Titanium sponge supply
past, present and future

Philip Dewhurst
Roskill Consulting Group Ltd.

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Overview of global titanium sponge supply

- Recent and historical supply trends
- Current producers
- Expansions and new developments
- Outlook to 2018
How titanium sponge is made and processed

- Rutile or titanium slag
- Chlorine salts
- Coke
- Chlorination
- TiCl₄
- Magnesium
- Vacuum distillation
- MgCl₄ recycled

- Reactor

- Titanium sponge
- Crushing
- Scrap
- Blending
- Alloying material
- Compacted sponge/scrap charge

- Welding
- Consumable electrodes
- Cold hearth melting
- Remelt electrodes
- Vacuum arc remelting
- Cast slab
- VAR ingots

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Little of the world supply of TiO₂ is used to make titanium sponge.
Supply
Review of recent trends

- After falling to 123.5kt in 2009, annual global supply of titanium sponge rose by an average of 26.5%py from 2010 to 2012 reaching 241kt.

- There was a global sponge surplus of some 20kt in 2012 consisting mainly of industrial (standard) material produced in China.

- Output is expected to fall to about 230kt in 2013 because of growing inventories and slowing demand growth.
Rapid growth 2010-2012 for aerospace and industrial demand
Growth was mainly in China - of industrial grade - and in Japan.
Forecast division of global output of sponge in 2013

World output forecast: 230kt

- China: 39%
- Japan: 22%
- Russia: 17%
- Kazakhstan: 9%
- USA: 9%
- Ukraine: 4%
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- China: 39%
- Japan: 22%
China, Japan and Russia account for almost 80% of world supply

Output in China continues to grow in 2013; unlike that in Japan and Russia

![Graph showing titanium sponge production (kt) from 2009 to 2013 for China, Japan, and Russia.](image-url)
Exports of sponge – 65kt in 2012 – 40% to the USA

Japan overtook Kazakhstan as the largest exporter of sponge in 2010; melting started in Kazakhstan in 2010
There are important differences in the grades of sponge produced

- Most of China’s output is of industrial or standard grade sponge for the domestic market; in Japan, Russia and Kazakhstan it is largely aerospace grade ultimately for export.

- There is far greater use of titanium in chemical and petrochemical plant in China than elsewhere – looking at the long term?

- Exports of sponge from China are small, but a growing amount is being converted to mill products for export: to 70 countries in 2012.
  - Taiwan, Russia, South Korea and the USA were the main destinations for Chinese exports of titanium mill products
  - Unit value is relatively low indicating industrial and consumer grade products
Global capacity for titanium sponge production

- Capacity of 330ktpy is greatly surplus to demand – more than 40% is for industrial grades in China.

- Capacity of ≈130ktpy for aerospace grade sponge, mainly in Japan, Russia, the USA and Kazakhstan, is more than adequate to meet current demand.
Companies producing titanium sponge
Locations of sponge producers:
23 companies with capacity to produce titanium sponge:

- 3 in the USA
- 14 in China
- 2 in Japan
- 2 in Russia
- 1 in Kazakhstan
- 1 in Ukraine

9 of these companies melt some or all of the sponge they produce – the remainder are merchant suppliers, mainly in China.
Production of titanium sponge by company in 2012

- VSMPO Avisma, Russia: 17%
- Osaka Titanium, Japan: 16%
- Toho Titanium, Japan: 11%
- UKTMP, Kazakhstan: 9%
- Zunyi Titanium, China: 8%
- Tangshan Tianhe, China: 4%
- Shuangrui Wanji Titanium, China: 4%
- Timet, USA: 5%
- ZMTC, Ukraine: 4%
- Other (mainly Chinese): 22%
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USA: mainly aerospace grade for domestic market

- Titanium Metals Corporation (Timet):
  - 12.6ktpy at Henderson, Nevada; aerospace grade
  - estimated 2012 output at capacity for own use

- Allegheny Technologies (ATI):
  - 10ktpy at Albany, Oregon; standard grade
  - 11ktpy at Rowley, Utah; aerospace licensing in 2014?
  - 2012 output about 7kt for own use

