Bauxite and Alumina in Abrasive Applications

By

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The raw materials

- Abrasive grade bauxite → BFA
- Bayer Alumina → WFA
- Calcined Alumina → Polishing grades
- Sol Gel Alumina → Specialty applications

Specifications abrasive grades

- Calcined Bauxite
  - 82-89% Al_2O_3, 1-9% Fe_2O_3, 2-4% TiO_2
- BFA
  - 96-97% Al_2O_3, 1-2% TiO_2
- WFA
  - 99.5% Al_2O_3, 0.3-0.4% Na_2O
- Cacined alumina
  - 99.5% Al_2O_3, hard or soft calcined for variable alpha alumina content

Added Value for Abrasive specifications

- Grain sizing critical
- FEPA/ANSI/JIS
- Heat treatment
- Coatings
- Amended chemistry alumina abrasives – AZ, Ruby

Supply

- Bauxite 2.3-2.4m tonnes abrasive grade
- BFA ~2 m tonnes about 40% for abrasives
- WFA 700,000 t about 50% for abrasives
- Calcined alumina 70,000 tonnes for polishing
- Sol Gel alumina 20,000 tonnes for abrasives

Capacity issues

- Capacity is overstated
- Total fusing capacity can include BFA, WFA and other fused minerals
- Leads to double counting of capacity.
- Gross overcapacity quoted for China
  - BFA “theoretical” capacity 4 million tonnes ~30% utilisation
  - WFA “theoretical” capacity 600,000 less than 50% utilisation
- Much of Chinese capacity will never be utilised
- Russian plant was constantly quoted as 125,000 tonne capacity but never reached that level and now quoted as a more realistic 63,000 T

Industry Structure

- China few large producers of either BFA or WFA but hundreds of small
- Even fewer have their own sources of bauxite
- ROW excluding Brazil and India, reliant on imports of bauxite for BFA, mainly from China
- WFA mainly served by specialised fusing companies but some integrated such as Rusal’s Russian operation
- Calcined alumina generally bought on contract outside China
- Spot market purchasing in China
- Polishing grades by specialty alumina companies

Chinese situation

- Environmental restrictions limiting production of calcined bauxite and fused alumina
- More closures expected
- Will reduce significant overcapacity
- Causing restrictions on supply
- Electricity costs rising and variable unpredictable supply
- Prices already rising due to reduced supply and increased costs of bauxite/alumina/labour/energy
- Profitability already difficult so many closed plants will never re-open

Pricing structure

- Calcined bauxite prices $280-300/TFOB China
- BFA prices ~$650/T for FEPA grade FOB China
- WFA ~$780/T FOB China
- Fused alumina prices from China down by about $100/t in last year
- Calcined Polishing grades ~$850/T for standard grades
- Sol Gel alumina 20-25 times the price of WFA
- Added value for fine grinding or specialty grades can increase prices to over $1000/T and in very special cases up to $10,000/T

Trade patterns

- China major export force in world markets
- Europe including Russia has its own major production of both BFA and WFA
- EU still significant net importer primarily from China with Russia a distant second
- EU Import value relatively low, production value higher added value, exports even higher unit value products
- North America net importer from China but also from Europe Brazil and more recently Bahrain and exports value added products


Chinese Exports Corundum
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
US$ '000
Tonnes


Chinese exports corundum unit value $/Tonne
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
-
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

