Presentation Title

TITANIUM PLATE HEAT EXCHANGERS IN INDUSTRIAL PROCESSES

Abstract of U. Fehlauer’s presentation

Ulrich Fehlauer will introduce GEA Group AG and its spectrum of products, that includes its global Plate Heat Exchanger (PHE) business first. Secondly he will provide a comprehensive general overview of the global market of PHE, in specific gasketed and welded types of PHE. He will of course focus on the role the titanium industry plays in the support and continued growth of the titanium PHE business. Space will be given to the industrial applications in particular to the marine- and petrochemical- application where titanium is the preferred material when it comes to seawater-cooling. The presentation will have an actual and future approach and will end with a message to the titanium industry.
Titanium Plate Heat Exchangers in Industrial Processes

GEA Group AG
-GEA PHE Systems –
-Ulrich Fehlauer-
Agenda

- Introduction to GEA
- Global market for PHE
- Which industrial applications need Titanium
- Why Titanium for PHE?
- Actual and future aspects
- Message to the Titanium industry
- Questions & Answers
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GEA Group AG – 88 years of engineering excellence

1920 - Founding of GEA Luftkühler GmbH by Otto Happel Senior

1989 - Reorganization of GEA as a joint stock company GEA AG

1999 - Integration of GEA AG into MG Technologies AG

2005 - Change to GEA Group AG
What GEA stands for

- **GEA** stands for **G**lobal **E**ngineering **A**lliance

- GEA Group is a leading global technology group with over 250 operating companies in roughly 50 countries

- Our core competences are specialty mechanical engineering and plant engineering

- We are one of the world's market and technology leaders in 90 per cent of our business
GEA Group AG - some facts & figures of 2007

Employees: 19,560
Bookings: 8,981 m$
GEA Group AG – fields of business

- Thermal Engineering
- Process Engineering
- Farm Technologies
- Pharma Systems
- Emission Control
- Process Equipment
- Air Treatment
- Refrigeration
- Mechanical Separation
### GEA Process Equipment Division – fields of business

<table>
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<tr>
<th>Plate Heat Exchangers</th>
<th>Flow Components</th>
<th>Industrial Heat Exchangers</th>
<th>Homogenizers</th>
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<tr>
<td><img src="image1.png" alt="Plate Heat Exchangers" /></td>
<td><img src="image2.png" alt="Flow Components" /></td>
<td><img src="image3.png" alt="Industrial Heat Exchangers" /></td>
<td><img src="image4.png" alt="Homogenizers" /></td>
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GEA PHE Systems – Competence in Heat Transfer
From GEA Ecoflex to GEA PHE Systems...

1995  **GEA Ecoflex GmbH** was founded out of GEA Ahlborn GmbH to be responsible for **gasketed** plate heat exchangers (GPHE) within GEA Group

1995  TAU Energy Products AB, Landskrona/S was bought, to become 1999 **GEA Ecobraze AB**, responsible for **brazed** plate heat exchangers (BPHE).

2002  Acquisition of **welded** plate heat exchangers (WPHE) from **Balcke Dürr**

2004  Acquisition of **WTT GmbH**, Nobitz/D one of the world leading manufacturer of brazed PHE

2005  Acquisition of **Hydroweld/S** and its **30,000 t** press for gasketed PHE and of **FlatPlate Inc, York/PA.**, the US leading manufacturer of brazed PHE

2006  Acquisition of **WCR Europe**, leading group of **AS & S**-comp. in D; NL; B; S

2008  Acquisition of **ViEX Inc**, Toronto/CA one of the leading manufacturer of bloc-type WPHE
and from a 15 Mio $ single company… to a…
... state of the art production facilities, like in York/PA...
or GEA ViEX in Toronto/Canada
and to over > 500 Mio $ of Plate Heat Exchanger Business
more than 60% of our products are younger than 4 years
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PHE market 2008 spread over Regions

