



Capital Markets Day  
AMG Superalloys  
June 3, 2014



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# Introduction to AMG Superalloys



## AMG Processing

- Aluminum master alloys
- Vanadium
- Titanium alloys and coatings
- Superalloys



## AMG Engineering

- Capital equipment for high purity materials
- Heat Treatment Services

## AMG Mining

- Silicon metal
- Natural graphite
- Antimony
- Tantalum & Niobium

### Energy



### Aerospace



### Infrastructure



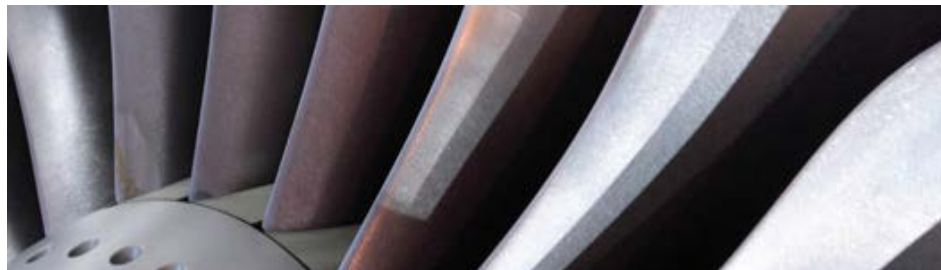
### Specialty Metals & Chemicals



**AMG provides high value-added specialty metal alloys and engineering systems related to CO<sub>2</sub> reduction and conservation of natural resources to growing markets**

# What is a Superalloy?

- Superalloys are materials that exhibit:
  - Excellent mechanical strength
  - Temperature and expansion resistance, and;
  - Good corrosion and oxidation resistance making them well suited for turbine blades of jet engines
- Superalloys are commonly used in:
  - Parts of gas turbine engines subject to high temperatures
  - Jet engine turbine blades
- Chromium, AMG Superalloys primary product, permits jet engines to operate in a high-temperature, high-stress, oxidizing environment



# Introduction to AMG Superalloys

- AMG Superalloys is a highly specialized producer of:
  - Chromium metal
  - Ferro titanium & ferro niobium
  - Nickel niobium
  - Aluminum powders and;
  - Cerium oxide polishing powders
- AMG Superalloys products are used in the following markets:
  - Aluminum
  - High Purity Steel
  - Superalloy
  - Hard-facing
  - Welding and;
  - Optical glass industries

} Aerospace



# Introduction to AMG Superalloys

- Headquartered in Rotherham, UK
- Four manufacturing plants
  - (3 ISO 9001)
  - ~230 employees
- Comprehensive range of products
- ~\$160 million in 2013 revenue
- Management
  - Mr Julien Crisnaire, President
  - Mr. Kevin Lawson, Managing Director
  - Ms. Leonora Scaife, Finance Director



**Rotherham, UK**



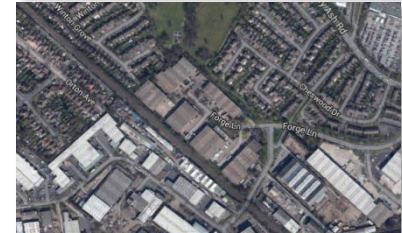
**Anglesey, UK**



**Skawina, Poland**



**Minworth, UK**



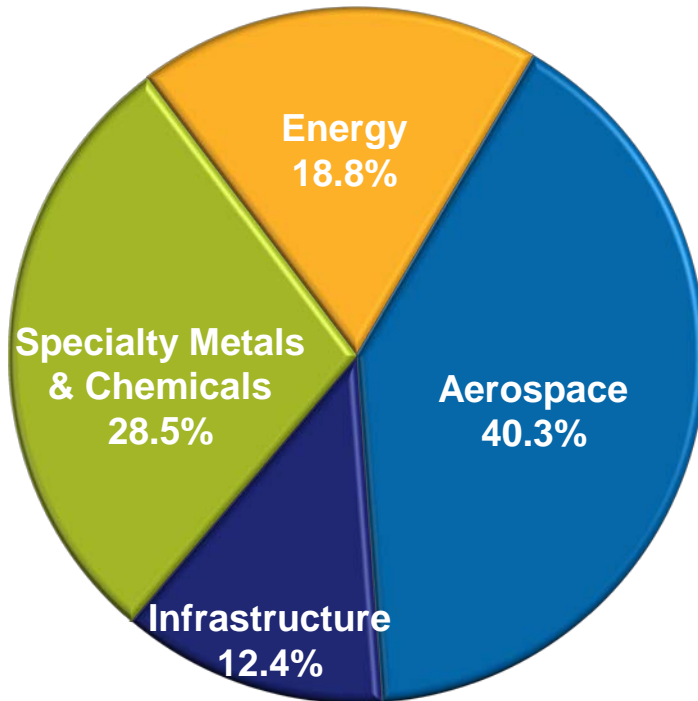
**AMG Superalloys UK is a leading provider of specialty metals, alloys and materials**



