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A view on the European Refractory Industry

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The author refers to the basic role of the Refractory Industry within the context from raw material to the use of products and outlines the major important political, economic and technical impact of the future

Key words: refractory materials, refractory raw materials, refractory industry trends, refractory industry crisis.

Una visión de la industria europea de refractarios

En el presente artículo se revisa la situación actual de la industria refractaria en Europa y se dan unas perspectivas de futuro para el sector, destacando su importancia política, económica y técnica. Dentro de este contexto se da una visión tanto de la situación de las materias primas como de los distintos uso de los productos refractarios y sus tendencias de futuro.

Palabras claves: materiales refractarios, materias primas, tendencias de la industria refractaria, crisis de la industria refractaria.

INTRODUCTION

The Refractory Industry suffers as most of the others actually under one of the most severe crisis of the past decades. Nevertheless this industry faced during the period after the World War a permanent challenge regarding the technological and economical evolution which in some periods pointed out to be extremely severe and putting a sustaining future into question.

In this presentation the author gives an outline around this industry in four segments:

- What is the role of the Refractory Industry in a political economy
- What are the Technical drivers
- What is the Economic background and evolution
- The outlook: what are the stakes, what are the obstacles

Of course, the statements given in the paper are more or less subjective, and are based on long experience in the industry They should give impacts for discussions This presentation is not subject to give an forecast of the future or to deliver recipes for strategies for the future market development but it should give some background for discussions about the future trends and developments.

- *A short view on the position*

TABLE 1. CERAME-UNIE INDUSTRIES IN EUROPE BASED ON FIGURES 2006

	SALES (x 10^3 mill EUR) (2005)		MANPOWER (x 1000) (2005)	
Wall/Floor tiles	(10.8)	10.9	(68)	67
Bricks/Rooftiles	(6.6)	** 6.8	(56)	** 58
Table/Ornamentalware	(1.8)	1.8	(35)	31
Refractories	(3.3)	3.5	(26)	26
Technical ceramics	(2.6)	2.7	(10)	10
Clay Pipes	(0.2)	0.2	(2)	1
Total	(27.3)	28.1	(226)	221

*EU-25 data when available
** estimated

Within the European Ceramic Industry, the Refractory Industry is on third place after Brick/Rooftiles and Wall/Floortiles with a 12.5% share of sales of the total sales of the Ceramic Industry.

Nevertheless, The Refractory Industry is one of the very basic industries, without which no thermal processing in subsequent Industries is possible.

WHAT IS THE ROLE OF THE REFRACTORY INDUSTRY

Technical Definition and position in the Industrial environment

A material is classified Refractory if it has a melting point of > 1520°C, a high refractory material melts only at temperatures of more than 1830°C. But there are numerous materials which soften already at lower temperatures and they are segmented as well under refractory or better thermal resistant products.

But heat is not the only challenge for Refractories. They are in most cases of applications subjected to other challenges as:

- Thermal shocks
- Abrasion
- Slag attack
- Attack of aggressive metals
- Attack of gases as CO in coke ovens, blast furnaces, etc…

Summed up, Refractories are exposed to very severe conditions where they have to deliver their performance. This means that in contrast to many other ceramic products as tiles, sanitaryware etc., the lifetime of Refractories is not only determined by their structure and properties and their

manufacturing process, their performance is as well mainly determined by their working environment and application.

Consumption in different industries

The following table shows the average consumption of Refractories in different industries and can be applied for the European area

TABLE 2. SPECIFIC CONSUMPTIONS OF REFRACTORIES[1,2]

1 to of this material	needs	so many kg of Refractories
Steel	→	10 kg
Glass	→	4
Cement	→	1
Lime	→	0,7
Copper / NF Metals	→	2,7
Waste Incineration	→	5,5

A simpler but even more efficient view gives the following:

- Every average car needs for its production about 10 kg of Refractories
- The production of an average air plane consumes about 1.1 t of Refractories and
- A 80000t vessel needs 650 t of Refractories out of which account about 600 t only for the steel production.

Based on these facts, the end-use of Refractories going into the consumer industries reads for the European area as shown in Figure 1.

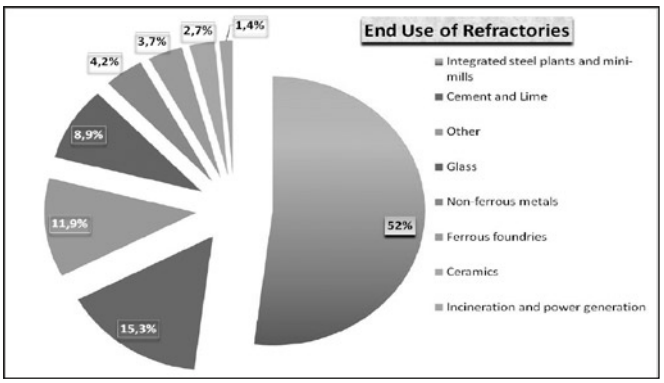


Figure 1. End-Use of Refractories - EU 2007

The vast majority goes into Iron&Steel production, whereas the other consumers, glass, cement, etc. follow with a big distance.

Due to permanent efforts in improving the efficiency the Refractory Industry contributed already to the reduction of greenhouse gases before this came into the common awareness. Example: 20 years ago for the production of 1 t of Steel about 30 kg of Refractories where needed whereas today it has been reduced by about 60% down to 10 kg/Refractories. The same developments are as well found in the other industries.

