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Introduction to the EFRC Workshop 2010

René Peters

TNO

Science and Industry

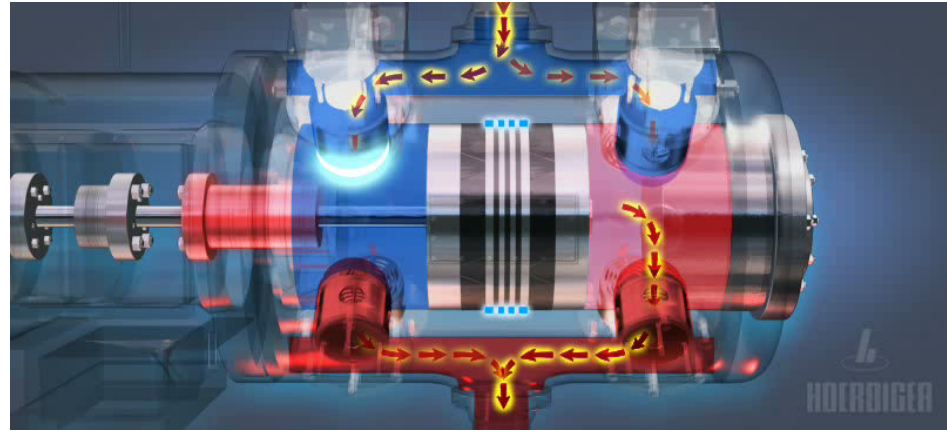


**EUROPEAN
FORUM
for
RECIPROCATING
COMPRESSORS**

20 October 2010

Overview

- *European Forum for Reciprocating Compressors*
- *History*
- *Aim*
- *Board*
- *Members*
- *EFRC conference 2010*
- *Working groups and activities*
 - *student promotion*
 - *pre-competitive R&D*
 - *standardization*
 - *knowledge exchange*
- *EFRC training on challenging environments*



Courtesy Hoerbiger



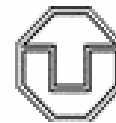
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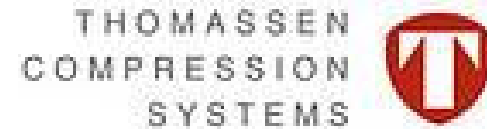
History

EFRC has been founded in 1999 by:

- NEA
- LMF
- Hoerbiger
- TNO
- TU Dresden
- Thomassen Compression Systems
- Wartsila Compression Systems
- Burckhardt Compression



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**Burckhardt
Compression**



- *To serve as a platform to facilitate exchange of information between vendors, operators and scientists working in the field of reciprocating compressors.*



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Aim of the EFRC

- 1. Knowledge transfer
 - Conferences
 - Internet
 - Workshops
 - Training and seminars
- 2. Perform joint research
 - Pre-competitive
 - Aiming at improving the performance of the recip
- 3. Improving the image of the reciprocating compressor
 - Student workshops
 - Field surveys



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EFRC board

- *President: Dr. Siegmund Ciernack*
– *RWE Energy AG*
- *Secretary: Dr. Peter Steinrück,*
– *Hoerbiger Kompressortechnik Holding GmbH*
- *Treasurer: Dr. Leonhard Keller,*
– *Burckhardt Compression AG*
- *Secretary support: Gudrun Heidenreich*
– *TU Dresden*



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Current Members

- 32 members
- 14 manufacturers
- 3 operators
- 1 packager
- 10 component suppliers
- 3 technology institutes
- 1 media representative



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Working groups and activities

- Pre-competitive R&D
 - Georg Samland – Burckhardt Compression
 - Initiate and fund R&D projects sponsored by members
- Standardisation
 - Peter Duineveld – Thomassen
 - Work on improvement of API 618 and ISO 13707 standards
- Student promotion
 - Siegmund Ciernack – RWE
 - Organise bi-annual student workshop
- Marketing and EFRC conference
 - Martina Frenz - NEA
 - Organise bi-annual EFRC conference
 - Maintain website www.recip.org



