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China - Its role and influence on the global magnesia Industry

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Setting the scene

- The historical global perspective
- Chinese influence on production
- Chinese influence on trade
- Growth of domestic markets in China
- Chinese government policy shaping the future

The historical perspective to 2000

Key Trends

1983-1993

Chinese exports rose from 312kt to 2.16Mt – making it the world's largest source of magnesia.

1993 Imposition of dumping duties on imports of Chinese magnesia into the EU

1990- 2000

The rise of EFM - China now accounted for an estimated 80% of EFM (Fused magnesia) production by 2000. EFM now firmly established in refractory formulations – putting pressure on ROW DBM magnesia producers

- Very little growth in refractories demand between 1990 and 2000.
- Increasing supplies of magnesia from China from 1980. and by 2000 Chinese production accounted for an estimated 46% of global output – increasing market share as demand, particularly from refractories was weak.
- Between 1990 and 2002 over 1Mtpy of high value non-Chinese DBM and EFM was closed
- Chinese export quotas introduced

Historical perspective – 2000- 2017

Key trends driven by Chinese production and exports

2000 onwards: Increased foreign investment in China in resources and end uses

2005 Chinese imposition of Export tariffs. Export quotas had been introduced previously which had raised prices gradually over the previous decade

2012 Five year plan – The control of output and adjustment of industry structure. Priority given to satisfying refractory demand for domestic steel and other industries, as well as refractories for export rather than exports of magnesia.

- A number of major refractory companies worked to become self sufficient in magnesia
- Other refractory producers invested in refractory operations and magnesia plants in China
- 2012 Five Year Plan for magnesia included the development of high tech production sectors for magnesia in Yinghou and Anshan and the development of a high performance refractory industry

Production

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Global reserves 2017 (000t MgO content)

	<u>Country</u>	<u>Reserves¹</u>
Macrocrystalline	Austria	50,000
	Brazil	390,000
	China	1,000,000
	North Korea	1,500,000
	Russia	2,300,000
	Slovakia	120,000
	Spain	35,000
	USA	35,000
	Subtotal	5,430,000
Cryptocrystalline	Turkey	390,000
	Australia	320,000
	Greece	280,000
	India	90,000
	Subtotal	1,080,000
Not specified		1,400,000
Total listed		7,910,000

Source: USGS Mineral Commodity Summaries, January 2018, Company information

Notes: 1. That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently sub-economic.

2-For Australia, JORC-compliant reserves were 38Mt.

