



The Changing Face of the Global Refractories Industry

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Overview

- Industrial Minerals Magazine and refractories
- What has happened in the last few years in North America and elsewhere?

Mergers/acquisitions/restructuring

Raw materials

Finished products

- View from the top Q&A: RHI COO Andreas Meier
- Changes in the steel industry
- The good news!

Industrial Minerals Magazine

- Founded 1967- world's leading non-metallic minerals info source
- Many key industrial minerals used in refractories - bauxite, magnesite, chromite, "fireclay", silica, andalusite, dolomite, sillimanite, graphite etc
- Our worldwide coverage in editorial and events (including regular Chinese meetings) gives us a good handle on trends



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M&A's/restructuring- What has happened in the largest companies?

- **RHI** has dissociated itself from US subsidiaries (only purchased 1998-2000) which are now under Chapter 11 and resolving asbestos liabilities- plant sales continue
- **Cookson/Vesuvius**- closures as result of Premier integration and downturn: 12 plants on top of already closed operations in the UK
- **National Refractories**- under Chapter 11, planned sale either all or in part by the end of 2002
- **LWB**- arose out of lime giant Lhoist buying Baker- has closed plants in UK and Mexico

Other mergers and tie-ups

- **Krosaki**- merged with Harima to be no.1 in Japan
- **Shinagawa**- collaboration with Kobe/Thermal Ceramics
- **Thermal Ceramics**- phased sale of brick business to Shinagawa; plant closures in UK/Brazil, cutbacks elsewhere
- **Minteq**- acquired Martin Marietta Magnesia Specialties
- **Resco**- acquired RHI (H-W) ops in Hammond and Marelán as well as some RHI brands
- Activity in **China**- mostly domestic expansions or JV's