Economy wise this Technical improvement lead to dramatic problems as the Industry suffered under permanent overcapacities, as they were not adjusted in the same speed as the reduction of consumption occurred.

IMPORTANT CONTRIBUTION OF REFRACTORIES FOR TECHNICAL PROGRESS

Why can a car producer guarantee 10 years for a car without rust?

One of the main reasons is the development of high quality steels which can be produced in regularity, which seemed to be impossible two decades before. Secondary and even tertiary metallurgy improved as well steel quality as well productivity and thus also the ecological aspect of steel production

One important element among others was the development and permanent improvement of the gas purging process in ladles. (Fig. 2 and 3)

Looking not only to the Technical issues but also to the balance of volumes and weight show the predominant role of high quality Refractories for high quality steel processing.

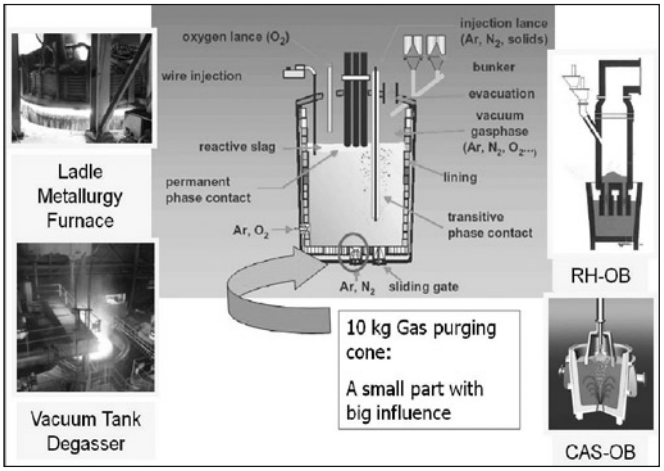


Figure 2. The Steel Ladle as Metallurgical Reactor[3]

Figure 3. Gas Purging Cones Reactor[4]

• ***The Technical issues of a purging cone***

The purging cone is a precast product made out Low Cement or even Ultra Low cement castables based on sintered Alumina and or mixtures of that with Spinel or Spinel forming aggregates with following key aspects:

- High temperature of application ≥ 1850°C
- High temperature spalling resistance
- High mechanical strength against abrasion through the metal
- High chemical resistance against metals and against infiltration

Only to mention the most important aspects.

The task of a cone within a ladle:

- 100% blow rate, i.e. no plugging allowed[5]
- Balanced temperature within the melt during tapping an casting (<5°C variation at app. 1600°C)
- Homogenous mixing of alloys during the treatment of steel
- Reduction of impurities of the steel and transfer into the slag
- High safety as level: no leakage allowed
- Etc.

Today after more than 20 years of development the refractory industry supplies several systems adapted to the needs of the customers and meeting the demands explained above. In order to really understand the value of this product for the total process, now a mass calculation:

TABLE 3. MASS CALCULATION STEEL LADLE/GAS PURGING

	Ladle Size
	5 m Heigth
	5 m Diameter
250 t	Liquid Steel Capacity
10 t	Steel Casing
10 t	Permanent/Safety Linig
20 t	Refractory Working Lining
290 t	Total
3 x 10 kg	Gas Purging Cones
	= 290.030 kg
0,01 %	of Total Weight

Only 0.01 % of the total weight of a steel ladle in operation has to ensure a significant work in order to produce high quality steel for demanding use. This figure underlines better than words and statements the performance and the innovation level, which is today standard in the Refractory Industry.

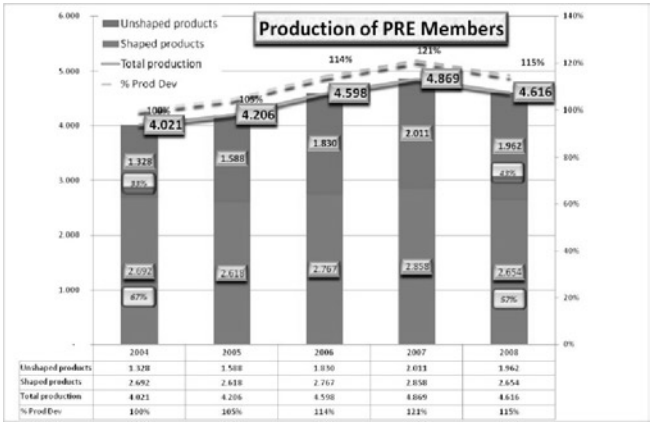
ECONOMIC SITUATION IN FIGURES

A rough estimation about the world production assumes some 2000 Companies producing about 22 Mt of Refractories products. The relevant market, which is accessible for all actors is estimated at 15 Mt. Worldwide figures are not available on a reliable basis.

The Situation in Europe

Since 2003 the PRE Association – Refractories Producer in Europe – collects statistical figures, giving a better view on the situation of the European Industry.