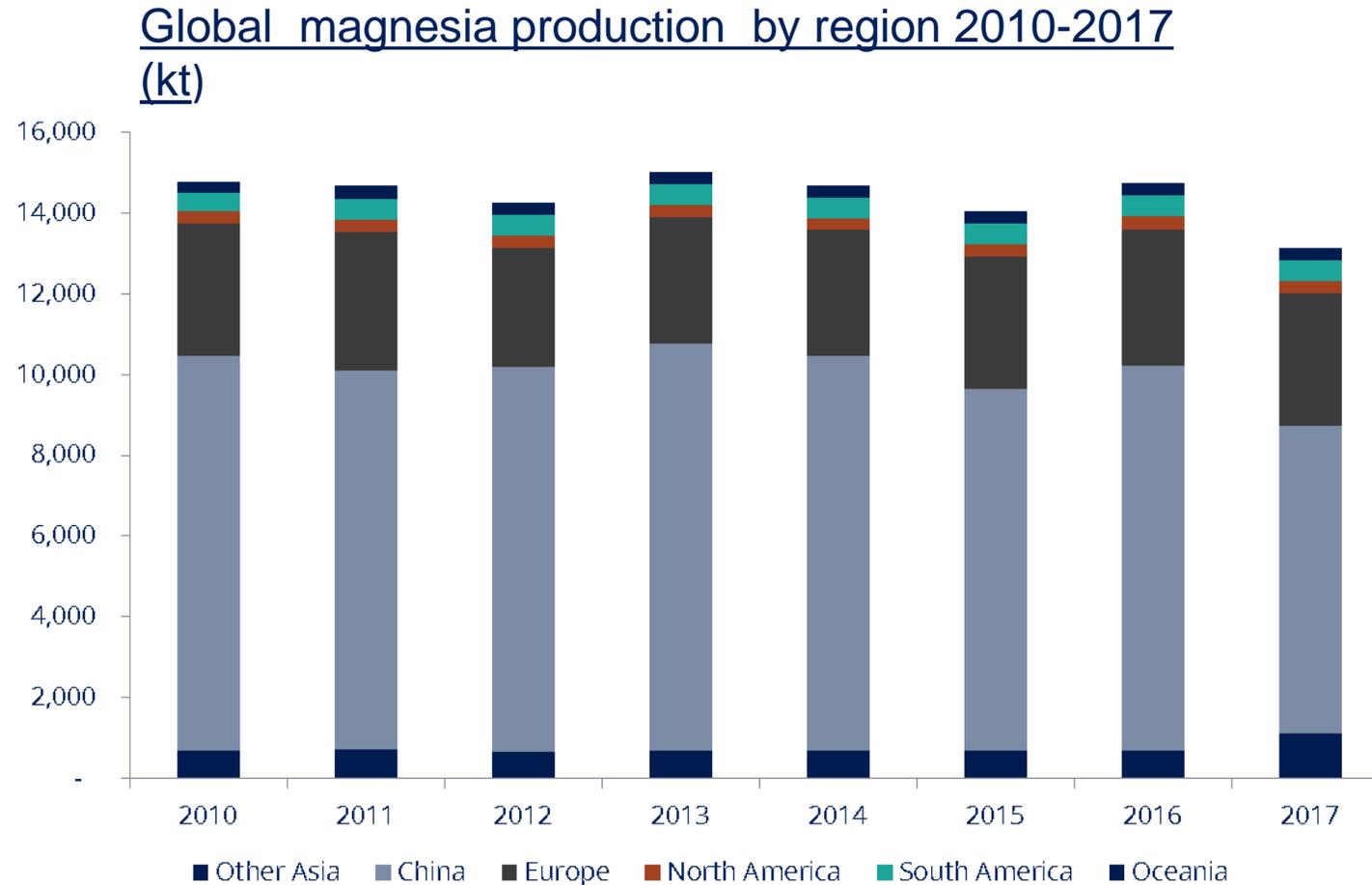
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The reserve base shows the more common occurrence of macrocrystalline magnesite reserves globally, which account for the majority of Chinese reserves.

There is a definite policy shift in China towards the management and conservation of high grade magnesite resources. China has minimal reserves of cryptocrystalline magnesite compared with other countries.

