The European Titanium Market Overview & Outlook

André Hempel

Hempel Special Metals
Agenda:

European business environment

Aerospace market in Europe

Industrial market overview

New Emerging markets for Titanium?

Summary & outlook
The European Market – expert’s perception of economic climate is “weak”

Basis: 274 economic experts, in cooperation ifo-Institute, Germany and icc, France
Expectations for the upcoming six months are considerably less confident

→ further growth in EU but at a lower level

Basis: 274 economic experts, in cooperation ifo-Institute, Germany and icc, France
Agenda:

European business environment

Aerospace market in Europe

Industrial market overview

New Emerging markets for Titanium?

Summary & outlook
Titanium demand of Airbus (I)

**Airbus Situation**

Airbus Order Portfolio as of 07/01/11 vs. one year before

<table>
<thead>
<tr>
<th>No. of aircrafts</th>
<th>2010 (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A318, A319, A320, A321</td>
<td>2,834 (+27%)</td>
</tr>
<tr>
<td>A330, A340, A350</td>
<td>915 (+/-0%)</td>
</tr>
<tr>
<td>A380</td>
<td>185 (-9%)</td>
</tr>
<tr>
<td>Order backlog aircraft</td>
<td>3,934</td>
</tr>
<tr>
<td>More than 5 years</td>
<td></td>
</tr>
</tbody>
</table>

Total titanium demand: ~ 92,000 MT (+85%)

Ti-Material spent 2010 = 275 million USD (incl. Fastener, Forgings, Castings)

50 % Airbus (35 %)/ EADS (15 %) directly

50 % indirectly (Tier I and Sub-Tiers)

Source: Airbus, June 2011
Titanium demand of Airbus (II)

Need for increasing production rate – still a long way to cover total demand

Source: Airbus, programme update, issue no. 80, May 2011
Titanium demand of Airbus (III)

Titanium buy-weight per aircraft and total order number makes A350 the driver for future Titanium consumption in the Airbus Group

MaterialMix
A350 XWB

Composite 53%
Titanium 14%
Al/AlLi 19%
Misc. 8%
Steel 6%

Source: Airbus, June 2011
Titanium demand of Airbus (IV)

Titanium demand actual and expected for Airbus family 2010 - 2014

Source: Airbus June 2011
Agenda:

European business environment

Aerospace market in Europe

Industrial market overview

New Emerging markets for Titanium?

Summary & outlook
European Titanium consumption is highly depending on plant engineering, purchasing and construction for the global market.

Examples:
- Chemical Industry
- Energy Market
- LNG Market
- Off-shore drilling
- Seawater desalination

Split of the Value Added in a typical large engineered and constructed plant.
EU chemical production:

sector outlook weakening and capacity utilisation well below pre-2008 levels

no significant new production capacities in EU needed in 2011 & 2012

Chemical Industry – high demand for new investments in Asia!

2008
EUR 1,700 billion

25%
38%
21%
6%

2020
EUR 2,400 billion

46%
18%
19%
6%

+4,5-5.0% p.a.

Asia Pacific
South America
North America
Rest of world
Western Europe

Source: Cefic Chemdata International
Trend in Chemical Industry:
Investments in Asia are less expensive and faster to completion

<table>
<thead>
<tr>
<th>Type of plant</th>
<th>Average investment</th>
<th>Average time to finish project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USD/KW, USD/MT, USD millions/kbpd</td>
<td>Month</td>
</tr>
<tr>
<td>Coal-fired power plant</td>
<td>Asia: 500 - 1,000</td>
<td>30 - 36</td>
</tr>
<tr>
<td></td>
<td>Developed market: 1,450</td>
<td>45 - 60</td>
</tr>
<tr>
<td>Petroleum refinery</td>
<td>Asia: 8 - 15</td>
<td>30 - 48</td>
</tr>
<tr>
<td></td>
<td>Developed market: 18 - 20</td>
<td>54 - 60</td>
</tr>
<tr>
<td>Steel plant</td>
<td>Asia: 500 - 600</td>
<td>14 - 18</td>
</tr>
<tr>
<td></td>
<td>Developed market: 700 - 850</td>
<td>30 - 36</td>
</tr>
<tr>
<td>Cement plant</td>
<td>Asia: 80 - 100</td>
<td>12 - 24</td>
</tr>
<tr>
<td></td>
<td>Developed market: 200 - 225</td>
<td>24 - 30</td>
</tr>
</tbody>
</table>

EPC-Business – strong movement to the new Asian competitors in plant engineering for large entities