EU- Sales / Production



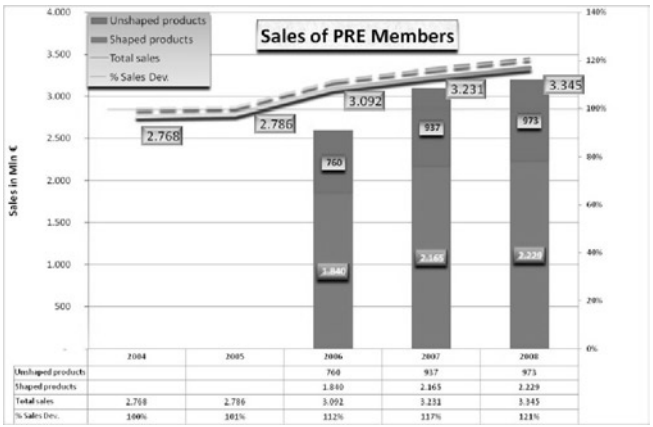


Figure 4. Production / Sales in Europe[6]

The above mentioned figures account only for members of the PRE. The total figures are estimated at level of 20% higher.

• ***Production***

The production increases steadily until 2007, with the decline in 2008 which showed already especially in the last

quarter the influence of the crisis and hence the reaction of the companies to meet this. The increase rose up to + 21 % since the inquiry of the statistics and fell to +15 %, which is still a very good status compared with the long-term downturn which began in end '70's.

The ratio between shaped and unshaped products varies from 67/33% in 2004 to 57/43%. There may be an influence by improved finding of the figures, but the steep change in 2008 with the beginning of the crisis seems to show, that unshaped products can reflect better to changing situations, even if some areas of application are excluded for unshaped materials.

• ***Sales***

A split between shaped and unshaped materials was only started in 2006. Basically there is the same view as with the production except two issues:

Although the crisis stared in 2008 the sales still rose. Reason may be the export to geographical areas with less impact of the crisis or deliveries into big projects which were still carried out.

The ratio between shaped and unshaped is different to production. That means that unshaped products are generally selling at a lower price level than shaped products.

• ***Workforce in the Refractory Industry***

As consequence of technological development the number of people working in this industry is continuously decreasing.

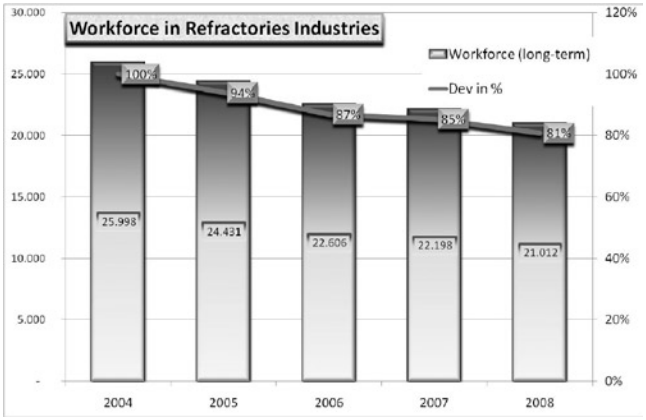


Figure 5. Workforce in the European Refractory Industry

In the past five years under consideration the number decreased by 19%, ranging now at a level of 21102 people. There is a tendency that this development is actually not found across all of Europe, but mainly in the new member states.

The restructuring lead in some countries to even sharper decreases, as Germany went form app.225000 people in the late 1970's to close to 6000 in 2007. There is as well a trend that in spite of the reduced number of personnel, there is an increasing shortage of specialists.

• ***Disillusioning Discrepancy to the major customers***

If the European figures for Refractories are compared with the similar data for steel as the major consumer, the situation is disillusioning. Compared to the above mentioned the Statistics for Crude Steel production in Europe show for 2008 a sales number of 200000M€. Refractories sales account only for 1.65% of the steel sales.

The same level with employment: European steel employs 420000 people, whereas in the same period only 21000M€ people earn their money in the Refractory Industry which is only 5%. For better understanding, the following graph explains the German situation: 1300 M€ turnover in Refractories vs. 48400 M€ in steel. It is even more dramatic, when an export ratio of app. 60% of Refractories is taken into account.

The situation turns even worse, if compared with the final industries as car industry and machinery. The Refractory Industry achieves only a 0.5 % of turnover compared with car, although technically the Refractory Industry is one of the drivers in innovation across steel, aluminium production etc.

The real challenge is here to underline the importance of this industry, even if it is commercially rather small, but technically very importance.

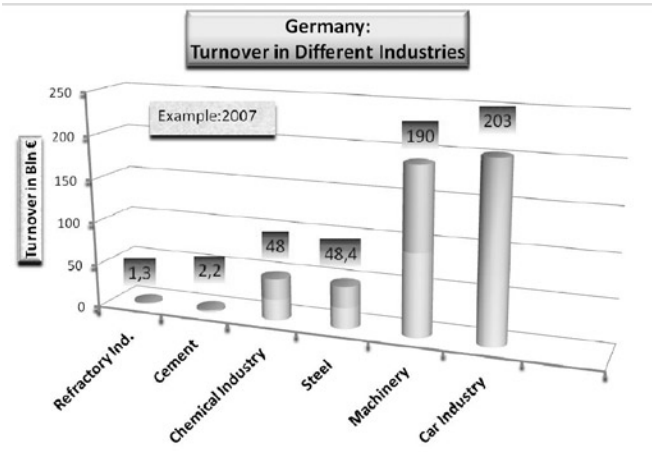


Figure 6. Comparison of Turnover of Industries: Example Germany in 2007 (1)[7]

THE HISTORICAL DEVELOPMENT SHOWN ON AN EXAMPLE

The knowledge of the history is essential for designing the future. As the German Refractory Association has a sound data basis created over a long period this is taken as reference.