Source: Roskill

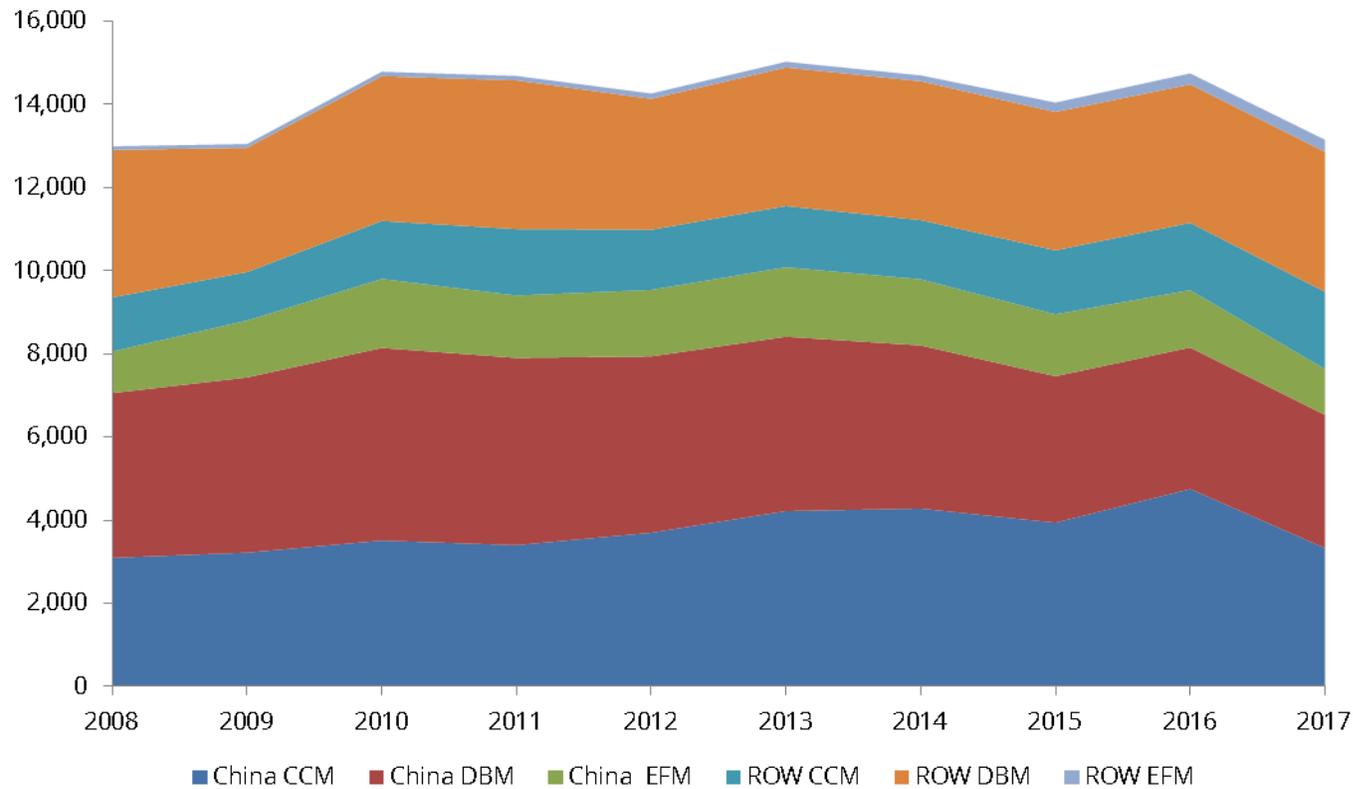
Chinese magnesia dominating supply for exports and domestic demand



- Chinese magnesia production levels have increased since 2000 to feed the domestic demand for refractories for the growing steel industry in addition to exports of mag-carbon bricks.
- Proportionally, Chinese production has become more important to global supply since 2000

China dominates EFM production today

Global magnesia production by type, and separated for China (kt)



