LEADING THE CRITICAL MATERIALS REVOLUTION



AMG Advanced Metallurgical Group N.V. September 2016

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# COMPANY OVERVIEW



AMG Advanced Metallurgical Group N.V.

# AMG at a Glance



# MARKET LEADING PRODUCER OF HIGHLY ENGINEERED SPECIALTY METALS AND VACUUM FURNACE SYSTEMS





# AMG End Markets, Competitors and Customers

	Critical Materials	AMG Engineering		
	2015 REVENUE: \$757.5M 2015 EBITDA: \$60.8M	2015 REVENUE: \$219.7M 2015 EBITDA: \$14.8M		
Units	Antimony Aluminum TAC Graphite Chrome Silicon Tantalum Vanadium	Engineering Heat Treatment		
End-Use Markets	<ul> <li>FLAME RETARDANTS</li> <li>AEROSPACE</li> <li>BATTERY ANODES</li> <li>EXPANDED POLYSTYRENE</li> <li>MICRO CAPACITATORS</li> <li>MICRO CAPACITATORS</li> <li>SUPER-ALLOYS</li> <li>INFRASTRUCTURE</li> </ul>	<ul><li>AEROSPACE</li><li>AUTOMOTIVE</li></ul>		
Competitors	<ul> <li>AMETEK, INC.</li> <li>MIDURAL GROUP</li> <li>LARGO RESOURCES LTD.</li> <li>IMERYS S.A.</li> <li>ERAMET</li> <li>SYRAH RESOURCES LTD.</li> <li>FERROGLOBE PLC</li> <li>ELKEM</li> <li>GLENCORE PLC</li> </ul>	<ul> <li>CONSARC CORPORATION</li> <li>RETECH SYSTEMS LLC</li> <li>BODYCOTE PLC</li> <li>SECO/WARWICK S.A.</li> </ul>		
Customers	Rotino   Rotino   Suppor   Suppor <th>CARPENTER CARPENTER Rolls-Royce ThyssenKrupp</th>	CARPENTER CARPENTER Rolls-Royce ThyssenKrupp		



# Key Investment Highlights

- 1) Attractive portfolio of critical materials with significant upside potential
- 2) Growth across diverse end markets driven by strong global regulatory and environmental trends
- 3) Leader in advanced technologies to address CO<sub>2</sub> reduction goals
- 4) Industry leading engineering division, focused on high-end aerospace and automotive applications
- 5) Portfolio effect results in stable earnings compared to industry peers
- 6) Consistent cash flow generation has delivered ample liquidity
- 7) Excellent platform for organic and acquisition-led growth
- 8) Highly accretive Lithium project
- 9) Deep bench of experienced management



# Attractive Portfolio of Critical Materials



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The cumulative average 10 year price appreciation of the AMG Portfolio was 6.4 percentage points higher than LME Metals and 6.8 points higher than oil, while the AMG EU Critical Materials outperformed LME Metals and oil by 5.9 and 6.3 percentage points, respectively

### CRITICAL MATERIAL PRICES OUTPERFORM THE LME

Note: Compound annual growth rates are calculated over the period Jun '06 through Jun '16 using the equation ((Ending Value / Beginning Value) ^ (1 / # of years) - 1) where ending value is avg monthly price in Jun '16 and beginning value is avg monthly price in Jun '06; and where AMG EU Critical Materials include Sb, Cr, Graphite & Si; AMG Portfolio includes Sb, Cr, FeV, Li, Nb, Si, Sr, Graphite, Ta, Sn & Ti; and LME Metals include AI, Co, Cu, Pb, Mo, Ni, & Zn. Avg annual growth rates (plotted above) are calculated over the same period using the equation ((Ending Value / Beginning Value) -1) and considering the same metal categorizations where ending value is avg monthly price in Jun of the given year and beginning value is avg monthly price (in Jun '06.