In Figure 7 the historical development is shown since 1950 and compared with the figures of the crude steel production. Although this may be only superficial but should give a good view on the long-term tendency. The graph for the Refractories allows segmentation into three major periods.

• ***Period 1 The good old fireclay day: 1950 –mid 1970***

This period describes the rapid need for recovery after the dramatic destructions of the World War II. The period was characterized by steady and heavy increase of production. There was no real market; it was more distribution than selling.

Innovation did not take place as the fast satisfaction of needs in volume was priority.

The Export share was for Shaped and Unshaped products below 20%.

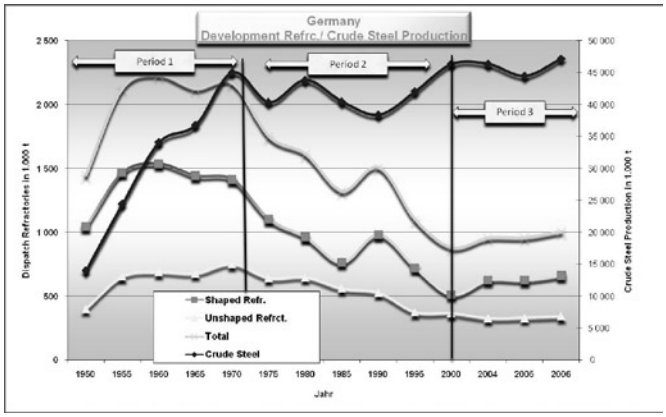


Figure 7. Development of Refractory and Crude Steel Production in Germany[8]

• ***Period 2: The heavy decline and restructuring: Mid 1970 until 2000***

In the mid '70s the market collapsed and the basic industries came to their limits of market saturation. Steel production fell distinctively as well for Cement production. The pure mass/volume approach was replaced by quality aspect which came stepwise into the scenario. Refractory production fell by app. 20%.

New processes were developed which needed new Refractories and installation methods.

Together with this technical changes and market changes the problem of overcapacities came onto the scene. Companies tried to meet these challenges by going global, the export ratio rose to 40-50% and the market turned into a real market, which was, however, a strong buyer market (⇒ see economic position). First companies went abroad, for example DIDER as producer in Rourkela, India)

Examples for Refractory Innovations out of this period:

- For Steel:

- Slide systems with integrated elements: Ceramics-Mechanics-electronics
- Isostatically pressed/Resin Bonded submerges nozzles, shrouds, monoblock stoppers, al that essential for the continuous casting process
- MgO-C bricks highly densified, fused coarse crystalline magnesia for Blast Oxygen Furnaces (BOF), Electric arc furnaces (EAF), ladles, etc.

- For cement:

- Magnesia Spinell bricks with flexible textures, replacing hazardous Chromate bricks
- Alkaline resistant products based on SiC, Zircon, etc.
- Waste incineration
- High resistant materials based on SiC or Chrome Alumina for severe slag attack, etc.

- General:

- Low and Ultra cement castables with high strength and low porosity
- New installation methods as pump – mixing, shot creting, etc.

This list is by far not exhaustive.

• ***Period 3: The recovery from 2000***

The consolidation phase is finished and the Industry is well prepared to conquer world markets. Despite heavy competition and disadvantageous economic conditions as for example exchange rates, the German and as well the European Industry is able to sell their products worldwide, especially where forefront technology is needed. The fruits of the disappointing years can be collected and the evolution follows the general economic recovery, which started early 2000.

• ***Period 4: The crisis and then?***

In 2008 the Industry experienced a worldwide downturn, if not to speak collapse. Actually nobody can say, how long the crisis will last, when and how the economy will recover. The only possible assumption allowed is that after the crisis will be different than before the crisis. More reflections later but everything else than thoughts are only speculative.

CUSTOMER INDUSTRIES

Some aspects on Iron&Steel, Cement, Aluminum

The first step is the look to the moves and developments in the customer industries, especially those, which are very important for Refractory consumption, i.e. steel and metals, which is done in the following in some examples.

Steel Industry

• ***Technical Development Steel***

One of the major impacts on the reduction of the specific consumption in the steel industry is the introduction of the Continuous Casting process. This started in the technical developed countries and was then spread with accelerating speed into the other countries. (Fig. 9) In the actual Situation no further big impact is expected as nearly 92 % of WW Crude Steel production is made by the CC process which took nearly 30 years for the total implementation. This rendered f.e. soaking pits unnecessary, which were real big refractory consumers. On the other hand new products came on stage as submerged nozzles, shrouds, etc. with completely different properties and tasks.

The next challenge, however, is the introduction of the Continuous Thin Slab Casting which puts the majority of reheating furnaces in question, which will lead to a further downturn in Refractory consumption.

In addition with all other Technical improvements as Ceramic cups in Blast Furnaces, water cooled panels in EAF, slag coating in BOF's, etc. the reduction of consumption from 25 kg to 10 kg Refractories of Steel in the last 30 years was possible. (Fig. 8 and 9)

Of course there will be further efforts to reduce the use of Refractories but the speed will not be the same as before and the main driver is not the reduction of Refractories' use but economy in energy use, reduction of green house gases and improving steel qualities with even better properties for challenging applications, as steel is in direct competition with Aluminium and Carbon Fibers, etc.