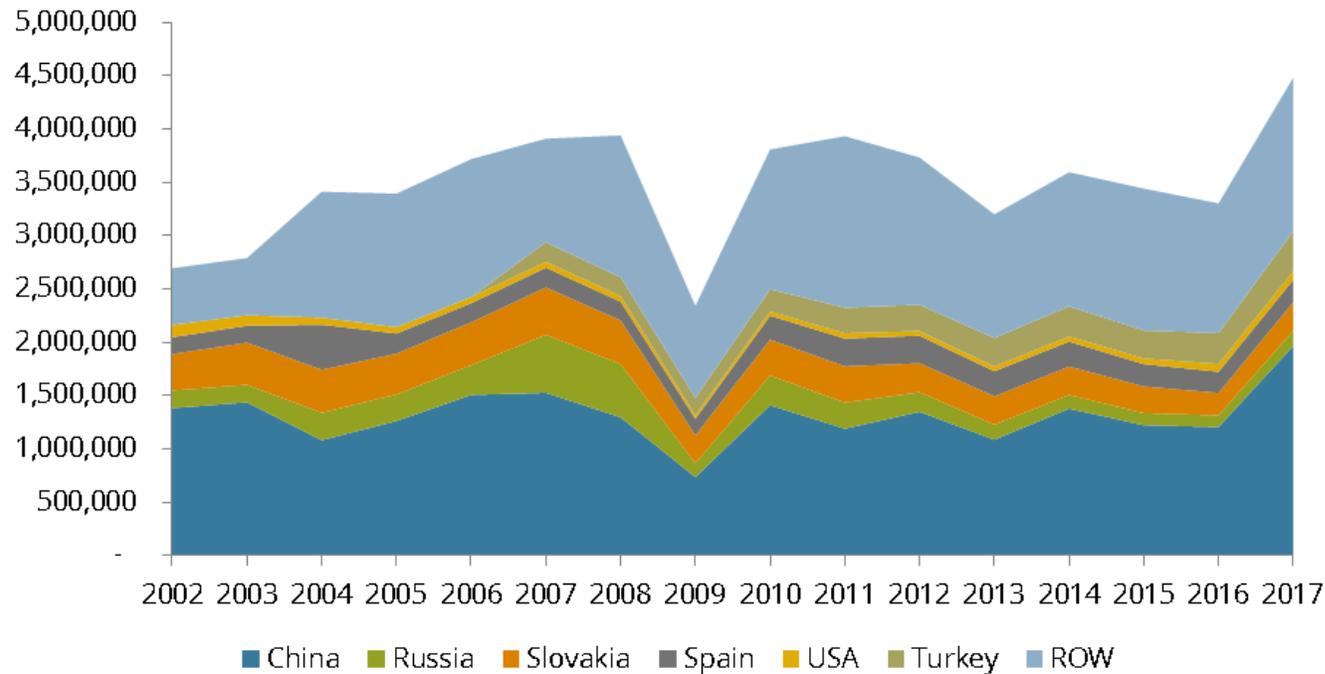
- DBM production split almost 50:50 between Chinese producers and ROW producers in 2016
- EFM production dominated by China, which represented 84% of global production in 2016.

Trade

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Leading exporters of magnesia – again showing Chinese influence on trade

Global magnesia exports 2002-2017 (t)