The Americas
- USA (biggest single market)
- Canada
- Brasil

800 Mio. US$

Europe/Africa
- „old“ Europe
- „new“ Europe
- Russia
- Africa

1,320 Mio. US$

Asia/Pacific
- India
- China
- Korea (Shipbuilding)
- Middle East (Oil & Gas)

1,850 Mio. US$

Total 3,970 Mio. US$

Source: Frost & Sullivan 2003
GIA 2007
GEA Ecoflex 2008
PHE market 2008 spread over applications

Source: Frost & Sullivan 2003
GIA 2007
GEA Ecoflex 2008

Total PHE market: 3,970 mio $ estim.
Orders placed even for Sales in 2011/2012
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Applications with highest Titanium content

Total PHE market: 3,970 mio $ estim.
thereof with TI : 1,120 mio $ ca. 30%
equalling t of TI : > 11,500

Source: Frost & Sullivan 2003
GIA 2007
GEA Ecoflex 2008
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Physical limits of different heat exchanger types

- **Gasketed Plate Heat Exchanger** (G)
- **Welded Plate Heat Exchanger** (W)
- **Brazed Plate Heat Exchanger** (B)

### Axes
- **Pressure Resistance (bar)**
- **Temperature Resistance (Celsius)**

**Legend:**
- Shell & Tube Heat Exchanger
- 180°C to 720°C
- 25 bar to 100 bar
Common nominator for all types of PHE
WPHE - A brief introduction
Distribution of the Global Heat Exchanger Market

- Shell & Tube Heat Exchanger
- Plate Heat Exchanger
- Other HE
  (Spiral, Compact, Air Cooler, etc.)
PHE vs S&T: Advantages through technologies
Advantages of PHEs vs. S&T

- Maintenance Time
- Fouling Coefficient
- Manufacturing Cost
- Installation Space
- Operating Weight
- Required Transfer Area
- Liquid Volume

S&T vs PHE Comparison: 
- Maintenance Time: PHE significantly lower.
- Fouling Coefficient: PHE shows higher effectiveness.
- Manufacturing Cost: PHE is more cost-effective.
- Installation Space: PHE requires less space.
- Operating Weight: PHE has lower weight.
- Required Transfer Area: PHE is more efficient.
- Liquid Volume: PHE uses less volume.
Summary

PHE have big, general advantages compared to S & T

Titanium PHEs have corrosion advantages even over standard SS
  ➢ much longer lifetime

Titanium PHEs have weight advantages
  ➢ more cargo per ship
  ➢ less space in buildings/lighter constructions
  ➢ less transportation cost to site for Titanium PHE

Titanium PHEs have
  ➢ long successful history
  ➢ well introduced and preferred material when it comes to seawater cooling
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Global, Annual Sea Trade (mio. tons)

Source: Lloyds Register of Shipping, 2008
PHE Marine development from 2002 to 2011
PHE Chemical, Gas & Oil development from 2002 to 2011
PHE Power development from 2002 to 2011
GEA PHE Power development from 2002 to 2011
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PHE market is a strong growing market in itself and by challenging S&T markets

PHE market is much less volatile than several other markets for Titanium

**GEA wants to secure a stable growth for their PHE-business and GEA likes to grow together with you**

Titanium can stay the future material for PHE with immense potential of growth if Titanium supply is secured for PHE

PHE industry tested alternative materials to Titanium when supply was not secured in the past. Several installations have proven reasonable lifetime-results. With drastic falling prices for nickel based alloy materials Marine-, Chemical- and Gas & Oil-industries are prepared to choose alternative materials when both quantity and quality of Titanium supply can not be secured.
Forward-looking statements are based on our current assumptions and forecasts. These statements naturally entail risks and uncertainties, which may cause the actual results of operations, financial position or performance to diverge significantly from the estimates given here. Factors that could cause such a divergence include changes in the economic and business environment, fluctuations in exchange rates and interest rates, launches of competing products, poor acceptance of new products or services, and changes in business strategy. We are under no obligation to update forward-looking statements.
Thank you, for your attention!