Titanium Scrap Trends
Impacts of a Dynamic Market
Topics of discussion:

I. Introduction to the ELG Utica Alloys Group
II. Impact of using scrap
III. Scrap Trends
IV. Impact of OEM’s controlling their Revert
V. Role of Scrap Processors in today’s market
VI. What happens when scrap flows change?
VII. Revert Melting outside of the US (Europe, Japan)
Topic I:
Introduction to the ELG Utica Alloys Group
ELG Utica is a world leader in state of the art certified processing of Titanium and Superalloys turnings and solids.

Full analysis of all elements and trace elements with in-house labs.

Controlled and certified mutilation of life limited parts and in-house recovery of precious metals.

Global Revert Management Programs.

12 locations in six countries dedicated to processing of Titanium and Superalloys and On-Site-Service. Another 34 facilities of the ELG Group in the US; Europe and Asia are utilized for service and logistics solutions.

Nicholas D. Corby, Titanium Product Manager

April 18-20, 2016 • Paris Marriott Rive Gauche Hotel & Conf. Center • Paris, France
“Combining ELG Utica Alloys processing facilities with ELG Group sites and offices ensures local presence, global collection and worldwide service – for a better recycling loop”
Mission

Service Approach
Providing processing and trading of Titanium and Superalloys as well as scrap related services

Global Reach
Global Scrap collection and processing network

Technology
Cost & Quality Leadership through constant development of processing Technology and proactive Commercial Team
Topic II:
Impact of using Scrap
Using solely Scrap as the primary source of raw materials for the production of Titanium ingots will reduce the energy consumption and the related CO² emissions by 95.4%.
Types of Scrap and their Impact

- **Bulk-Weldable Feedstock**
- **Feedstock**
- **Turnings**
Topic III: Scrap Trends
Raw Material Value Trends

Sources:
1. Ti64 BW, Ti64 Chip, CP2 Clip – metalprices.com

Nicholas D. Corby III, Titanium Product Manager
Sept. 25-28, 2016 • JW Marriott Desert Ridge Resort • Phoenix, Arizona
Major Factors in Scrap Availability

- Buy-To-Fly of parts to scrap.
- Scrap Consumption Ratio (incorporation rate)
- Fe-Ti or Steel Grade Percentage of Scrap Generated

### Assuming 8:1 By-To-Fly, 40% Fe-Ti Rate, and 56% Scrap Consumption

<table>
<thead>
<tr>
<th>Ingot</th>
<th>Buy to Fly</th>
<th>Scrap</th>
<th>Fe-Ti Ratio</th>
<th>Vacuum Ratio</th>
<th>Incorporation</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>61,800</td>
<td>0.875</td>
<td>54,075</td>
<td>21,630</td>
<td>32,445</td>
<td>34,608</td>
<td>(2,163)</td>
</tr>
</tbody>
</table>

### Assuming 8:1 By-To-Fly, 40% Fe-Ti Rate, and 50% Scrap Consumption

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<td>1,545</td>
</tr>
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</table>
Assumes:
- 61,800 MT Ingot Production
- 8:1 Buy to Fly Ratio
- 60% Scrap Generation is VAC
Topic IV:
Impact of OEM’s controlling their Revert
Topic V:
Role of scrap processors in today’s market
Most of the melting capacity for Titanium scrap is concentrated in the North America (largest capacity worldwide) with new projects in Europe, Japan and China.....

Scrap has to sourced globally but supplied locally – Sophisticated logistic solutions are needed to secure scrap volumes generated emerging manufacturing clusters.
Topic VI:
What happens when scrap flows change?
US Scrap Consumption

Source - USGS (http://minerals.usgs.gov/minerals/pubs/commodity/titanium/)

*2016 Ingot Production, and Sponge Consumption are based upon Q1 2016 figures multiplied by four.

**2014-2016 Scrap Ratio was capped at 61%, versus reported 2014 (79%), 2015 (84%), and 2016 (84%).

Nicholas D. Corby III, Titanium Product Manager

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Scrap Flows

Scrap Imports to the USA

Source - USGS (http://minerals.usgs.gov/minerals/pubs/commodity/titanium/)
* 2016 Volumes were based upon Q1 Results multiplied by four.

2002-2016*

Avg 2011-16*

United Kingdom  Japan  Germany  France  Korea, Republic of

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Topic VII:
Revert melting out of the US (Europe, Japan)
• France – a joint venture between Aubert & Duval, UKAD, ADEME (Energy), CACF (Finance) will begin qualification in 2017, with Industrial Production beginning in 2018.

• Japan – a joint venture between Nippon Steel and Sumitomo Metal Corporation (NSSMC) recently signed supply agreement with SAFRAN.

• Russia – increasing scrap generation due to partnerships with OEM’s delivering finished and semi-finished parts. Utilization of Skull Furnaces will enable VSMPO to recycle domestic scrap that was previously available.
Summary:

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Thank you for your attention!