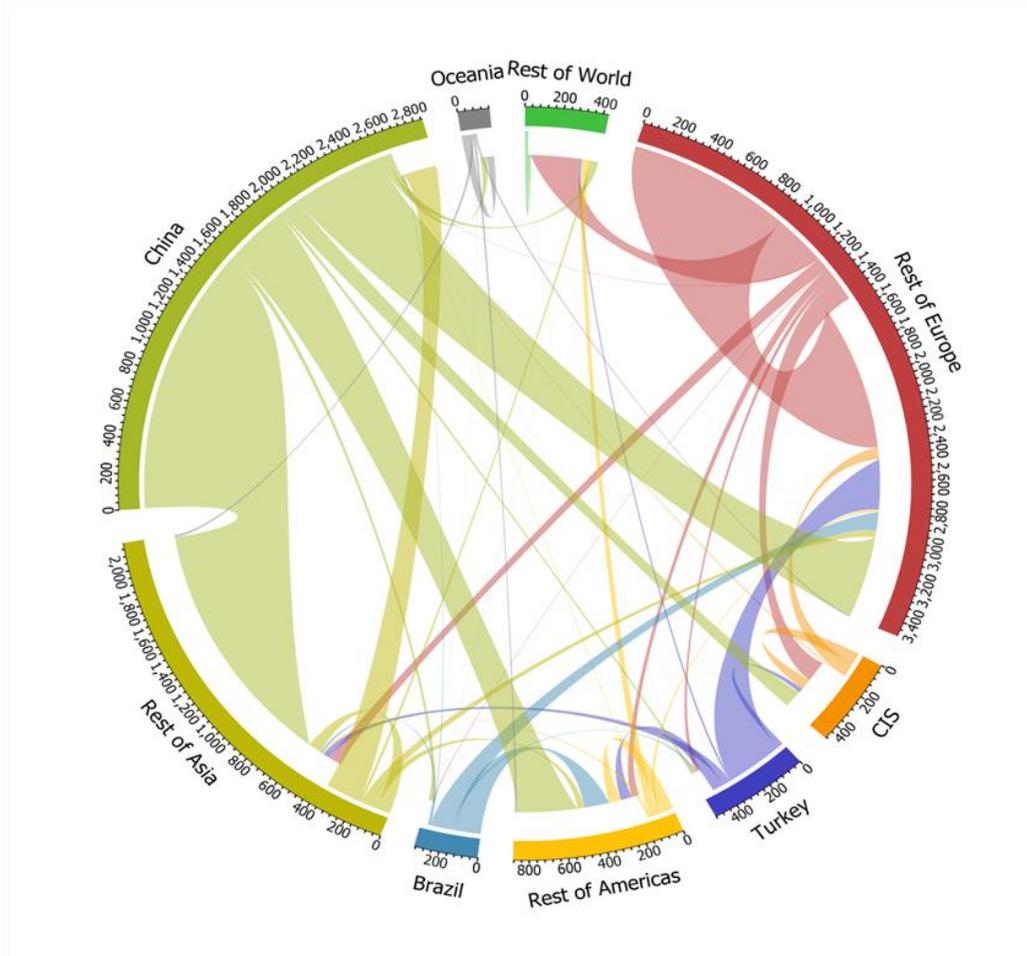


- China continues to be a major player in world trade
- Turkish exports have increased, whilst Russian exports have declined as a proportion.
- Higher exports in 2017 due to rise in Chinese exports
- This includes CCM, DBM and EFM

Source:
Note:

GTT
In ROW the Netherlands is a major exporter which includes magnesia transhipped to other European countries and sourced from outside Europe