# Attractive Portfolio – with Significant Upside Potential



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- Metal prices are measured on a scale of 0 to 10, with 0 and 10 representing the minimum and maximum average quarterly prices occurring during the past 10 years
- The positions demonstrate the current price level of each metal with respect to their various historical price points over the past 10 years

AMG has significant potential upside within certain critical materials based on historical price ranges



LEADER IN ADVANCED TECHNOLOGIES TO ADDRESS CO<sub>2</sub> REDUCTION

# CO<sub>2</sub> REDUCTION

A GLOBAL IMPERATIVE FOR THE 21ST CENTURY

### AMG: MITIGATING TECHNOLOGIES

Products and Processes saving raw materials, energy and CO<sub>2</sub> emissions during manufacturing (i.e., recycling of Ferrovanadium)

### AMG: ENABLING TECHNOLOGIES

Products and Processes saving  $CO_2$  emissions during use (i.e., light-weighting and fuel efficiency in

the aerospace and automotive industries)

### AMG HAS DEVELOPED INTO A LEADER IN ENABLING TECHNOLOGIES

### Industry Leading Engineering Division – Select Recent Innovations

### 2014

# **Syncrotherm®:** Newly-developed one-piece flow heat treatment furnace system for automotive market



### New furnace for **glass forming of critical components** in ultra-resistant glass for automotive and consumer markets



### 2015

Newly developed **plasma** hearth melting furnaces for the recycling and reuse of titanium scrap to several key customers in the aerospace industry





New, high-productivity super alloy powder atomizer with the world's largest melting capacity



### Portfolio Effect Results in Stable Earnings versus Industry Peers



- AMG's portfolio of critical materials lessens its exposure to price volatility of a single metal, enabling more stable performance on a consolidated basis over time
- AMG Engineering has historically provided a further measure of earnings stability, given its lack of metal price exposure
- AMG's combined production and engineering capabilities provide superior metallurgical know-how and market insight, enabling additional growth opportunities
- In contrast to AMG's relatively stable financial performance, competitors who lack an diversified and integrated business model have experienced significant financial volatility through the most recent cycle

<sup>1</sup> EBITDA Volatility defined as annual variance from average EBITDA for years 2012-2016
<sup>2</sup> Dedicated Miners: BHP, Vale, Newmont, Anglo American, Fortescue & Rio Tinto; data pulled from ThomsonOne



# Consistent Cash Flow Generation, Delivering Ample Liquidity

#### OPERATING CASH FLOW (IN MILLIONS OF US DOLLARS)



- Q2 '16 cash flows from operating activities were \$24.3M
- Cash flows from the first half of 2016 exceeded those from the first half of 2015 by 33%

NET DEBT (IN MILLIONS OF US DOLLARS)



- Net debt: \$6.2 million
- \$188.0 million reduction of net debt since December 31, 2012
  - Net Debt to LTM EBITDA: 0.08x
- AMG's primary debt facility is a \$400
  million multicurrency term loan and
  revolving credit facility
- 5 year term (until 2021) with an accordion feature that allows the Company, subject to certain conditions, to increase the commitment amount by up to \$100 million
- In compliance with all debt covenants



# AMG – Ready for Growth





# LITHIUM PROJECT



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### AMG LITHIUM – PROJECT HISTORY

- 2002 2013: AMG began development of a pilot plant process route for the flotation of Mica and Feldspar from tailings
- 2007 2008: Flotation equipment installed
- 2009 2010: Dry magnetic separator installed
- 2011: First set of samples produced and tested by industrial customer
- 2012: Electric rotate dryer was installed to enable batch trials for technical grade Spodumene
- 2013: AMG provided 43,603kg of spodumene to industrial customer to develop a tank test, following which pilot plant operations were halted
- 2015: The pilot plant received basic maintenance and wet magnetic separators were rented, placing the pilot plant back into operational condition

### AMG LITHIUM – PROJECT OVERVIEW

### **PHASE I – Lithium Concentrate**

#### **OBJECTIVE**

Monetization of substantial lithium mineral deposits currently residing in AMG Mineração's tailings ponds and tailing stockpiles

AMG will construct a lithium concentrate (spodumene) production facility, co-located with AMG Mineração's tantalum mine and upgrading plant in Brazil

### **PLANNED PRODUCTION**

90,000 metric tons per year of lithium concentrate, with an option to expand to 140,000 metric tons

