The European Titanium Market
Chances and Risks

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*Special thanks to the research team of The University of Applied Sciences Anhalt
The European Market – economic climate for an upswing still positive, .....
…but the actual situation and the expectations are not as bright as it seems!

Further growth in EU but at a slower pace
The Aerospace market in Europe -Titanium demand of Airbus (I)

Airbus Order Portfolio as of 07/01/10

<table>
<thead>
<tr>
<th>No. of aircrafts</th>
<th>Count</th>
</tr>
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<tbody>
<tr>
<td>A318, A319, A320, A321:</td>
<td>2,237</td>
</tr>
<tr>
<td>A330, A340, A350:</td>
<td>914</td>
</tr>
<tr>
<td>A380:</td>
<td>204</td>
</tr>
<tr>
<td>Order backlog aircraft:</td>
<td>3,355</td>
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<td>More than 5 years</td>
<td></td>
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Total titanium demand: ~ 50,000 MT

Ti-Material spent 2009 = 225 Millions USD (incl. Fasteners, Forgings, Castings)

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

50 % indirectly (Tier I and Sub-Tiers)

Source: Airbus, June 2010
Titanium demand of Airbus (II)

Negative impact on the build rate caused by the economic crisis

Source: Airbus, June 2010
Titanium demand of Airbus (III)

Titanium semifinished product demand per aircraft (fly-away-weight)

Material Mix
A350 XWB

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

Source: Airbus, June 2010
Titanium demand of Airbus (IV)

Titanium demand expected for Airbus family 2010 - 2014

New delays A350 due to economical crisis and technical difficulties

Source: Airbus June 2010, Les Echos/Welt 27.08.10, own calculation
EU chemical production: sector outlook

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
<tr>
<td>Consumer Chemicals</td>
<td>-1.9</td>
<td>-6.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Specialty Chemicals</td>
<td>-3.8</td>
<td>-9.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>-4.6</td>
<td>-10.6</td>
<td>6.0</td>
</tr>
<tr>
<td>Chemicals</td>
<td>-4.5</td>
<td>-12.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Polymers</td>
<td>-5.5</td>
<td>-19.7</td>
<td>5.3</td>
</tr>
<tr>
<td>Basic Inorganics</td>
<td>-6.6</td>
<td>-20.1</td>
<td>5.0</td>
</tr>
</tbody>
</table>

→ no significant new capacities needed in 2010 & 2011

KPMG Report: The Future of the European Chemical Industry
Chemical Industry – high demand for new investments in Asia = chance for EU fabricators

Source: Cefic Chemdata International
Titanium demand for LNG facilities

LNG trade is expected to increase significantly

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

- **LNG in 2009** = 8 %
- **LNG in 2030** = 25 %

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

Source: Siemens, High Performance Tube, TK VDM
Titanium demand for liquefied natural gas LNG – Risks -

New pipeline projects, from 2011 – 2014, making EU less dependent on gas supply from Middle East, but strengthening dependence from CIS countries

In the United States approx. 60 trillion m$^3$ of natural gas found as unconventional gas resources = 100 years of current US demand can be covered

Offshore drilling – despite the BP disaster…..
…the hunger for energy justifies new challenges in oil exploration

Environments are becoming:

- Deeper
- Harsher
- More corrosive

(due to H2S, salinity, pressure and temperature)

We need challenging materials to withstand the demanding conditions!

Source: http://www.infield.com/fixed_platform_market_reports.htm// US Dep. of Interior
Seawater desalination

Growing population is the driver for new desalination plants

Contracted desal plants by technology

- Reverse Osmosis technology
  - = no Titanium necessary!

- Multi-Stage Flash & Multi-Effect Distillation
  - = 70 – 400 to Titanium per unit

Increasing importance of RO technology is a risk for future Titanium consumption in desalination

Source: GWI DesalDate/own interviews/research, based on 2008
Riding a winning horse – Growing together with the renewable energy market

- **Solar Power**: Reaches almost 280 TWh in 2030, up from just 4 TWh in 2007
- **Wind Power**: Projected to reach 4.5% of total electricity generation in 2030 worldwide, compared with less than 1% in 2007
- **Biomass/Biofuel**: Increases from 259 TWh in 2007 to 840 TWh in 2030
- **Geothermal Energy**: 16 GW until 2020
Worldwide Development of Windenergy 1995 - 2009

World’s Top 5 countries: installed power 2009

- USA
- D
- CNA
- E
- IND

source: BWE
Offshore wind energy – the new challenge

- 828 wind turbine in the EU in 2009
- 38 wind parks in the EU in 2009
- Total capacity of 2056 MWp

Further 100 GWp projects are in the planning process
Further 4,200 wind mills are planned

- Mounting in a depth of 20 - 50 metres (example Germany)
- Fundament and mounting are exposed to wind, salty water, wave sand tides (esp. splash zone)
- Titanium will/can be used as: anodes, fasteners, bolts, protection of welding zones
Geothermal Energy

- Drilling depth: 2,000 – 4,000 metres
- Quarried water temperature: > 300 °C
- Water pipe and components characteristics:
  - high corrosion resistance (Cl-, H₂S)
  - high temperature resistance

Emerging markets especially in countries having volcanic active zones, e.g.:
- El Salvador, Kenya, Island, USA/CA, Nicaragua, Philippines, Costa Rica

- Construction est. volume until 2030: € 25 bn
- 56 geothermal plants are planned until 2020 (each with a volume of 5 GW)

Source: Deutsche Bank Research
Summary & Outlook for 2011 (I)

Aerospace Market:

Titanium still not back on track. Lower build rates than previously expected, still high stock levels and substitution leaving Titanium aerospace market unsatisfactory.

Industrial Market:

Global recovery expected but still not at the same level as 2007. Shrinking/substituted market segments have to be compensated by new opportunities.
Summary & Outlook for 2011 (II)

Capacities and Supply

New and large capacities have been built up worldwide for the expected ramp up of B787, A380, A350 & Co.

New Chinese capacities in sponge production, melting and fabrication of semis are add-on w/o new significant areas of consumption

➔ Unbalanced supply/demand in Titanium industry will remain in 2011
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