Annual Refractory Production - U.S. and Japan

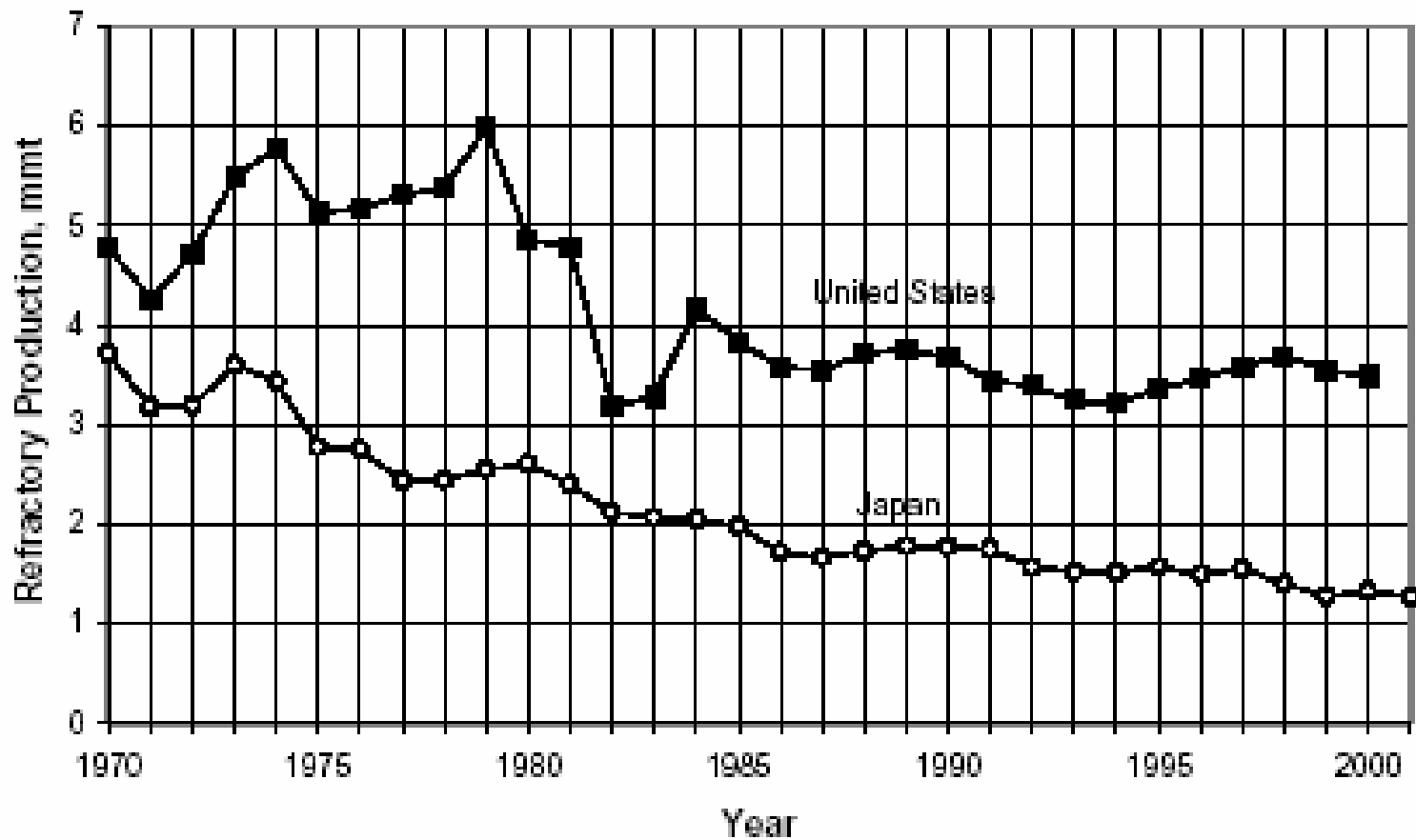


Figure 1. Annual Refractory Production in the United States and Japan since 1970.