Global Market Volume, 2006
Ca. 200 bil. €

- ROW 15%
- Western Europe 25%
- China 3%
- Japan 15%
- Germany 20%
- USA 22%

Global Market Volume, 2010
Ca. 250 bil. €

- ROW 10%
- Western Europe 22%
- China 8%
- Japan 10%
- S-Corea 12%
- Germany 18%
- USA 20%

Source: VDMA, cit. Air Liquide, Francois Venet, 1st Engineering Summit July 11, Munich
Strong global demand for energy – regional differences in growth rates

➔ Titanium for e.g. steam turbine blades, heat exchangers

<table>
<thead>
<tr>
<th>Global energy production</th>
<th>EU 27</th>
<th>China</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 in 1.000 TWh</td>
<td>21.0</td>
<td>4.0</td>
<td>1.0</td>
</tr>
<tr>
<td>2030 in 1.000 TWh</td>
<td>36.7</td>
<td>9.0</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Source: Siemens, Hauenschild, VDMA engineering summit, July 2011, Munich
Titanium demand for liquified natural gas (LNG) – a further growing market

LNG trade is expected to increase significantly

World gas consumption:
- 2009 = 2940 billion m³
- 2030 = 4275 billion m³

LNG in 2009 = 8% of gas cons.
LNG in 2030 = 25% of gas cons.

Titanium demand for LNG:
- LNG plant: 250 to
- LNG tanker: 20 to

Source: Siemens, High Performance Tube, TK VDM
Titanium in offshore – challenges still to come

Requirements for deep water:

- High mechanical strength
- Specific corrosion resistance
- Special physical properties

Used Ti-grades:
- Ti 6-2-4-6
- Ti 6-6-2
- Ti 6-4
- CP

Source: [http://newenergyandfuel.com; IHS Energy](http://newenergyandfuel.com)
Titanium is a superior material for medical implants, but not a volume driver

Europe counts for 42% of global consumption of dental implants; Growth of Ti dental implants is from today approx. 0.5 bn US$ to be expected to 0.7 bn US$ in 2012

European market for orthopaedic implants is expected to be approx. 3.8 bn US$ in 2012

Steady increase in demand is expected through the next years

Plus Orthopedics GmbH; Aesculap GmbH; www.dl-s.de/bilder/bildimplantatok.jpg
http://www.researchandmarkets.com/reports/358936/orthopaedic_implants_markets_i... 28.07.2011
**Agenda:**

- European business environment
- Aerospace market in Europe
- Industrial market overview
- Any emerging markets for Titanium?
- Summary & outlook
Titanium might be an interesting material for geothermal energy plants

Ti-tubulars for geothermal production
(courtesy Chevron)

Valle Secolo/ Italy geothermal plant by Enel GreenPower

Direct Use Worldwide

<table>
<thead>
<tr>
<th>Year</th>
<th>GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>2000</td>
</tr>
<tr>
<td>2000</td>
<td>60000</td>
</tr>
<tr>
<td>2005</td>
<td>120000</td>
</tr>
<tr>
<td>2010</td>
<td>140000</td>
</tr>
</tbody>
</table>
Some demand might be driven by landbased military vehicles - Boxer

Units: 272 (D); 200 (NL)
Duration of program ca. 10 years
Ti-Consumption: ca. 750 MT

Source: artec 2011, deisenroth, 2010
Another example is the 'Puma' 

Units: 405 (D)
2012 - 2020
Ti-consumption
Agenda:

European business environment

Aerospace market in Europe

Industrial market overview

New Emerging markets for Titanium?

Summary & outlook
## Summary & Outlook for 2012

<table>
<thead>
<tr>
<th>Industry</th>
<th>Trend</th>
<th>Chance</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace</td>
<td></td>
<td>High order portfolio</td>
<td>Substitution tendency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Carbon Fibre a/c</td>
<td>Still production problems with A350/B787</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High growth in traffic</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>High growth in Asia</td>
<td>Substitution tendency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Megatrend material</td>
<td>No growth in EU/USA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increasing availability</td>
<td>Economic downturn in ’12</td>
</tr>
<tr>
<td>Medical</td>
<td></td>
<td>New growing target groups in Asia</td>
<td>Economic downturn in ’12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accidents within trend</td>
<td>Budget restrictions in health care in Europe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sports in Europe</td>
<td></td>
</tr>
<tr>
<td>Emerging markets</td>
<td></td>
<td>Military programs ongoing with Ti</td>
<td>Budget restrictions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No new application</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Small volumes per application</td>
</tr>
</tbody>
</table>
You can help to increase the consumption:

Invest in a Titanium Fassade

Thank you for your kind attention!
All statements as to the properties or utilization of the materials and products mentioned in this presentation are for the purpose of description only.

Guarantees in respect of the existence of certain properties or utilization of the material mentioned are only valid if agreed upon in writing.