Export magnesia trade flows – showing Chinese dominance

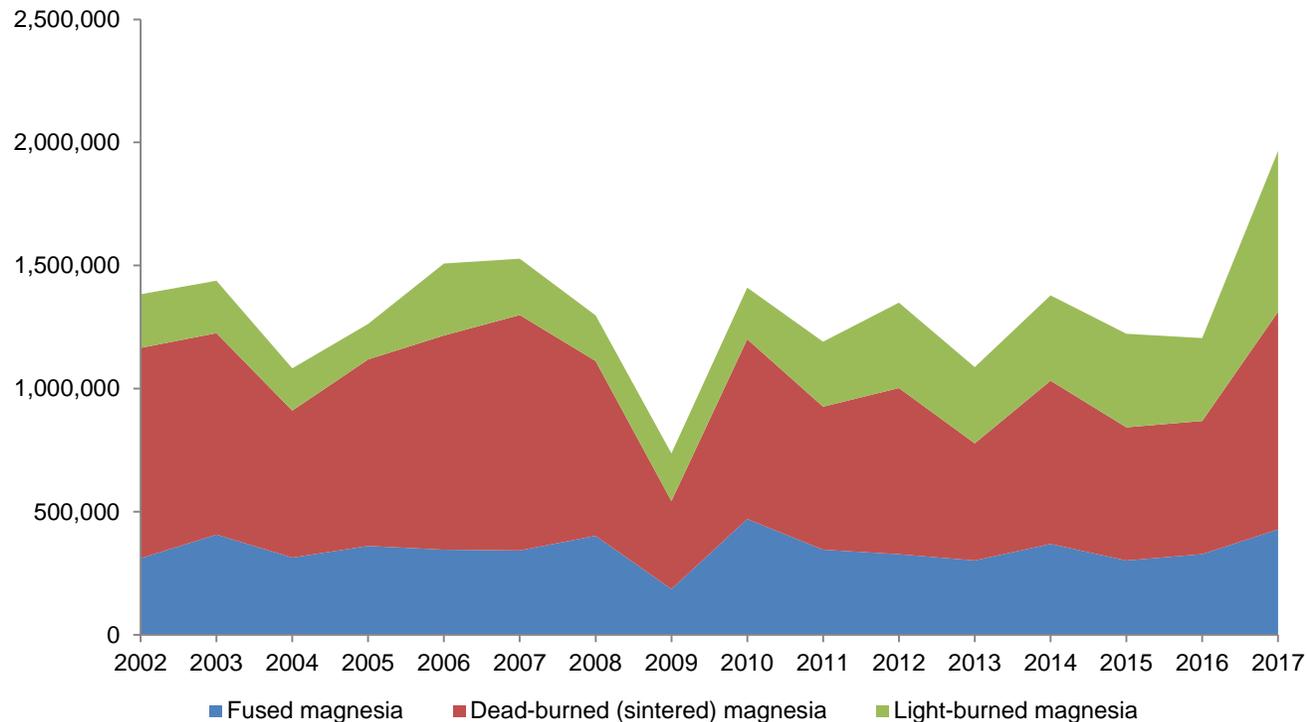


Source: GTT, Roskill

- Includes low grade magnesias from China (>70%) (may include other minerals with a magnesia content such as olivine)
- Note some imports into China in 2017. Mainly CCM from North Korea and some high grade magnesia from other sources
- Note Brazilian and Turkish exports – mainly to Europe.

Chinese exports now at much lower levels than those over 2Mtpy seen previously up to 2000

Chinese exports of EFM, CCM and DBM 2002-2017 (t)

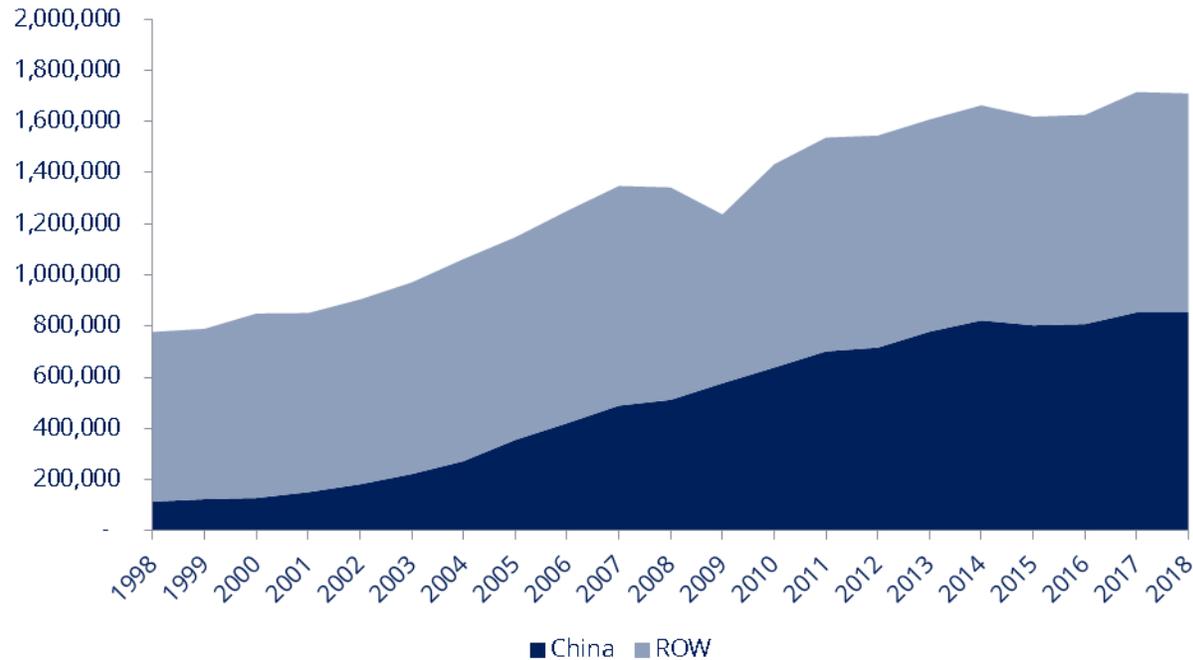


- Longer term trend has been a decline in Chinese exports of DBM, as DBM has been consumed by the domestic refractories industry
- Removal of export taxes at the beginning of 2017 sent exports soaring – to the highest level for many years. This was combined with an improvement in refractories demand which had been building in 2016.
- China is the largest exporter of CCM. Exports rose to 653kt in 2017 up from 337kt in 2016.
- Relatively stable exports of EFM between 2011 and 2016