Annual Refractories Market Value

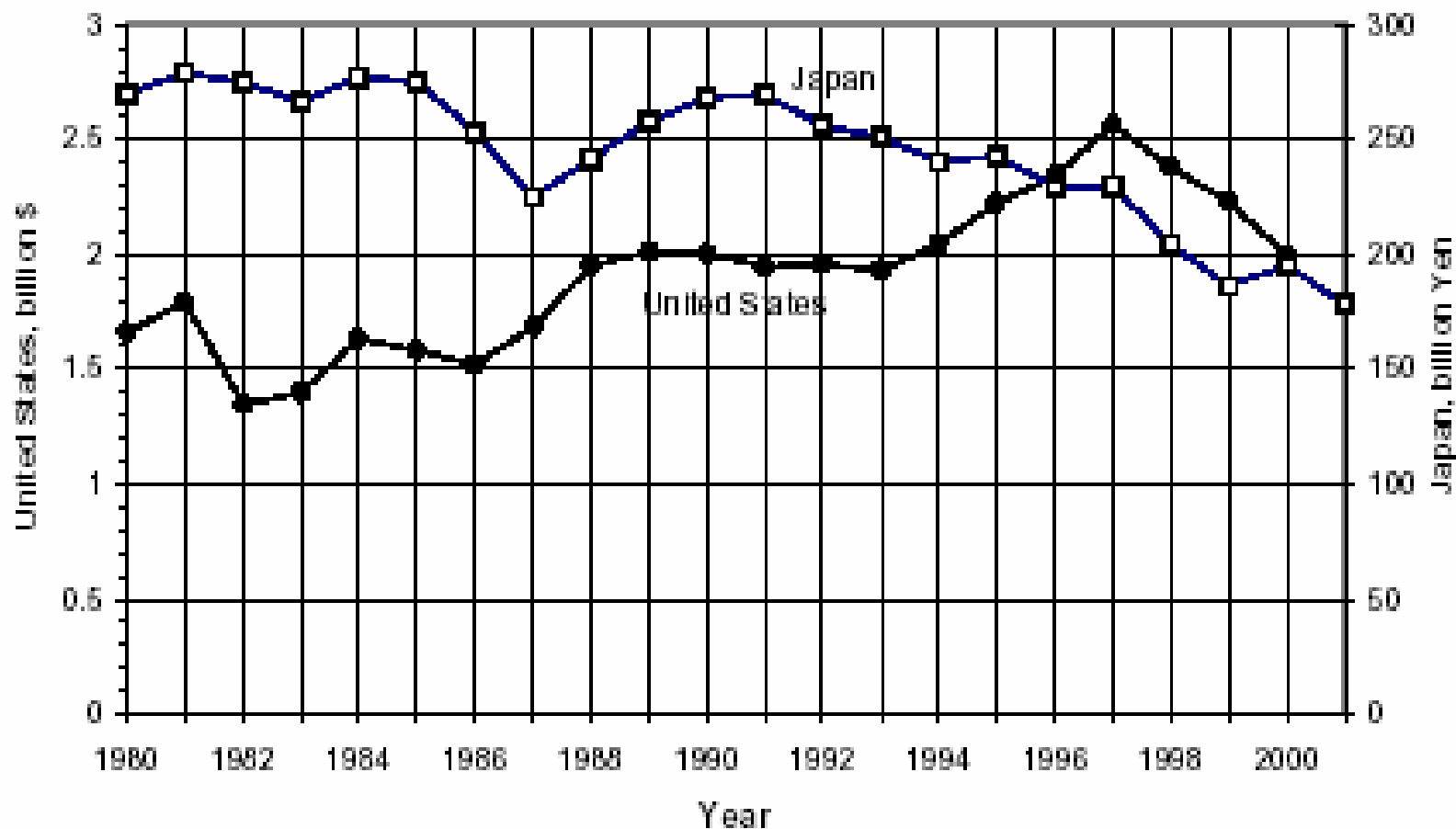


Figure 2. Annual Refractories Market Value in the U.S. and Japan since 1980.

Raw Materials

China- need I say more?

- Its dominance in raw material supply has increased hugely in past ten years
- More sized/processed minerals export- quality improvement
- Better trade situation- more stability in export licenses, some antidumping measures removed, WTO membership
- Direct raw materials sales set to increase further



Raw Materials

China- Mineral by mineral

- **Bauxite**- under fire from env. Issues- closure of shaft kilns; lack of investment for new rotaries. Marginal business for traders. China still dominates though
- **Magnesite**- very strong market. More consumption from domestic mag-carbon production
- **Fused alumina**- already well established. EU duty just expired October 2002
- **Silicon carbide**- China strong but hefty antidumping duties
- **Graphite**- very strong competitor worldwide
- **Clays/silica**- increasing production of synthetics eg. mullite
- **Zirconia**- baddeleyite on way out- production from mineral sands now dominates

Raw Materials

Elsewhere in the world

- **Guyana bauxite**- supply remains low- reliability a problem
- **Brazil**- overtaken Guyana as no.2; still a lot of potential for bauxite growth. **MSL/Caemi** leads
- **Imerys**- established itself as key supplier through CE Minerals, Treibacher, Damrec/Samrec, Timcal (also owns Plibrico SA)
- **NA/European magnesia**- eg. Nedmag, Premier Periclase, Baymag still important for high purity grades. Britmag in UK closed
- **Graphite**-outside China mainly Brazil, Mexico, Canada, other but US and Germany important processors/traders

Finished products

- Decline in brick consumption in favour of monolithics- this trend continues as application techniques improve
- Decline in specific consumption continues though clearly this has a bottom limit
- Move away from silica and chrome products for environmental reasons except certain areas eg. glass
- Move away from standard firebrick products in China, India for performance reasons
- Big picture- globalisation. Away from handful of large companies with numerous large plants to smaller companies or divisions focussing on speciality market areas or regions

Finished refractories... China

- One of the most significant trends is finished product from China: following % imports of consumption in USA from the US Census Bureau

1999: mag/mag-carbon/chrome brick 39%;

2000: this had increased to 44.5%

1999: clay bricks and shapes 18.9%;

2000: this had increased to 39.2%

- Steel companies themselves often at the forefront of imports- Corus in Europe, UEC (US Steel) in USA
- Numerous other examples you may have come across- Liaoning-Mayerton, Shandong Refractories, Wuxi Sujia, Puyang, Baotou

Where are the world “majors” in China?

- A difficult market competing against domestic producers but quite well established- major examples are:

Dalian Morgan Refractories Ltd (70%- 1991)

Orind Refractories Ltd (100%- 1995)

RHI Refractories Liaoning Co. Ltd (60%- 1995)

Kingkou Kyushu Refractories Co. Ltd (26%- 1996)

Vesuvius Advanced Ceramics (Suzhou) Co. Ltd (100%- 1998)