### STATUS

Phase I capital investment of approximately \$50M was approved by the AMG Supervisory Board on July 19<sup>th</sup>, 2016

Lithium concentrate operations to commence in the first quarter of 2018

### **PHASE II – Lithium Chemical**

#### OBJECTIVE

Downstream conversion of lithium concentrate into lithium hydroxide monohydrate and/or lithium carbonate

### **PLANNED PRODUCTION**

14,000 metric tons lithium carbonate equivalent (LCE) per year (hydroxide and/or carbonate), expandable to 20,000 metric tons

#### STATUS

Affirmative scoping and site location studies completed

Pre-feasibility study for the construction of a lithium chemical plant will be completed in the fourth quarter 2016

AMG's objective is to be the low-cost producer of spodumene globally

# AMG LITHIUM – PROJECT STRENGTHS

- Existing management and mining infrastructure not a new mine project
- Strong understanding of the mine geology
- AMG Mineração's last mineral resource estimate, published in 2013 and prepared in accordance with National Instrument 43-101 Guidelines, and endorsed and signed-off by Coffey, identified 19.3 million tons of measured, indicated and inferred resources, which includes tantalum, niobium, tin and lithium
- Mining infrastructure already in place and operational
- Ore extraction and crushing costs absorbed by profitable tantalum operation
- Lithium concentrate (spodumene) plant will be fed via lithium deposits in existing tailings, as well as incremental lithium-bearing tailings generated via tantalum production
  - 2.8 million metric tons of spodumene plant feed stock already extracted in the form of on-site tailings
- AMG has operated a spodumene pilot plant since 2010 (see slide 7)
- Phase 2 lithium chemical plant pre-feasibility work being performed by Hatch, the world's leading builder of lithium plants

AMG has operated the Mibra mine for 38 years

## AMG LITHIUM – PHASE I TIMELINE



- scale flotation tests
- Pilot plant operation
- Industrial production scoping study
- statement life of mine extended
- Pre-feasibility
  - study

# 2016

- Spodumene plant basic engineering completed July 2016 by Outotec
- AMG Supervisory Board approval July 19th, 2016
- Spodumene plant construction to commence Q3 2016
- Resource expansion drilling campaign to start Q3 2016

 Updated 43-101 compliant resource statement to be

2017

2017

- completed Spodumene plant construction to be completed Q4
- Spodumene plant to be at full capacity Q3 2018

2018-20

### LITHIUM INDUSTRY BASICS & BATTERY VALUE CHAIN





## GLOBAL LITHIUM DEMAND AND PRICING OUTLOOK

### **FUNDAMENTALS**

Lithium-ion battery costs are falling rapidly as global battery producers expand manufacturing facilities

Global lithium demand was 182k MT lithium carbonate equivalent (LCE) in 2015, with EV demand doubling YoY and accounting for 14% of global demand

Global lithium supply has increased at a 7% compound average growth rate (CAGR) from 1995 to 2015 to meet increased demand from mobile phones and other electronics

### LITHIUM DEMAND BY APPLICATIONS (2015 ACTUAL) Industrial Applications 66% 66% Electronics 28% 66% Electric Vehicles 6% 188k MT LCE

Source: Citibank Deep Dive | Commodities report, Oct 16, 2015, Figure 2. Lithium Supply Demand Balance, pg. 5

### PRICING OUTLOOK

Rapidly growing market driven by growth in electric vehicles and falling cost of production of lithium-ion batteries

### New production

Hard rock mining projects at higher cost

#### **Disjointed pricing**

Chinese lithium hydroxide spot prices are currently estimated at US\$19,315/MT with medium term forecasts around \$10,000/MT (Roskill)



### BATTERY SEGMENT GROWTH

**Transportation & Renewable Energy:** two key end markets driving long term growth, with further upside potential

## WORLD MARKET FOR RECHARGEABLE LITHIUM BATTERIES BY END-USE



#### Renewable Energy (Grid Storage)

Driven by growth in renewable energy and need for resources to provide system flexibility and balance supply/demand

Global installed base of ~1.1 GW, projected annual installations reaching up to >12 GW by 2025 (Navigant Research)