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Student promotion

- *Site visit OEM's and operations with recipis for international students*
- *Participation from many EU countries*
- *Presentations by EFRC members*
- *Excursions to production sites*
- *Exercise for students (incl. award!)*



- *2002 Benelux and Germany*
- *2004 Poland*
- *2006 Italy and Switzerland*
- *2008 Austria*
- *2010 United Kingdom*



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EFRC conference

- *International conference on reciprocating compressor development and operation.*
 - *Strong international participation*
 - *Papers by OEM's, operators and suppliers*
 - *Training seminar for young engineers*
-
- *1999 Dresden*
 - *2001 The Hague*
 - *2003 Vienna*
 - *2005 Antwerp*
 - *2007 Prague*
 - *2008 Dusseldorf: International Rotating Equipment Conference*



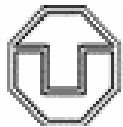
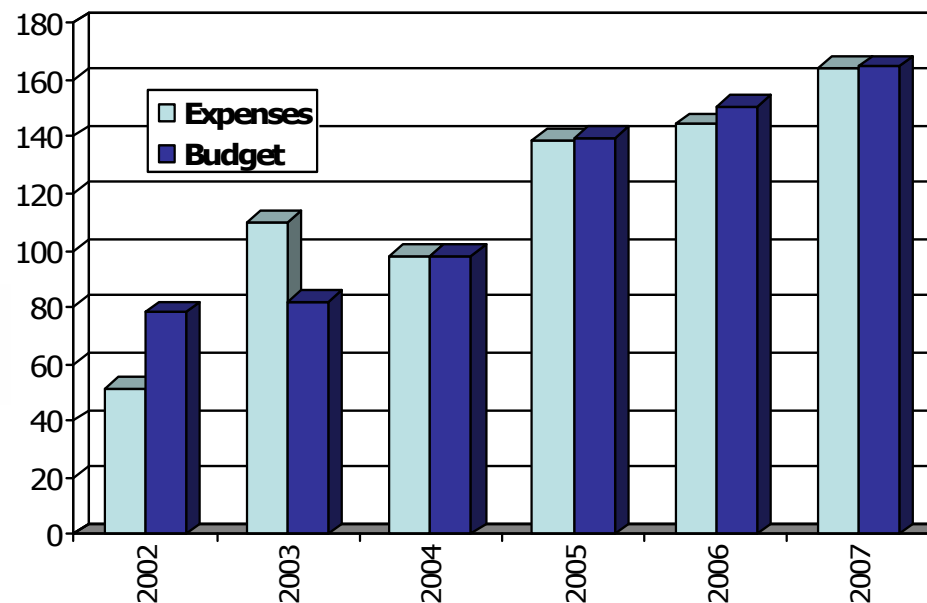
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EFRC Joint Research

- *Combining forces of EFRC members to solve / investigate problems which are beyond the scope of a single player*
- *Basic research and precompetitive research carried out at research institutes or universities*
- *Scientific arm of the reciprocating compressor community*

R&D Budget in kEUR



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The EFRC Research Group

- *Open to all EFRC members*
- *Annual budget funded by participating members*
- *Selection of ideas*
- *Approval of projects*
- *Projects are executed by research partners*
- *Project controlling*
- *Results are owned by EFRC*
- *Research results are disclosed to EFRC research group members only*



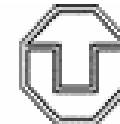
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Pre-competitive R&D Projects

Example projects:

- TNO - Characterization of Pulsation Damper Devices
- TNO - Separator Efficiency in Pulsating Flow
- TNO - Effect of Solid Particles on Compressor Operation
- TU Dresden – Model Based Diagnostics
- TU Dresden – Effect of Valve Leakage on Rod Load
- TNO – Allowable Flange Loads due to Misalignment
- RWTH Aachen – Hydrogen Compression for Refueling
- TNO / VKA – Noise Generation in Reciprocating Compressors
- TU Vienna – In Cylinder Flow, Pulsations & Heat Transfer
- TU Dresden – A new method for Piston Cooling
- TNO – EFRC Guideline on Allowable Vibration levels