# Markets

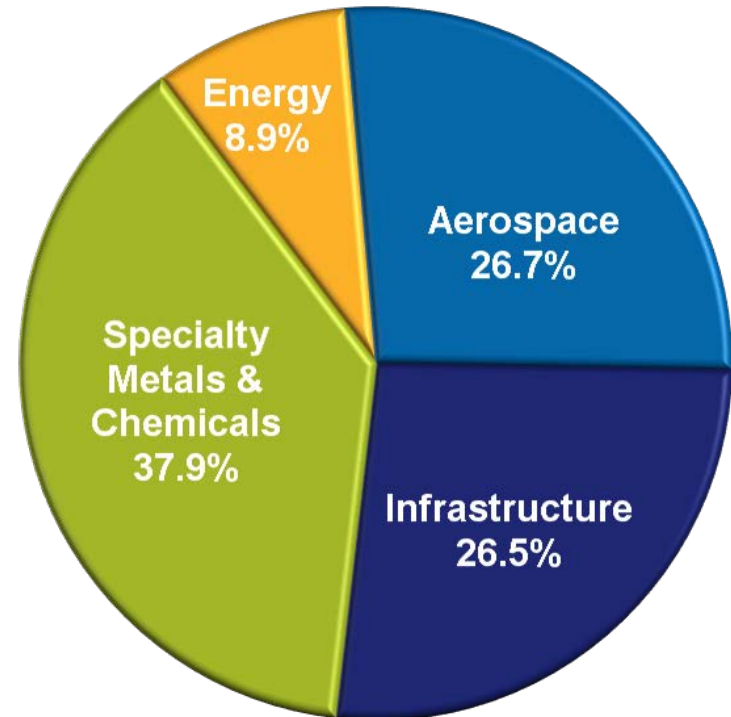
# AMG & AMG Superalloys

**AMG Revenue**



**Aerospace is AMG's  
largest end market  
segment**

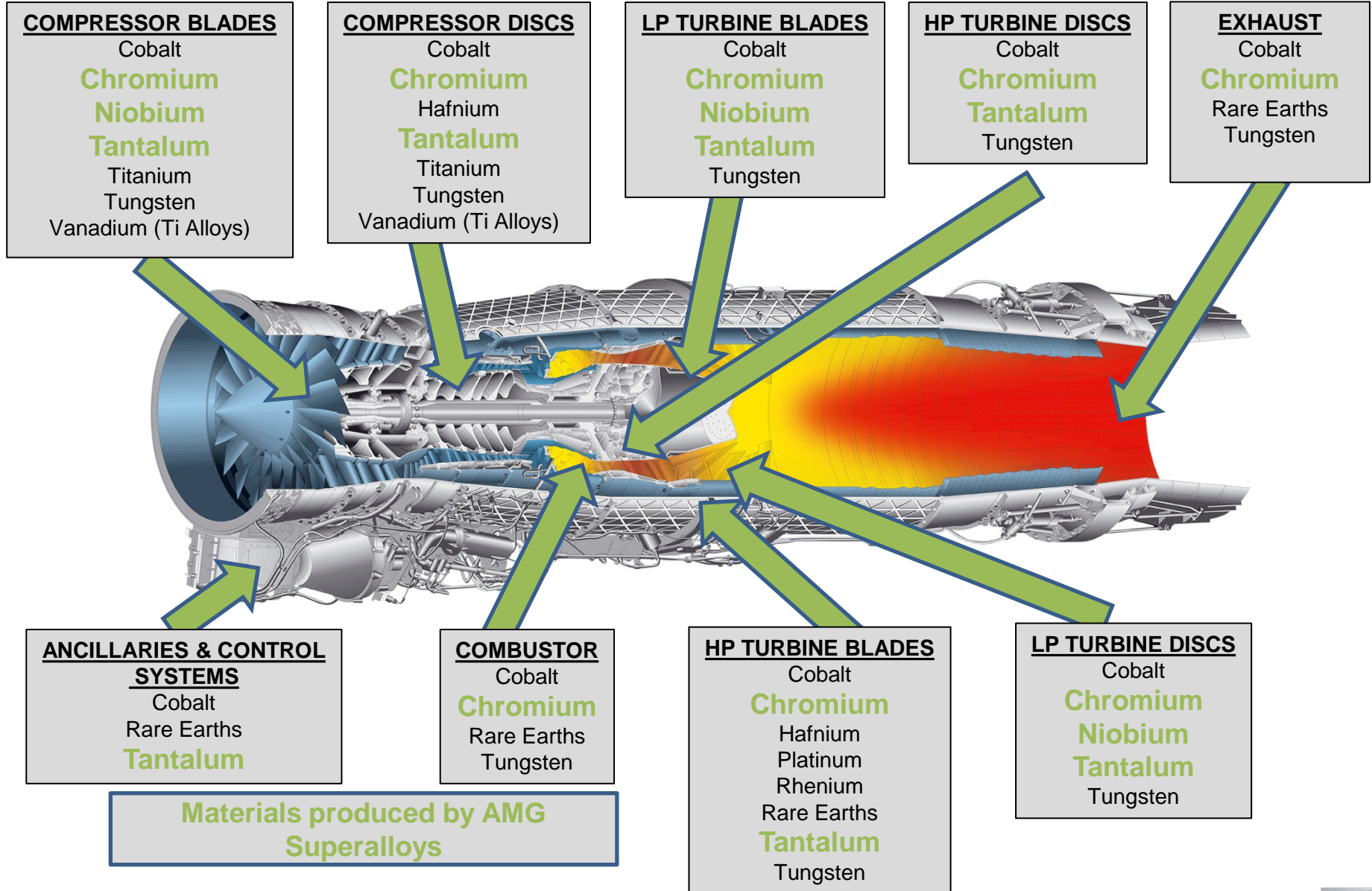
**AMG Superalloys Revenue**



**Aerospace is a  
significant market for  
AMG Superalloys**



# AMG Superalloys for Jet Engines





## Products

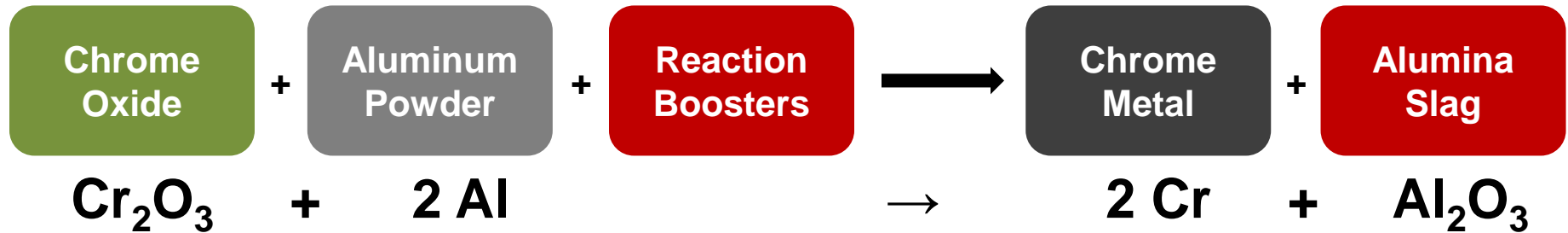


# Key Products – Chrome

- Products:
  - From regular grade for steel industry...
  - ...To high purity grades for superalloy applications
- Use:
  - Chromium provides heat and corrosion resistance in aircraft engines
  - Small component of overall superalloys cost
- Markets:
  - Aircraft engines
  - Industrial gas turbines
  - Stainless steels
  - Al & Cu alloys



# Key Products – Aluminothermic Chrome



Alumina  
Slag

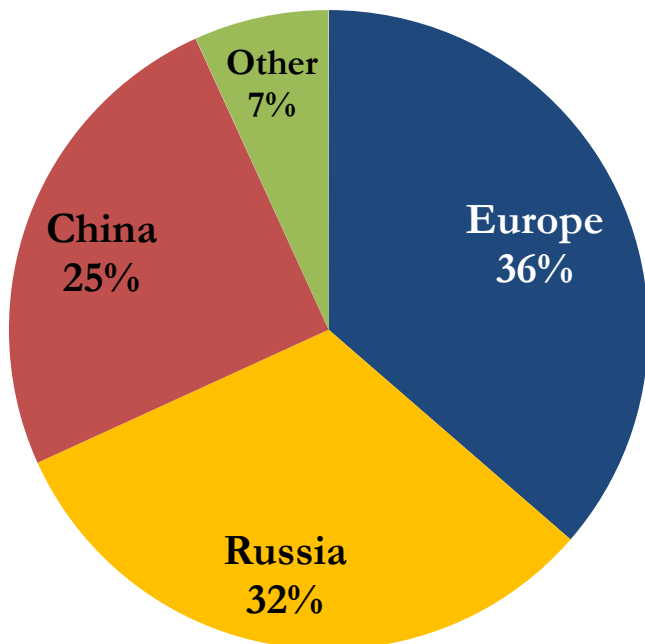
Chrome Metal

- Chrome Oxide is created from Chrome Ore
  - 95% of chrome ore is used to create ferrochrome for steel
  - ~4% of chrome ore is used to create chrome chemicals (oxides)
  - Chrome oxide primarily produced in South Africa, Russia and Kazakhstan