• ***Commercial Aspect in Steel***

The main driver for the recovery in the Refractories industry was the tremendous development in steel production worldwide. The development was in fact enormous and was

surprising especially for the Western countries where a long-term drop in steel production and all heavy industries was forecasted.

A closer look reveals, however, that the Western countries experienced an increase, the dramatic boost came only from China, which nearly doubled its production in only four years.

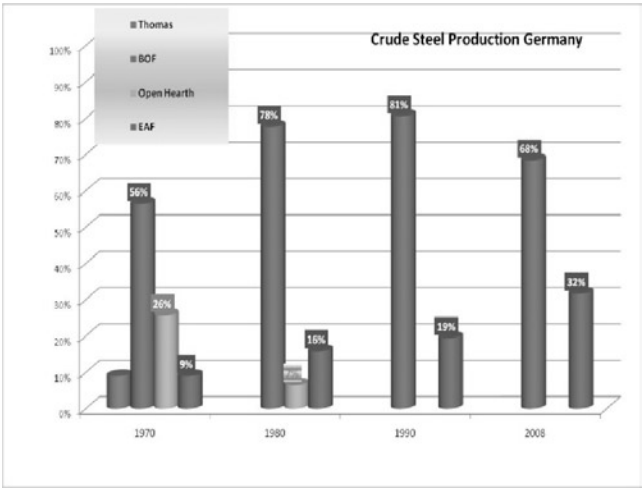


Figure 8. Processes in Crude Steel Production[11]

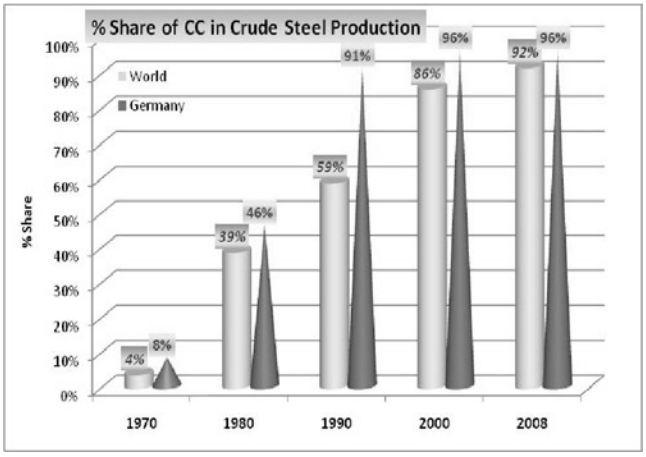


Figure 9. Introduction of CC Process in Steel[11]

TABLE 4. CRUDE STEEL PRODUCTION SELECTED COUNTRIES[12]

Crude Steel Production	Mln / ton	monthly average				
	2004	2005	2006	2007	2008	2009
EU Total	16,9	16,3	17,2	17,5	16,5	10,3
% of average	100%	-3%	6%	1%	-6%	-38%
Germany	3,9	3,7	3,9	4,1	3,8	2,4
% of average	100%	-4%	6%	3%	-6%	-36%
Spain	1,5	1,5	1,5	1,6	1,6	1,0
% of average	100%	1%	3%	3%	-2%	-35%
China	22,8	29,0	34,9	40,7	41,7	42,5
% of average	100%	27%	20%	17%	2%	2%
Russia	9,4	9,3	10,0	10,3	9,6	7,3
% of average	100%	-1%	7%	3%	-7%	-24%

The table demonstrates as well the actual situation. Whereas the European Countries have decrease its production app. With 35 %, the major impact came from China which has actually the comfortable "problem" of a low one digit growth. Russia as one of the other big producer suffers as well a downturn, which is, however, by far not so steep as in the European countries.

• ***An outlook is not possible***

Given all statements of the industries, economic institutes and governments nobody makes any precise forecast, as it is not possible. EUROFER states in its latest newsletter that in the first half of 2009, steel consumption will drop by 40-45% leading to a minus of 30% for 2009 on a year to year basis. In 2010 a slight recovery may be possible due to the fact that stocks are fading and consumers have to cover their operational need. No major growth is in sight.

The German Steel Association (13) announces, that the order situation is as low as 5.4 M. tons and is the lowest since the German unification in 1990. However, since March there is a first sign of a "bottom formation". Order income improved in April 2009 and was for the first time > 2.0 M € on a monthly basis, which was the best value since October 2008. Anyhow, any improvement will be based on a very low level and behind the past activities.

Cement Industry

Compared to steel, cement was a more regional market, which could develop differently in different areas. Precise Information is difficult to gain, but I want to outline some aspects on rudimentary information.

Cembureau figures available are with regard to the actual situation in delay and give no conclusions. Qualitative statements say, that countries, as for example Spain, UK, etc. with heavy construction development in the recent past are more concerned, than others.