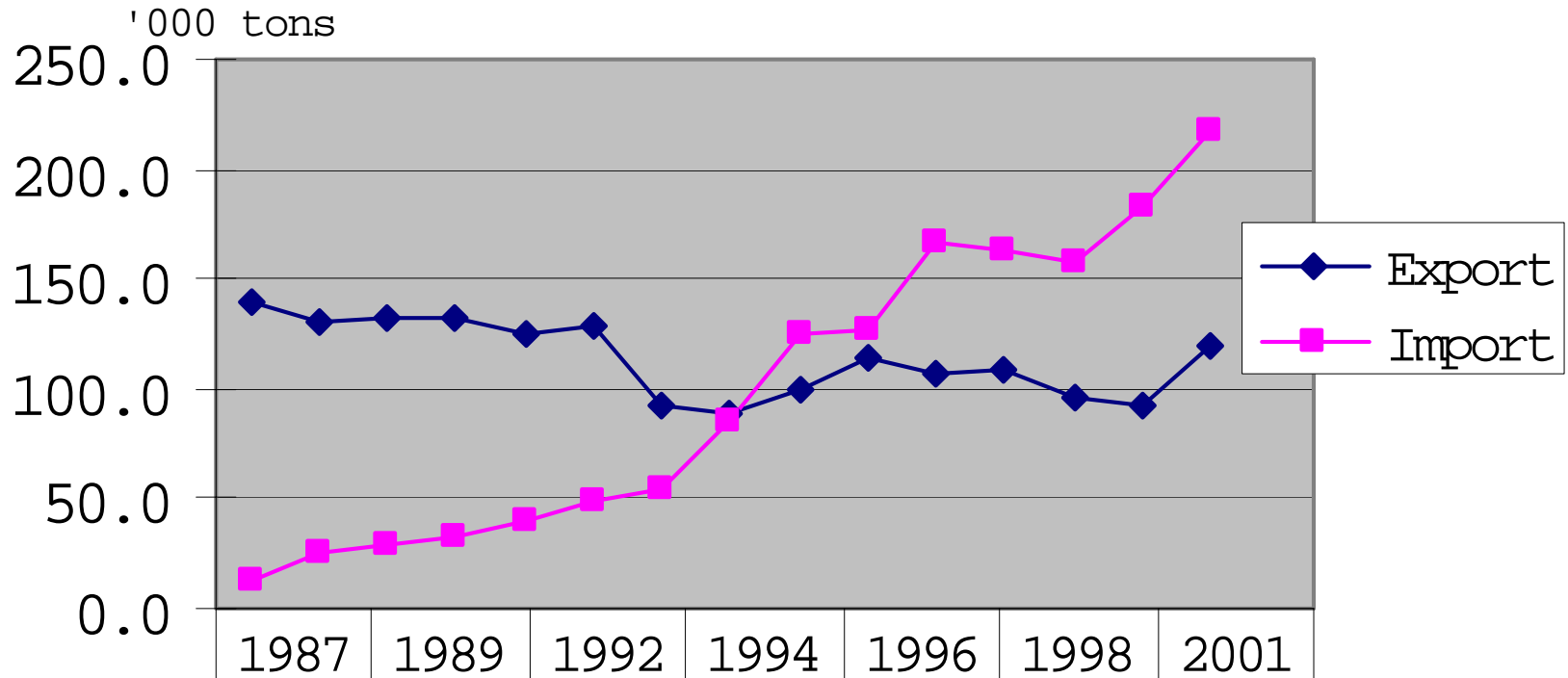
Allied Mineral Products (Tianjin) Co. Ltd (100%- 1999)

*Shanghai Morgan Matroc Technical Ceramics Co. Ltd (90%-
2000)*

Other markets- Eastern Europe/South America/rest of Asia

- Considerable western capacity moved to E. Europe and S. American regions to reduce production costs
- Still a lot of growth potential for higher performance refractories
- South America unstable economically however
- Eastern Europe- cost increase once Poland etc join EU in 2004?
- India- huge potential with strong domestic companies eg. Tata Refractories, Orind (Orissa Industries), OCL
- Japan- still quite a closed market with high pricing, but imports really starting to make inroads
- Taiwan/SE Asia- losing share to China?

Japan Refractories Export & Import



Export	138.8	132.6	128.9	88.7	113.6	109.1	119.7
Import	13.3	29.2	48.4	85.9	126.9	163.2	217.8

View from the top- RHI AG

- Andreas Meier, deputy chairman and COO; responsible for refractories division
- Headquartered in Vienna, Austria
- Brands- Radex, Franchi, Didier, Harbison-Walker, Narco, Zircoa etc
- Still the world number one when looking at total refractories production



Q: What's going on in the US?

**(RHI AG remains the sole shareholder in RHI America-
recently renamed ANH Refractories)**

- *Our companies in the USA had to file for Chapter 11 due to asbestos liabilities, but the North American refractory industry was changing anyway, with a poor price structure and high production costs. But RHI has not definitively turned its back on the US assets - our future moves depend simply on the extent of future asbestos costs. We are still supporting RHI America by not directly competing and are still contractually getting money from others involved in the asbestos issue eg. Honeywell.*

Q: Has steel slippage been countered by growth elsewhere?