#### **Transportation**

Fast-growing market for hybrids and electric vehicles driven by regulations on CO2 emissions, falling battery costs, expanding charging infrastructure and desire for an enhanced driving experience

#### **Consumer Electronics & Devices**

Slowing demand for laptops and conventional mobile phones are offset by robust demand growth for smart phones, tablets and wearables, driven by trend towards highercapacity batteries



# LITHIUM ELECTRIC VEHICLE ("EV") MARKET FORECAST

### **OVERVIEW**

Global lithium carbonate market has been short of supply since 2013

It is estimated that there is ~6k MT of pure EV driven lithium demand today

Leading automakers are committing to developing a wider range of EV models which are more lithium-intensive than hybrid EVs or plug-in EVs

Lithium only accounts for 3% of battery costs



#### LIMITED EFFECT OF LITHIUM COSTS ON BATTERY PRICING



#### EV PENETRATION OF PRODUCTION



### **GLOBAL LITHIUM SUPPLY**

### **FUNDAMENTALS**

Global supply of lithium minerals has been historically dominated by large-scale lithium brine operations in South America

Global lithium supply has increased at a 7% compound average growth rate (CAGR) from 1995 to 2015 to meet increased demand from mobile phones and other electronics

2016 global lithium supply is around 164k MT LCE, split roughly 50:50 between hard-rock and brines

#### LITHIUM SUPPLY BY COUNTRY (2015 ACTUAL)





#### LITHIUM SUPPLY AND DEMAND OVER TIME



## MARKET PRICE FORECASTS – LITHIUM CONCENTRATE (SPODUMENE)





### LITHIUM PRODUCER / PROJECT COST POSITION – LITHIUM CONCENTRATE (SPODUMENE)



Source: Roskill 2016, Ehren Gonzalez Ltda, Hatch; Note – Operating costs only, not including transportation

Note: AMG cost estimates per Outotec of \$127/MT; includes production costs and SG&A costs; does not include cost of transportation to port

<sup>1</sup> Greenbushes cost includes G&A but excludes selling expenses

<sup>2</sup> Pilbara Minerals figure includes credits from tantalite production; includes transport and loading costs of \$37/t concentrate

### LITHIUM MARKET BALANCE, THROUGH 2025

Outlook for lithium consumption remains optimistic. Additional supply needed to feed strong demand in multiple markets.



#### Demand

Overall cumulative average growth rate (CAGR) from FY12 to FY25 of 6.4% (Base Case)

Battery demand CAGR of 12.6%

High Case – stronger global economy, surging demand for battery and energy applications – 9.5% per annum growth

1% increase in electric vehicle penetration would increase demand by 70k MT lithium carbonate equivalent (LCE) per year

#### Supply

Forecasted production is based upon current capacity, as well as publicly announced expansions

Source: Roskill 2016 Lithium Market Report

Note: new mine projects include Orocobre, Galaxy Resources, RB Energy, Lithium Americas/SQM, Eramet, Neometals, Nemaska Lithium, and Western Lithium.



## AMG MINERAÇÃO – MIBRA MINE

### **History and Overview**

The mine was founded in 1945 and acquired by Metallurg / AMG in 1978

Activities include open pit mining, crushing/grinding, gravimetric and electromagnetic concentration

Extract tantalum and niobium bearing ores and sells as tantalum concentrate

**Current production** of 300k pounds of tantalum concentrate annually

### **Present Product Lines**

**Tantalum** concentrate sold exclusively to United States under long term contract

Feldspar sold in local market to ceramics and glass producers

Tin sold primarily in local market

 Smelting of byproduct into tin metal occurs at third party operations

## MIBRA MINE – MINERAL RESOURCES

Source	MT Material (ore/Tailings)	% Li <sub>2</sub> 0 Contained	MT Li₂0 Contained in Ore	MT LCE Contained	MT Li <sub>2</sub> 0 Contained in Spodumene Concentrate	MT Spodumene Concentrate
Ore source – 2013	19,360,000 <sup>1</sup>		146,363	361,019	90,745	1,463,630
Less consumption	3,214,584 <sup>3</sup>		15,517	38,274	9,620	155,167
Net Ore Balance	16,145,416 <sup>2</sup>	0.81%	130,846	322,745	81,125	1,308,463
Tailings-Ponds 1&2 4	2,070,110	1.00%	20,701	51,061	13,870	223,705
Net Ore & Tailings Ponds	18,215,526		151,547	373,807	94,994	1,532,168
Tailings-Stockpiles <sup>4</sup>	750,000	1.15%	8,625	5,779	5,779	93,206
Total Resources	18,965,526		160,172	379,586	100,773	1,625,374