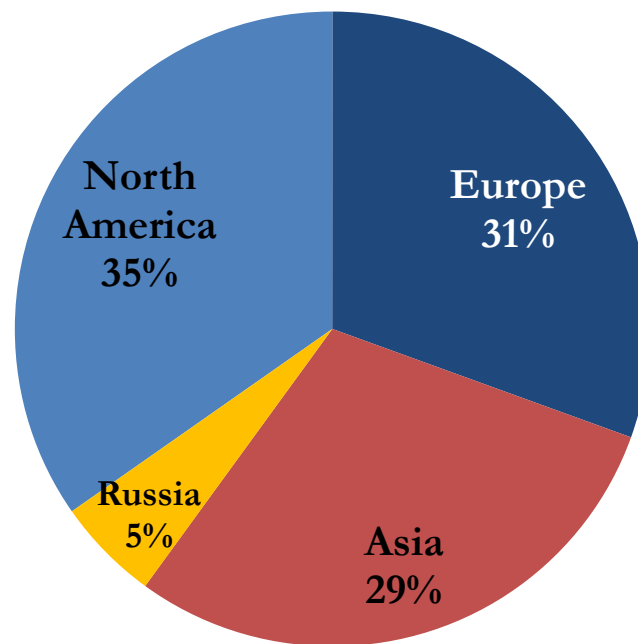


# Key Products – Aluminothermic Chrome

2013 Chrome Metal Supply<sup>(1)</sup>



2013 Chrome Metal Demand<sup>(1)</sup>



**MIDURAL®**  
GROUP



DELACHAUX



锦州钛业有限公司  
JINZHOU TITANIUM INDUSTRY CO.,LTD.



OJSC «Novotroitsk Plant of Chromium Compounds»



**ATI**



Firth Rixson



Precision Castparts Corp.

**CHROMALLOY**

**AUBERT&DUVAL**



CARPENTER®

**Alcoa Howmet**



# Key Products – Aluminum Powders

- Products:
  - Aluminum powders
  - Aluminum granules
- Use:
  - Chrome metal
  - Rocket fuel
  - Paints and pigments
- Markets:
  - Autos
  - Aerospace
  - Chemicals



# Key Products – Polishing Powders

- Products:
  - Glass and plastics polishing compounds and glass decolorizers
    - Regipol™ - cerium oxide based
    - Decol™ - cerium oxide based
    - Polimax™ - aluminum oxide based
- Use:
  - Flat glass (main current market for AMG)
  - Precision optics (growth opportunity for AMG)
- Markets:
  - Infrastructure
  - Optics
  - Electronics



# Other Products & Applications

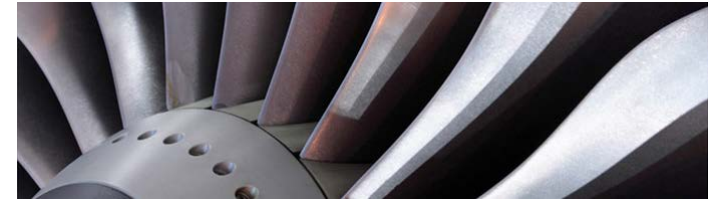
## Boron

- Hard face coating
- Superalloys & stainless steels
- Magnet alloys



## Niobium

- Steels & Superalloys
- Super conducting magnets
- Construction



## Titanium

- Stainless & high strength low alloy steels
- Deoxidant
- Complex alloys



## Powders

- Complex alloys & powders
- Welding industry
- Copper Alloys for bronze production



## Laboratory

- Inorganic analytical testing services
- Multiple accreditations







# Operations

- Restructured business in Q4 2013
  - New management team installed
  - New Kaizen / continuous improvement culture kick started
  - Focus on
    - Improving Environmental Health & Safety (EH&S)
    - Improving gross margins
      - Reduced fixed costs and SG&A (10% headcount reduction)
      - Rationalized low margin / ROCE products
      - Implemented systems to reduce raw material price risk
      - Right-sized production levels to current market demand
    - Reducing working capital
      - Improved terms with suppliers and customers
      - Improved value chain management
- **All with the goal to improve ROCE and increase operating cash flow**





[www.amg-s.com](http://www.amg-s.com)

[info@amg-s.com](mailto:info@amg-s.com)