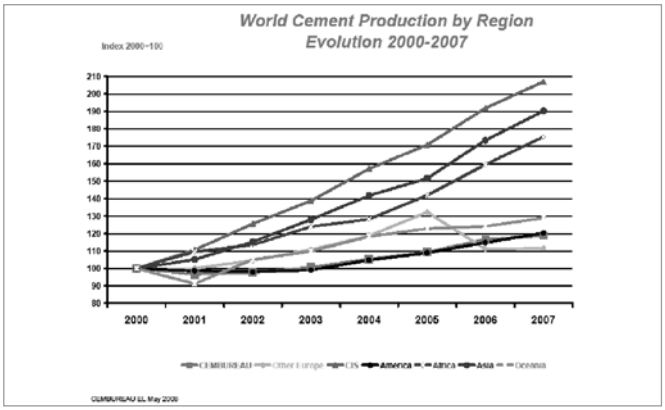


Figure 10. World Cement Production

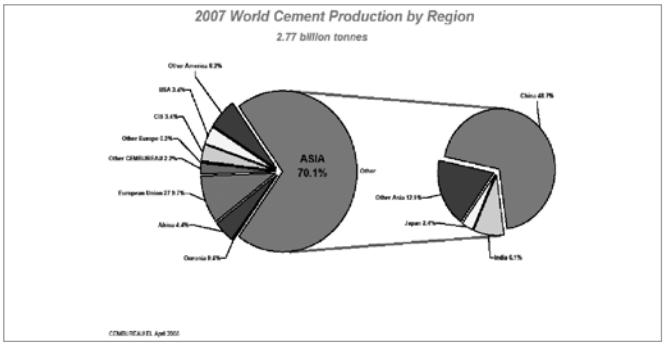


Figure 11. Production Split by Region

The erratic situation in the cement industry shows the above Figures. There is a constant increase in nearly all regions worldwide. But looking in detail there is only one area which contributes to this situation, which is China. The difficulty, to have a good interpretation and therefore a strategy of serving this industries show the figures below.

TABLE 5. CEMENT PRODUCTION IN GERMANY

The Cement Industry in Germany								
Year	Companies		Plants		Plants/ Company	Turnover Mio €		Employees	
2000	38	*100*	64	*100*	1,7	2.651	*100*	11.144	*100*
2001	38	*100*	62	*97*	1,6	2.410	*91*	10.746	*96*
2002	38	*100*	62	*97*	1,6	1.956	*74*	9.722	*87*
2003	25	*66*	60	*94*	2,4	1.618	*61*	8.496	*76*
2004	23	*61*	59	*92*	2,6	1.688	*64*	7.721	*69*
2005	22	*58*	58	*91*	2,6	1.792	*68*	7.624	*68*
2006	22	*58*	58	*91*	2,6	1.983	*75*	7.424	*67*
2007	22	*58*	56	*88*	2,5	2.256	*85*	7.483	*67*
2008	22	*58*	56	*88*	2,5	2.528	*95*	7.694	*69*

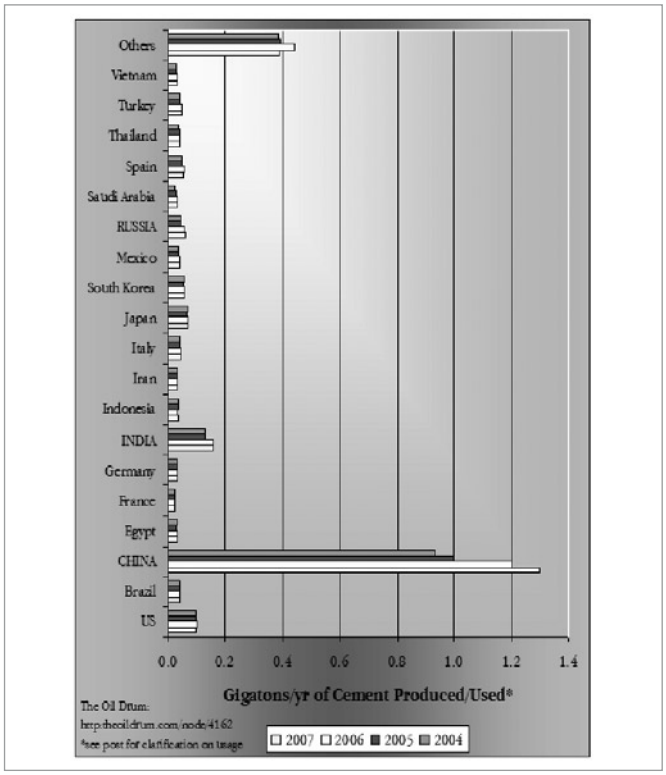


Figure 12. Comparison of Cement production of Major Countries[14]

The German Cement Industry was really hit by a crisis the beginning 2000, when turnover fell down to 1600 M€ which is 40% less than in the year 2000 and 2008. The restructuring led to 42 % of companies disappear, and the loss of 31 % of jobs.

The worldwide view in the graph of Fig 12.: Whatever is done in rest of the world, the development of cement production is determined by China.

Aluminum Production

Last but not least a view on a "specialty" which is not determinant for the Refractory Industry but still a good consumer and a Technical challenger: The Aluminum Industry.

Transfer of production of primary Aluminum is worldwide determined by the prize of energy and the availability of bauxite. Regions which cannot offer one of theses possibilities will disappear from the map of Aluminum production.

However, as Aluminum is a metal easy to recycle, this aspect will gain for all countries of importance, especially where energy costs are significant.