- *Steel still represents the majority of refractory consumption- 70% compared to 30% remainder. But no, the decline in specific consumption has not been compensated for by demand for refractories in cement, glass, aluminium and other markets. These industries have themselves been suffering from overcapacity and the current economic situation.*

Q: How is raw material sourcing changing?

- *By far the most significant change is the shift to China which has changed the whole picture, giving access to cheaper raw materials such as fused magnesite, as opposed to seawater derived magnesia. Producers like Nedmag and Penoles still supply high purity material but have little chance against standard Chinese fused magnesite because of the gulf in production costs. We have a Chinese purchasing manager and are developing this. While traders still supply the majority we intend to change this to the point where we will use them mostly in co-operation for freight. In ten years time the majority of our minerals supply will be direct sourced.*

Q: What's your take on consolidation?

- *Consolidation in the industry is advanced in Europe and the US driven by the actions of RHI and Cookson but it is not yet finished, and an equilibrium has not yet been achieved. In the consuming industries too, a lot of consolidation has occurred in the aluminium and cement industries but there is still a lot of work to do in steel. My guess is that the steel industry will continue to consolidate to about 5 world companies.*

Q: Can you sum up Chinese potential?

- *In terms of refractories supply, the Chinese market is the main focus currently as it has the fastest growing steel industry. However, volume wise, refractory consumption is not increasing as rapidly as might be expected because of the increased use of modern steel process routes that require a shift from low-grade fireclays to high grade products. RHI has experienced a growth rate of over 10% per year but we still have a small share relative to the overall Chinese market, where there are a huge number of suppliers. But RHI will expand in the supply of specialty products. We plan to double the current capacity of our Chinese joint venture, which has been highly profitable to date.*

Q: China...continued

- *There is also a clear trend towards more finished refractories coming from China. While there is an export licence for many refractory raw materials, there is not for finished products. This has driven Chinese producers towards adding value rather than supplying crude mineral products. At RHI we are addressing this, having our own supply chain through our Chinese JV, from which we can serve a full range of products.*

Q: What about product trends?

- *We are co-operating more and more with our big consumers, trying to further minimise the cost of production by reducing the cost/tonne of steel produced. However, the competition in the market means there is considerable pressure on pricing. Some speciality areas like BOF and de-gasser products are still reasonable but for commodity products such as EAF bricks it is currently very difficult to sustain reasonable margins.*



Markets- Steel USA

- US restructuring well underway- under Chapter 11 includes Bethlehem, Geneva, National, LTV, Wheeling-Pittsburgh
- Some success stories- Dofasco, Nucor, ISG
- Some consolidation already eg. Nucor and Birmingham
- Still a lot of room for consolidation though- much more has occurred in cement, aluminium etc- just think of **Alcoa**, Alcan, Holcim, **Lafarge**
- **Steel tariffs** have had little impact globally on refractories

Realism is finally here

Robert Miller, Bethlehem chairman and CEO 20/9/02

- *“Although the industry has been seriously injured by unfair trade, Bethlehem has productivity disadvantages compared to certain of our domestic competitors as well. The key players in the domestic steel industry are no longer the old, stand-alone fully integrated firms like Bethlehem. Instead, newer, more nimble firms like Nucor and ISG are setting the standard for modern work practices, compensation packages that reward workers based on the success of their individual business units, outsourcing non-core work, absence of restrictive work rules, and appropriately staffed facilities.”*
- **This is mirrored in refractories-** you could equally say “the key players in the domestic refractory industry are no longer large brick plants”