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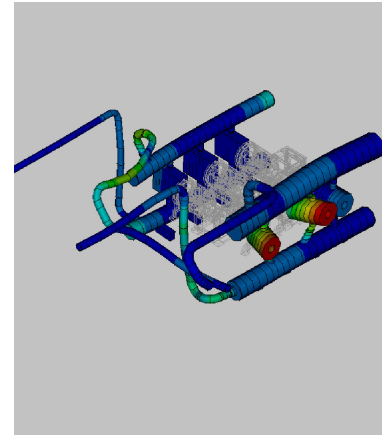
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Example project: Allowable Vibration levels

- Motivation:
 - Vibrations are an important design criteria for installations
 - Existing standards are considered to be not specific
- Result:
 - EFRC Guideline on vibrations
 - Working towards ISO standard
- Approach:
 - Literature search
 - Interviews with stakeholders
 - International Workshop
 - Report



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What are challenging environments?

- Liquids and solids in the gas stream
 - Droplets in the gas stream
 - Polymerised particles
 - Sand or dust particles
- Extreme environments, HPHT
 - High pressure, cryogenic conditions
- Aggressive and corrosive gasses (H_2S , CO_2)
 - Extreme corrosion
 - Interaction with sealing materials



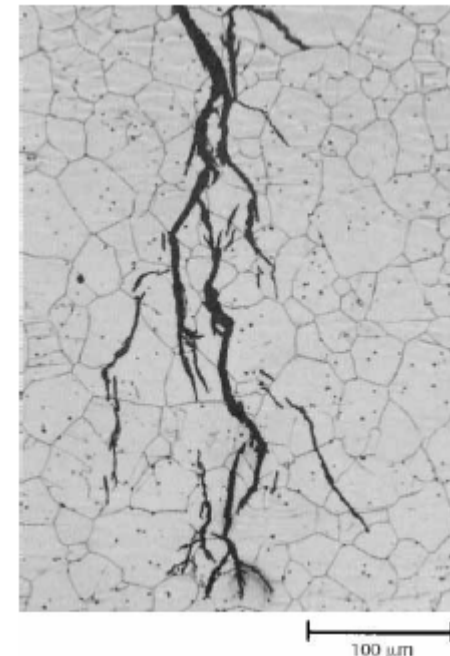
Particles in the gas stream

Result:
Clogging or failure of valves



Aggressive components

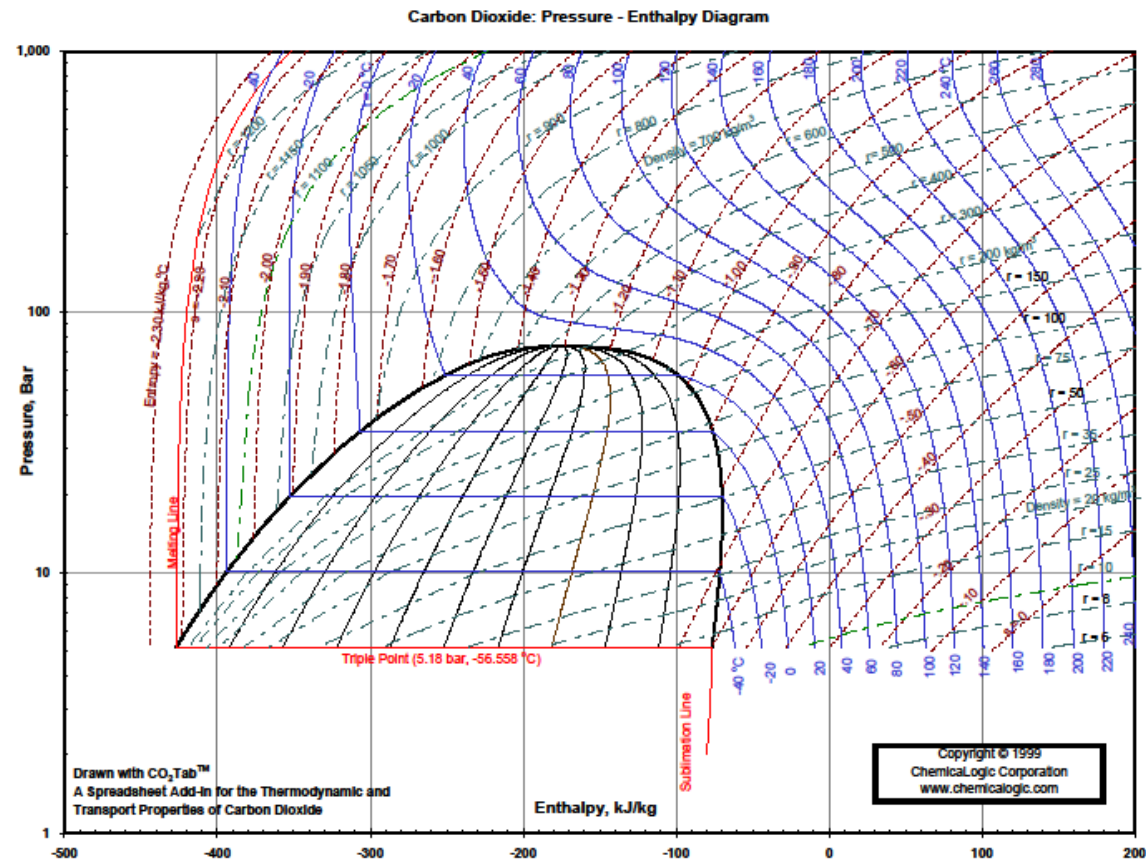
- Increasing sour gas production worldwide
- H_2S leading to Sulfide Stress Corrosion
- CO_2 interaction with sealing elements
- H_2 embrittlement
- Chlorides causing SCC



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Extreme process conditions