Trade issues

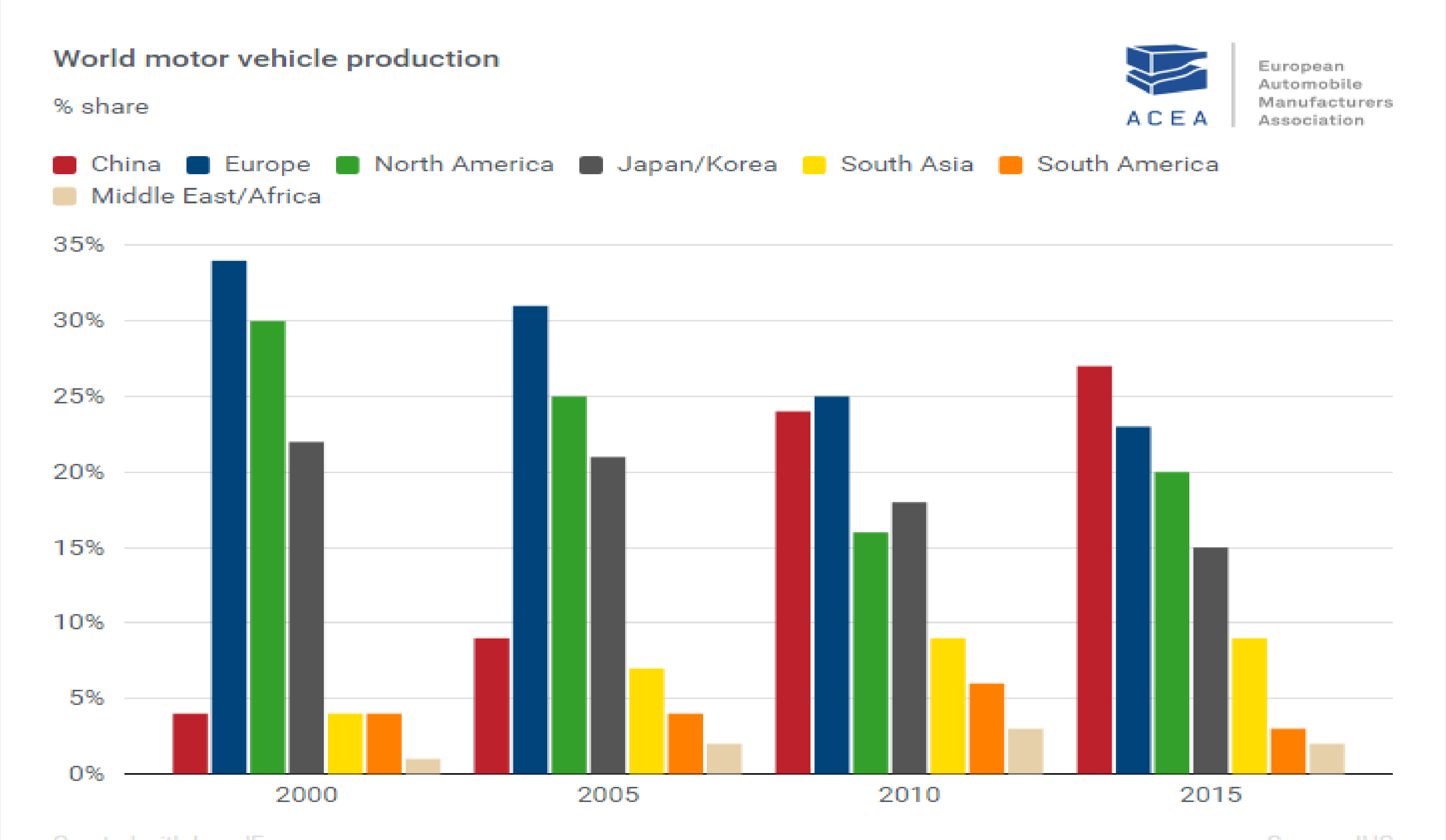
Imports from China to rest of world				China exports				Difference	
Period	US$ '000	Tonnes	$/T	Period	US$ '000	Tonnes	$/T	Tonnes	$/T FOB
2003	142,375	477,067	298	2003	173,026	671,614	258	194,547	- 41
2004	201,279	564,114	357	2004	222,324	708,959	314	144,845	- 43
2005	223,917	562,829	398	2005	227,760	694,395	328	131,566	- 70
2006	205,313	504,879	407	2006	224,920	694,462	324	189,584	- 83
2007	302,350	653,385	463	2007	319,951	844,502	379	191,118	- 84
2008	516,812	624,335	828	2008	504,485	820,890	615	196,556	- 213
2009	182,038	237,755	766	2009	182,483	314,659	580	76,904	- 186
2010	436,941	591,915	738	2010	482,310	788,930	611	197,015	- 127
2011	563,940	712,803	791	2011	558,720	815,871	685	103,068	- 106
2012	505,552	635,772	795	2012	523,170	737,112	710	101,339	- 85
2013	501,951	605,562	829	2013	523,866	712,819	735	107,257	- 94
2014	552,958	595,737	928	2014	597,190	810,149	737	214,412	- 191
2015	457,844	586,350	781	2015	508,829	677,493	751	91,143	- 30

Chinese Internal customs data for 2016 Exports BFA – 554000 tonnes WFA – 167,000 tonnes Total 721,000 tonnes

Demand drivers

- Automotive
- Aerospace
- White goods
- GDP in general

Total vehicle production 2000 – 56.3 million, 2015 -- 91.5 million, 2016 – almost 95 million



Metalworking innovation

- Near net shape castings reduce abrasive requirement but mature trend
- Trends continuing to achieve finer finishes to tighter tolerance requiring high specification abrasives
- Want faster cutting/longer life/lower costs
- Always a compromise
- Balance of cost of abrasive against cost of labour and downtime

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Questions

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