TABLE 6. ALUMINUM PRODUCTION IN GERMANY[15]

Aluminum Production in Germany (in tons)	2003	2004	2005	2006	2007	03-07
Recycled Aluminum	680.400	703.800	718.300	795.700	857.600	*177.200*
		3%	*2%*	*11%*	*8%*	*26%*
Primary Aluminum	660.800	667.900	647.900	515.500	551.030	*-109.770*
		1%	*-3%*	*-20%*	*7%*	*-17%*
Total	1.341.200	1.371.700	1.366.200	1.311.200	1.408.630	*67.430*
		2%	*0%*	*-4%*	*7%*	*5%*

The tendency in this development is exemplary for what we will see in the future. Concentration of primary Aluminum production will take place in areas as Australia, Island, etc. The challenge for the Refractory Industry will be to follow the technology of recycling, as well

THE CRISIS OF 2008…. AND 2010?

After the tour on Refractories back to the actual situation. Starting already in 2008 the world economy is hit by one the strongest and deepest crisis' since the '30s of the last century. Originally ignored not only by politicians of the various countries but even by economic scientists, which seemed to be before real specialists, the economy plunged in way nobody had expected.

Actually the only statement actually allowed is– to speak with Socrates, the great Greek philosopher - :

I know that I don't know.

It is only very recent, that first responsibles are forecasting still a slight further reduction of the economy and then a prudent and incremental recovery at the end of 2009 and 2010, but there are actually no further fundamental data underlining this aspect.

Let us take the situation simple and practical:

- The crisis was created by excessive credits for housing in the US to people who could not afford that.
- The credits were "structured" (ABS=Asset backed securities; CDS=Credit default Swaps, etc.)
- The structure papers were traded
- At the end nobody knew, what he had in his hands
- In the same time wealth exploded artificially
- When the market imploded, wealth vanished
- The " Real economy" was hit

What can be learned from the recent past is:

- Governments react as fast as possible and as much as possible in order to keep the impacts as low as possible. It is tried very hard not to make the same mistakes as in former crisis situations especially in the 30'S of last century.
- Nobody knows what will be the outcome with the different actions, i.e. the scrap bonus in Germany for old cars. Will it bridge the worst period or lead to crash of car production when it is ended.
- The duration of the crisis is still unpredictable; Several scenarios are under discussion, but there are still no indicators
- The situation will not be as before the crisis – Management of overcapacities will become essential in all industries.
- Confidence has become a major driver for the economic and commercial activities.

In order to provide some concrete figures in the following some forecasts of the European Commission are shown, which reflect some cautious optimism demonstrate the political will to do the utmost for improving the situation.

TABLE 7. FORECAST OF ECONOMIC INDICES FOR EUROPE

Evolution of GDP in %

Year to Year

	2009	2010	Variation
USA	-2,9	0,9	3,8
Spain	-3,2	-1,0	2,2
Germany	-5,4	0,3	5,7
UK	-3,8	0,1	3,9
Italy	-4,4	0,1	4,5
France	-3,0	-0,2	2,8
Ireland	-9,0	-2,6	6,4

Private Consumption in %

Year to Year

	2009	2010	Variation
USA	-2,0	-1,2	0,8
Spain	-3,1	-1,1	2,0
Germany	-0,5	0,5	1,0
UK	-3,4	-1,5	1,9
Italy	-1,7	0,2	1,9
France	0,2	0,5	0,3
Ireland	-7,9	-4,0	3,9

THE MAJOR DRIVERS FOR THE FUTURE

In order not to dilute to much the scenario I want to address only three major drivers for the Refractory Industry, which are:

- Raw Materials
- Energy
- Politics

Raw Materials

Raw Materials account especially in the unshaped segment for up to 60 % of the total cost. Apart from the cost side they are essential for the technological development within our and the customer industries as explained before.

The evolution since 2000 shows, however, a dramatic and annoying evolution. Apart from the fact that the majority of raw materials have to be imported from overseas, the countries which own these sources, apply policies which are detrimental for further positive development and are in line with trade rules addressed in the World Trade Organization.

The majority of sources for the most important raw materials are owned by China, which accounts for resources of:

- 95 % for Refractory Bauxite
- 90 % for Fused Magnesite
- 80 % for Graphite

Only to mention the most important ones.

On top of that, China launched an auctioning system, which favors dramatically the domestic producers and leads still in the time of recession to shortcuts and cost impacts, which are detrimental for the European Refractory Industry. Together with the practices which are addressed as unfair trade of finished products and which led to the application of the Anti-Dumping levy of MgO-C bricks, the whole scope of the impact of the EU Industry can be evaluated.

The US government and the EU commission have launched an initiative against China which will be treated at the WTO. Additionally the EU commission took action regarding this topic in implementing a raw material initiative since 11/2008. In the next two months a list of critical raw materials will be established, which are:

- Critical for European Industries
- Where EU industry has limited access
- Where there is no substitution possible

Energy

This is one of the other important items for producing Refractories. The actual relief of the oil prize is only temporary. On the long-term, the economy will have to live with permanently rising oil and energy prizes as the resources are shortening and renewable energies are on the mid-run not able to replace gas and oil.