Growth in Chinese magnesia markets

Chinese refractory production has grown to meet the needs of the domestic steel industry

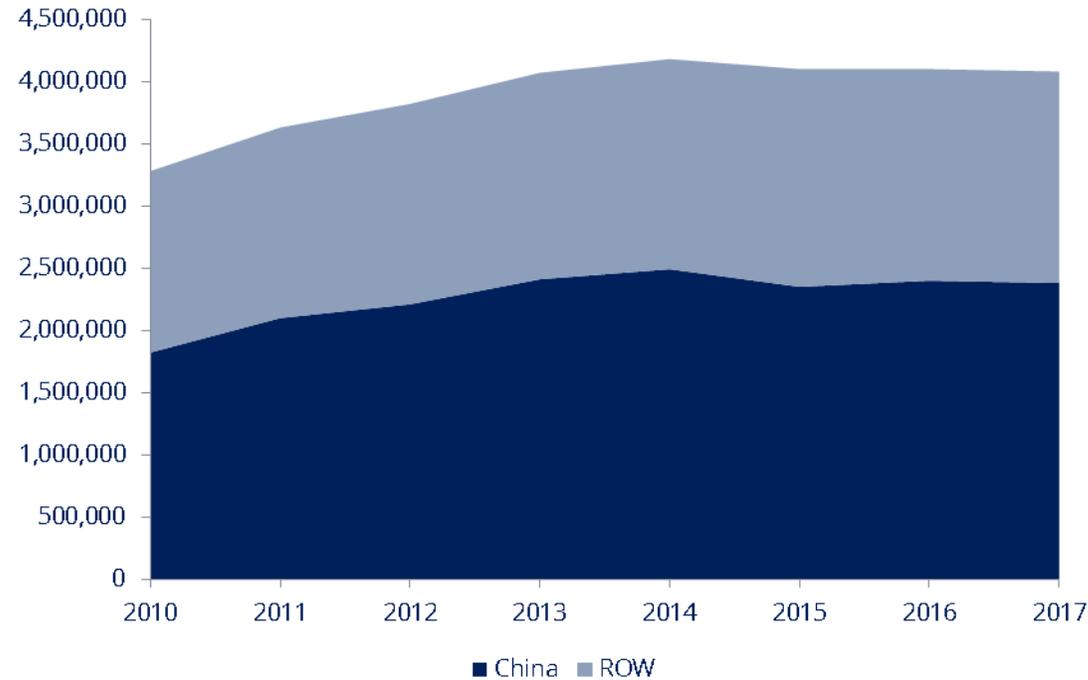
Growth of the Chinese steel industry (kt)



- The Chinese steel industry has grown by a CAGR of 10.6% between 1998 and 2018, from a level of 115kt to a predicted 854kt in 2018
- Most of the global growth in refractory production has taken place in China over the last 20 years. By 2010 Chinese refractory production represented 70% of the global total.
- The unit consumption of refractories in China has fallen

