 1999:

€ 500,- (DEM 978,-) excl. VAT.

Later registration:

€ 575,- (DEM 1.125,-) excl. VAT.

The conference fee includes conference papers, lunch buffet, conference beverages and the conference dinner on November 4th, 1999.

Arrangement 1: Conference + 1 night in Hotel Bellevue

The arrangement includes conference fee (incl. conference papers, lunch buffet, conference beverages and conference dinner November 4th, 1999) and accommodation in Hotel Westin Bellevue (***) in single or double bed room from **Nov 4th to 5th, 1999**. Rooms have been reserved at special conference conditions. Hotel fees include breakfast buffet and the use of fitness center, sauna and swimming pool.

Arrangement 2: Conference + 2 nights in Hotel Bellevue

The arrangement includes conference fee (incl. conference papers, lunch buffet, conference beverages and conference dinner November 4th, 1999) and accommodation in Hotel Westin Bellevue (***) in single or double bed room from **Nov 3th to 5th, 1999**. Rooms have been reserved at special conference conditions. Hotel fees include breakfast buffet and the use of fitness center, sauna and swimming pool.

Registration until September 6th, 1999:

Arrangement 1

Arrangement 2

Single w. river view: **€ 628,-** (DEM 1.228,-) **€ 756,-** (DEM 1.478,-)

Single w.o. river view: **€ 618,-** (DEM 1.208,-) **€ 735,-** (DEM 1.438,-)

Double w.river view: **€ 656,-** (DEM 1.283,-) **€ 812,-** (DEM 1.588,-)

Double w.o.river view **€ 646,-** (DEM 1.263,-) **€ 792,-** (DEM 1.548,-)

Later registration:

Additional handling fee per arrangement:

€ 90,- (DEM 175,-) excl. VAT.

CONFERENCE FEE FOR STUDENTS

€ 50,- (DEM 98,-) excl. VAT

All fees are exclusive taxes and duties!

20 % VAT have to be applied!

Payment:

We kindly ask you to effect payment at the moment of registration. You will be sent a confirmation upon receipt of the registration. Please indicate your name and the code „EFRC“ with payment.

For bank transfer:

Schoeller Bank (Vienna), **Account No. 61511 6050 54**,
Bank code number: **19200**.
Account holder: NÖL-Tours, Vienna, Austria.
Please mark your payment with „EFRC“.
Banking charges are at the expense of the payer.

Credit cards:

We accept Visa, Mastercard, Diners Club or American Express

Cancellation:

Cancellation can only be accepted in writing.

Conditions for cancellation

Up to Sept. 21st, 1999: repayment of 50% of the fee

Up to October 1st, 1999: repayment of 30% of the fee

Cancellation after Oct.1st, 1999: no repayment.

For registration please cut off the last page and send the form duly filled in and signed per mail to:

EFRC - Conference Secretary

Mr. Johannes Wunderlich

c/o

Hoerbiger Ventilwerke GmbH

Braunhubergasse 23

A-1110 Wien

Tel.: +43 1 74 004 151

Fax: +43 1 74 98 285

E-Mail: wu@hvw.hoerbiger.com

by

September 6th, 1999

Registration also possible via Internet

Homepage: <http://www.recip.org>

Conference Registration Form
European Forum for Reciprocating Compressors
November 4th and 5th, 1999 **Dresden**

In capital letters please
(one form per registration only)

Title: _____
Surname: _____
First name: _____
Company: _____
Address: _____
City Code: _____
City: _____
Country: _____
Phone: _____
Telefax: _____
E-Mail: _____

Please mark with a cross:

Position

- | | |
|--|---|
| <input type="checkbox"/> Plant Manager | <input type="checkbox"/> Plant Supervisor |
| <input type="checkbox"/> Engineer | <input type="checkbox"/> R&D Engineer |
| <input type="checkbox"/> Maintenance Manager | <input type="checkbox"/> Process Engineer |
| <input type="checkbox"/> Rotating Equipment Engineer | <input type="checkbox"/> Process Engineer |
| <input type="checkbox"/> Scientist | |
| <input type="checkbox"/> Others _____ | |

Industry

- | | |
|--|--|
| <input type="checkbox"/> Petrochemical Industry | <input type="checkbox"/> Refinery |
| <input type="checkbox"/> Chemical Industry | <input type="checkbox"/> CHP Plants |
| <input type="checkbox"/> Compressor Manufacturer | <input type="checkbox"/> Engineering Company |
| <input type="checkbox"/> Component Manufacturer | <input type="checkbox"/> R&D Organisation |
| <input type="checkbox"/> University | |
| <input type="checkbox"/> Gas Exploitation , Gas Transport, Gas Storage | |
| <input type="checkbox"/> others _____ | |





I want to register for: (please tick)

- Conference „European Forum f. Reciprocating Compressors“**
- Arrangement 1 (Conference + 1 night in conference hotel)**
- Arrangement 2 (Conference + 2 nights in conference hotel)**

Please tick : **Arrangement 1** **Arrangement 2**

- | | | |
|----------------------------|--------------------------|--------------------------|
| Single with river view: | <input type="checkbox"/> | <input type="checkbox"/> |
| Single without river view: | <input type="checkbox"/> | <input type="checkbox"/> |
| Double with river view: | <input type="checkbox"/> | <input type="checkbox"/> |
| Double without river view: | <input type="checkbox"/> | <input type="checkbox"/> |

- STUDENT (please send copy of identification card)**

- Payment by bank transfer**

Schoeller Bank (ViennaAccount no. 61511 6050 54, Code: "EFRC",
Account holder: NÖL-Tours; Banking charges are at the expense of the
Registered person.

- Payment by credit card:**

Visa Mastercard Diners American Express

Credit card holder: _____

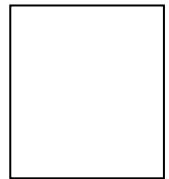
Credit card no.: _____

Valid from: _____ to: _____

Signature: _____

I accept the registration conditions:

Signature: _____



Konferenzsekretariat c/o
Hrn. Johannes Wunderlich
Hoerbiger Ventilwerke GmbH
Braunhubergasse 23
A-1110 Wien
Austria