In the past, we had already several "energy-crisis'", which are compared to actual economic situation only a soft blow versus a hurricane. This challenge, however, will be triggering in the future new solutions which will not be created by one partner alone, but by the fruitful collaboration between the produces – the Refractory Industry – and its consumers. It is a threat but as well a challenge to think and realize new processes and solutions.

The graph below shows, that energy prizes are not a "knock-out" factor, but a challenge. In times of high rising prizes, the industry went well and managed to work with that.

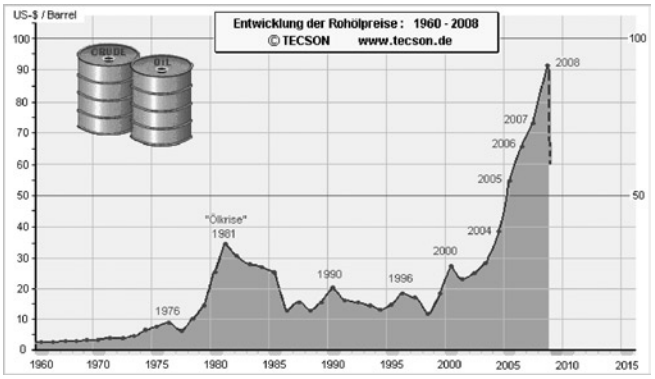


Figure 13. Development of Oil Prize since 1960

Politics

EU policy has created in the recent past a lot of activities which were designed to serve people and create better life and ambience but which could have a contradictory effect, if economic and people's welfare is looked at.

There are numerous actions and regulations which were designed under the aspect of climate protection, energy consumption and health, but which can turn out as a boomerang, if the economy and among this the sustainability of companies and jobs is regarded.

Some examples for demonstration:

Reach
Registration-Evaluation-Approval-of Chemicals

Originally designed as a tool for better life pure nature and protection of people, this activity turns out to be the "box of Pandora".

Now, becoming operational it turns out, that REACH is far from being an element of improvement but detrimental, not

only for Refractories.

Some facts, based on Situation June 2009:

There is straight dead line for pre-registrations and registrations

In the mean time, after the dead line of pre-registration it turns out, that

- 65000 Companies had made pre-registrations
- 2750000 pre registrations were made
- Originally only 30000 registrations were forecasted from the officials
- Many consultants appear on the scene, which are not related to Industry
- Capacity of laboratories is insufficient to deal with the Technical work
- A negative impact on the European Industry is visible
  Cost: An approval can cost up to 500k€ per substance
  Time: The process is not fast and can take months
  Competitiveness:
  An importer of Bricks into the EU is outside REACH
  A producer of bricks in the EU is inside REACH

Anyhow, the EU commission started an impact assessment of REACH and we all can hope, that there will be final positive outcome.

ETS

Emission – Trading - Scheme

The background is, to decrease to emission of Greenhouse Gases (GHG) until 2020 up to 20 % compared to 1990, which is from 2005 to 2020 a level of 21%.

This means, that European Industry has to reduce its emission form 2012 at 1.74 % per year!

There was a strong activity of PRE to adapt this process to the Refractory Industry, because we have a strong " carbon leakage", which means a threat, that production will leave Europe into regions with no restrictions like the ETS.

Finally it was achieved, that the Refractory Industry is outside the auctioning scope and is judged through benchmarking processes.

IPPC

Integrated- Pollution-Prevention-Control

As well an example for a severe process, which could have impacted the Refractory Industry. Negotiations went on for years to come to an acceptable level for the Industry.

The Refractory Industry achieved a solution, where the majority of its installations are exempted from IPPC, but thelong-term impact on the customer industries cannot be forecasted.

CONCLUSION

The actual scenario is too manifold, to give some simple recipes for the future. As the Refractory Industry is closely linked technically to its consumer industries is heavily depending on their evolution and trends.

For the time being, some general remarks will be stated, which will determine the near future of our industry:

- Iron & Steel industry will have a strong impact on the future structure of the Refractory Industry as it is its main customer.
- Technical developments will lead to further reduction of specific consumption of Refractories, but there will a natural limit for reduction.
- The speed of reduction of specific consumption will be reduced
- The concentration in the consuming industries will go on. Refractories will follow.
- Niche players will have their space but will be challenged by permanent technological innovation
- The supply chain of Raw material -Refractories- Final products will be strengthened
- Cement production will follow regional needs, the main changes are in China, India, etc.
- Import-/Export of clinker will grow in importance
- The trend from cements to customized binders will continue
- Developing countries will continue in improving efficiency and thus reduce specific consumption
- Energy prizes will have a determining effect on Refractories
- Improvements are possible with customers and suppliers
- Political aspects will gain further importance and may not always support the industry vs. the intercontinental competition
- Human Resources will as well play a major role, as specialists are essential for further technical development
- Innovation remains a key factor

WHAT TO DO?

There is no general recipe for the Industry, how it will develop for the next years. One thing, however, has gained importance and has been in some parts neglected.

The role of associations, which means a network of companies with same objectives gains an increasing importance. Given all the impacts, may it be political, by raw materials, energy, etc. it is vital to share the common concerns and bundle activities, which help to get the best out of the situation. The work of the national associations as well as the PRE as European backbone cannot be underestimated.

Form this point of view, apart from the company internal visions and strategies, the work and support of the associations I more important than ever, if the Refractory Industry will as well live and flourish in the next decades in Europe, where it belongs to.

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