### **RESOURCE EXPANSION – OBJECTIVES**

- Update new resource in the west area of the mine, not included in 2013 resource statement
- Upgrade existing mineral resources from Inferred to Indicated and / or Indicated to Measured
- Exercise to be completed 1H 2017

<sup>1</sup> Ore balance per 2013 NI 43-101 Statement
 <sup>2</sup> Prior to resource expansion
 <sup>3</sup> AMG estimate of ore consumed in Ta and Feldspar production; residual quantities to tailings ponds
 <sup>4</sup> Preliminary AMG estimates



# FINANCIALS: Q2 2016



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# Q2 2016 at a Glance

AMOUNTS IN \$M (EXCEPT EARNINGS PER SHARE)	Q2 2016	Q2 2015	% CHANGE
REVENUE	\$248.3	\$257.4	(4%)
GROSS PROFIT	\$53.8	\$44.6	20%
GROSS MARGIN %	21.6%	17.3%	25%
PROFIT BEFORE INCOME TAXES	\$15.6	\$8.3	88%
EBITDA	\$26.0	\$25.1	4%
EBITDA MARGIN %	10.5%	9.8%	7%
NET DEBT	\$6.2	\$41.9	(85%)
RETURN ON CAPITAL EMPLOYED (ROCE)	17.8%	15.7%	13%
NET INCOME ATTRIBUTABLE TO SHAREHOLDERS	\$13.4	\$3.8	253%
EARNINGS PER SHARE	0.48	0.14	243%

- Q2 '16 EBITDA up 4% versus Q2 '15 due to improved profitability within AMG Engineering
- Annualized ROCE increased to 17.8% versus 15.7% in Q2 2015
- Q2 '16 revenue declined by \$9 million, or 4%, compared to Q2 '15, driven largely by weak metal prices
- Net debt: \$6.2 million
- \$35.7 million reduction of net debt since Q2 2015
- -Net debt to LTM EBITDA: 0.08x

INCREASES IN EARNINGS PER SHARE OF 243%, COMPARED TO Q2 2015



# Financial Data: ROCE & EBITDA





# **AMG Critical Materials**





# AMG Critical Materials – Quarterly Revenue Drivers

KEY PRODUCT	Q2 '16 REV (\$M)	Q2 '15 REV (\$M)	VOLUME	PRICE	CURRENCY
FeV & FeNiMo	\$22.8	\$28.1	$\Leftrightarrow$	+	+
Al Master Alloys & Powders	\$43.0	\$45.7	•	₽	+
Chromium Metal	\$19.9	\$20.5	$\Leftrightarrow$	+	$\Leftrightarrow$
Tantalum & Niobium	\$17.2	\$23.8	+	÷	$\Leftrightarrow$
Titanium Alloys & Coatings	\$21.1	\$21.2	•	÷	<b>⇔</b>
Antimony	\$19.0	\$24.9	+	➡	+
Graphite	\$16.4	\$14.9	•	$\Leftrightarrow$	<b>+</b>
Silicon Metal	\$22.4	\$22.1	$\Leftrightarrow$	$\Leftrightarrow$	<b>+</b>

- Double-digit declines in the average quarterly prices of Nickel, Aluminum, Chrome, Niobium and Antimony negatively affected revenue in the second quarter of 2016
- Strong sales volumes of Aluminum Master Alloys & Powders, Titanium Alloys & Coatings, and Graphite were partially offset by lower sales of Niobium and Antimony
- AMG's ferrovanadium sales prices are indexed to the prior month's average market price



# AMG Engineering