- Supercritical conditions of CO₂, ethylene



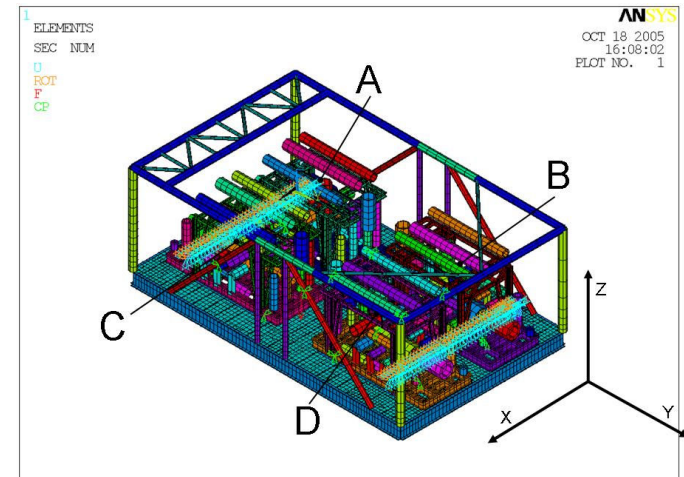
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Dynamic environments

Floating production systems

- FPSO
 - Oil production
- FLNG
 - LNG liquefaction
- FSRU
 - LNG regassification



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EFRC training session on challenging environments

- 13.00 Introduction to the program – René Peters
- 13.15 Corrosion components in the gas stream – Peter Duineveld
- 13.45 Impact of liquids and dynamic phenomena – Leonard van Lier
- 14.15 Valve selection and design under harsh conditions – Gunther Machu
- 15.00 Coffee break
- 15.15 Impact on seals and packings – Marc Langela
- 15.45 High pressure compression and design – Luzi Valaer
- 16.15 Condition monitoring to protect the machine – Tobias Ahlert
- 16.45 Summary and conclusions
- 17.00 Closing



Please respect



NO SMOKING

throughout the event!



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Please switch off your



Mobile

during the session!



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Thank you for your interest

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- Or visit www.recip.org for more information about EFRC



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