- Honeywell Electronic Materials:
  - 300tpy at Salt Lake City, Utah; high purity electronic grade
USA: 34ktpy capacity but most requirements are imported
China: 147ktpy capacity – most used domestically in industry

- **Zunyi Titanium:**
  - 24ktpy at Zunyi City, Guizhou; to increase to 34ktpy by 2015; 18.9kt in 2012 largely for domestic market; some aerospace grade (Grade #0)

- **Tangshan Tianhe Titanium:**
  - 15ktpy at Tangshan, Xingang; 10.5kt produced in 2012; for export and domestic markets

- **Shuangrui Wanji Titanium:**
  - 11ktpy in Henan Province; 10.4kt produced in 2012 for domestic market

- **Pangang and Jinchuan Groups**
  - 15ktpy of new capacity each in 2012; includes aerospace grade

- **Other Chinese producers**
  - 67ktpy at nine companies
Japan: 68ktpy capacity – aerospace and industrial – half for export

- Osaka Titanium technologies:
  - 40ktpy at Amagasaki; 8ktpy added in 2011
  - ≈30% exported mainly for aerospace applications; remainder melted in-house or by Kobe Steel
  - ≈38kt produced in 2012; output rate cut in early 2013

- Toho Titanium:
  - 16ktpy at Chigasaki
  - 12ktpy opened at Wakamatsu, Kitakyushu in April 2010
  - for domestic industrial markets and for export
  - ≈25kt produced in 2012; output rate cut in 2013
Russia: Aerospace grades - local processing and export

- **VSMPO Avisma:**
  - 44ktpy at Berezniki, Perm Krai; 6ktpy added in 2011
  - 80%-90% melted in-house to aerospace and industrial products mainly for export
  - Estimated 42kt produced in 2012

- **Solikamsk Magnesium:**
  - 2.5ktpy at Solikamsk, Perm Krai; opened 2009
  - Ultimate design capacity is 5ktpy
  - 1.9kt produced in 2012; 44% for export
Ust-Kamenogorsk Titanium and Magnesium Plant

- 45% owned by Specialty Metals of Belgium
- practical capacity of 30ktpy at Ust-Kamenogorsk City; production 22kt in 2012
- melting started in 2010; export of ingot mainly to South Korea
- remainder exported to USA, EU & Japan
- plans to melt up to 16ktpy locally
- JV with Posco of South Korea started producing slab at Ust-Kamenogorsk in 2013 (6ktpy)
- JV with Aubert & Duval producing mill products in France
Ukraine: Standard sponge being produced mainly for export

- Zaporozhye Titanium & Magnesium Combine
  - 12ktpy standard grade at Zaporozhye City
  - acquired by Group DF
  - 10.3kt produced in 2012 – exported mainly to Russia, USA and EU
  - small volume of local melting
  - new 20ktpy plant in two phases planned by Group DF
Expansions and new developments
Global output forecast to reach 310kt by 2018

- Despite a global surplus, capacity continues to grow in China
  - Pangang, Jinchuan, Gansu Lixing Titanium and Yunnan Xinli together commissioned some 50ktpy of new capacity in 2012 and 2013; including some aerospace grade
  - Plans by Chaoyang Jinda Titanium, Chalco Fushun Aluminium, Shuangrui Wanji, Yunnan Copper Group and Zunyi Titanium amount to a further 50ktpy by 2015

- In Ukraine, Group DF plans 20ktpy including aerospace grade – no timetable announced

- In India, Kerala State Industrial Development Corp plans 10ktpy
Outlook to 2018
Global output to reach 310kt by 2018; aerospace grade \approx 100kt

Less volatility than in the past? Growth rate of 4-5%py
Comparison of forecasts: sponge production/aircraft deliveries

With growth of industrial markets the link has become tenuous
New Roskill Report now out:

Titanium Metal: Market Outlook to 2018

Roskill Information Services Ltd.

Contact:
Philip Dewhurst and Pedro Palma at Booth 603A

+44 20 8944 0066
pedro@roskill.co.uk
Thank you for your attention!