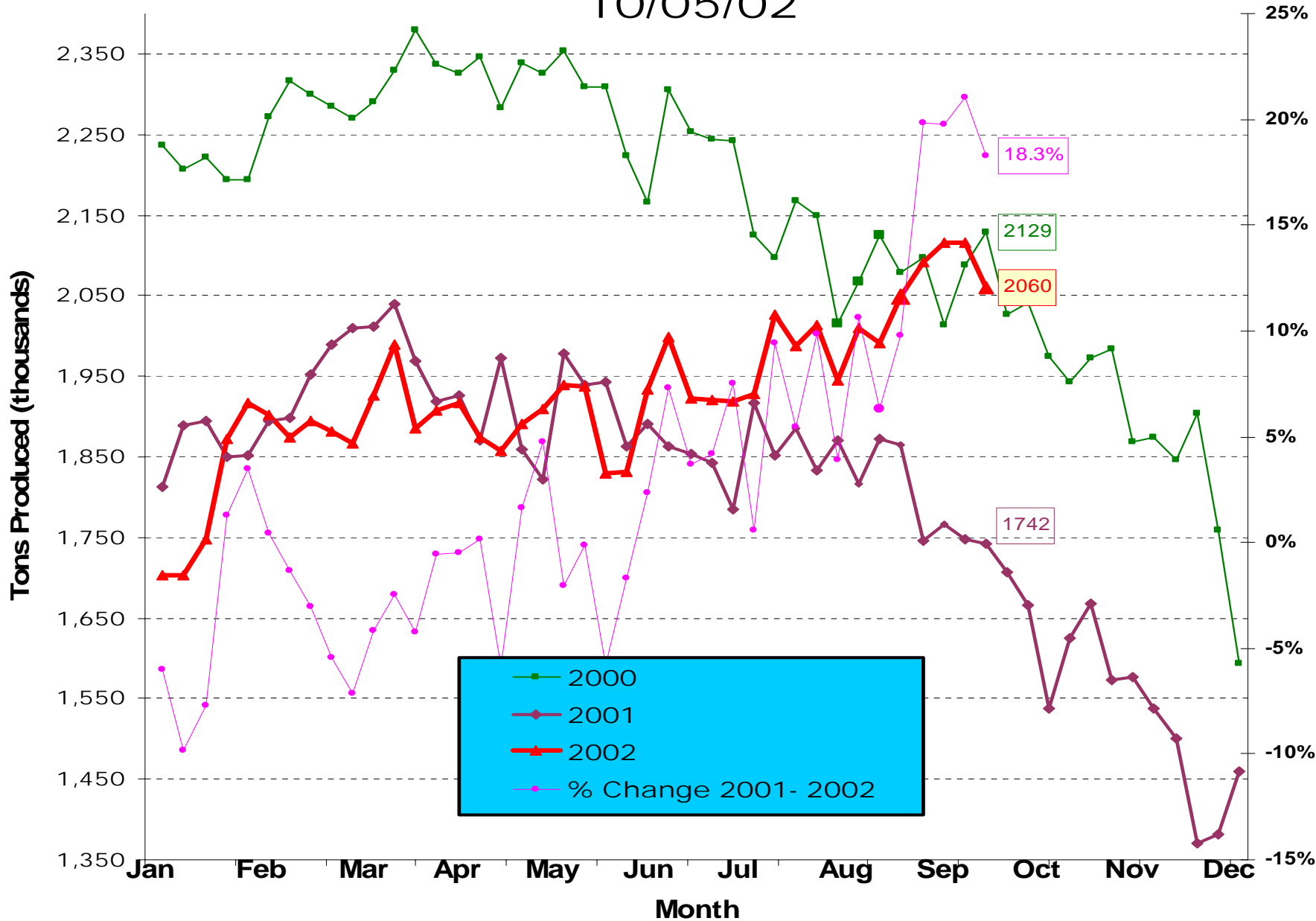


Steel elsewhere

- Europe- a lot of consolidation has already occurred- Corus, Thyssen Krupp, Arcelor
- Already three plant closures this year. Production flat to small decline
- Japan- Kawasaki/NKK (to create new JFE Group), Kobe/Nippon/**Sumitomo** collaboration
- China- only major growth area (crude steel 25% up for first **8** months 2002 versus same period 2001 to **over 115m. tonnes**)
- But also rapid modernisation- therefore domestic refractory growth not as significant as might be expected

USA Raw Steel Production Week Ended

10/05/02



Other markets example- glass

- globally consumes 0.75-1m. tpa of refractories, far less than steel
- the demand for higher-performance refractories eg. magnesia-zircon – is increasing
- over 95% of refractories used in the glass industry are shaped. Monolithics are always used in combination with shapes
- twenty years ago, glass consumed 11-13kg/tonne of refractories, a figure that has dropped to 4.5-5.5kg/tonne today. Steel, on the other hand, has reduced consumption from 30kg/tonne in 1980 to 10kg/tonne today

The good news...

- Necessary consolidation already well underway - return to stability
- Steel has recovered more quickly than some predicted
- Major issues such as retirement funds and asbestos liabilities may be closer to resolution
- Refractories are not an optional extra item - they will always be needed
- Countries like China and Russia offer huge potential