.....and also the Chinese cement industry

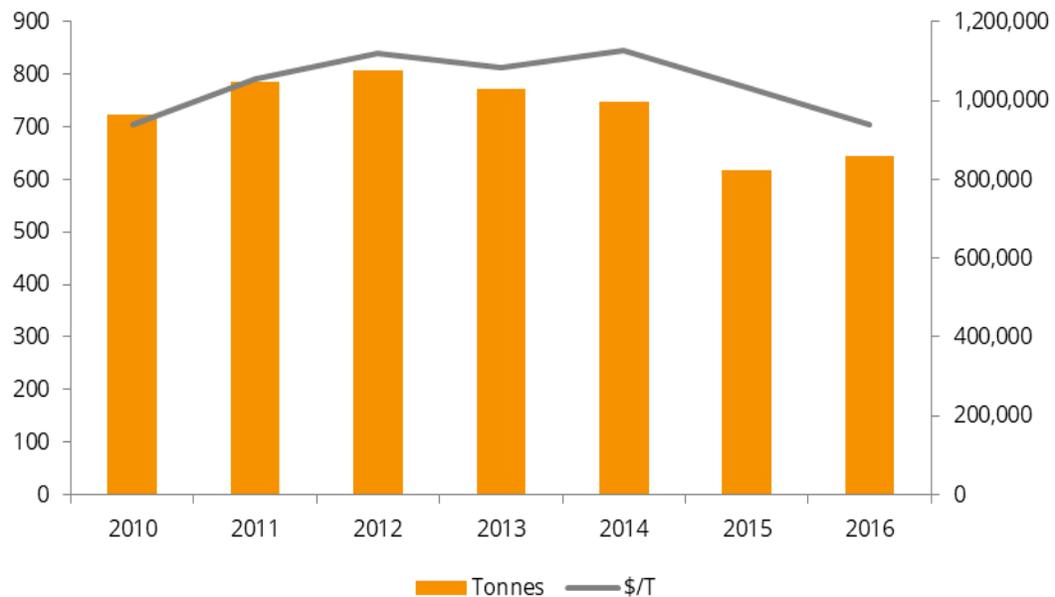
Chinese and ROW cement production (kt)



- China represented 60% of global cement production in 2017 with production of an estimated 2,500Mt of cement,
- Cement industry is affected by recent environmental regulations and closures
- Longer campaigns and further use of waste fuels are placing increasing demands on the refractories for cement industry - and the magnesia raw materials

The growth in magnesium-carbon refractory production in China and Chinese exports over the last 20 years has increased domestic refractory magnesia demand

Exports of refractory bricks containing >50% MgO (t)



- Rationalisation in the refractories industry from the late 1990s onwards saw production centres shift, especially China
- Chinese exports of basic refractory products rose to a peak of 1.08Mt in 2012. Exports were 858Kt in 2015, but are expected to stabilise closer to this level or even decline in the medium to long term.

Government policy shaping the magnesia industry

13th Five Year Plan 2016-2020 – a sea change for the magnesia industry

“Requires local government to improve energy efficiency and processing technology”

Main change is that this is being centrally driven by the Ministry of Ecology and the Environment, not at Provincial level government.

New regulations are being enforced and operations closed until inspected, and then only given licence to reopen if all new pollution and environmental criteria are met

Measures being implemented in 2018

- Stringent and repeated regional inspections
- Ban on the use of dynamite explosives
- Suspension of non-compliant mines and burning plants
- Switch to shaft kilns for CCM production, to rotary kilns for DBM production and elimination of smaller EFM furnaces
- Installation of filters in ore processing and burning operations
- In some provinces, substitution of coal by natural gas fuel
- Dust prevention measures
- Tax evasion clampdown
- Clampdown on illegal mining

Conclusions

How is this shaping the future in China?

- Reduction of overcapacity in China
- Tighter supply of high grade magnesite ores
- Increasing processing of lower grade ores to meet high grade qualities – higher opex for Chinese magnesia producers
- Increased costs to meet pollution control regulations and investment in modern technologies
- Switch to gas fuel for some producers will be difficult owing to infrastructure
- Potential for “synthetic magnesia production” in China from brine sources or development of new processing technology

Uncertainty for the next two years

- New projects could be accelerated
- New opportunities for ROW producers as rising costs will make ROW magnesia more competitive
- New patterns of global trade, especially in Europe
- More focus for Chinese producers to satisfy domestic demand rather than export markets

However, China will continue to lead the magnesia industry in terms of production, demand, and trade. It will take at least two years for a new landscape to emerge, when the medium to longer term picture will become clearer.

Thank you

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