

Ceramic goods



In its broad sense, the ceramic industry embraces any industry which manufactures products based primarily on clay minerals which, after forming and drying, are subjected to high-temperature firing.

The raw materials used are largely found within the Community and the manufacturing process confers on them a high value-added content.

However, highly technical ceramic products also use some special raw materials which are found only outside the Community (e.g. zirconium, high-purity magnesium, etc.).

Classified according to use, the main products are:

- ❖ materials for construction: tiles, sanitary-ware, bricks and roofing tiles;
- ❖ tableware and household goods: tableware, household articles and ornamental ware;
- ❖ products for electrical, electronic, mechanical and other uses: insulators and electrical insulating parts, products for chemical use, specialised and advanced technical ceramics;
- ❖ refractories and heat-resistant products;
- ❖ products for drainage and channelling: stoneware pipes.

With the exception of bricks and roofing tiles (see NACE 241), ceramic products are all classified under NACE 248.

Given the heterogeneous nature of the industries grouped under NACE 248 and the inadequacy of the aggregate data available, this study concentrates on the following main subsectors:

- ❖ tiles for floors and walls;

- ❖ tableware and ornamental ware;

- ❖ technical ceramics;

Each of these subsectors is described in greater detail in the remaining sections of this chapter.

Production and external trade

Total turnover for the ceramic industry reached about 13.6 billion ECU in 1989, i.e. about 52 000 ECU per person employed; about 40% of this figure was achieved by tiles, 20% by tableware and ornamental ware; advanced ceramics are not included in these figures, no statistics being available.

Following a reduction of sales in 1980, the 1981-83 period was marked by stagnation which, above all, affected those sectors dependent on the construction industry. Production capacity in these sectors remained largely under-utilised. Sales picked up from the beginning of 1984 and continued to do so in the majority of the subsectors until 1988 and 1989.

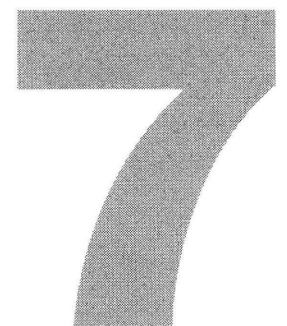


Table 1
ceramic goods
Main indicators, 1980-89

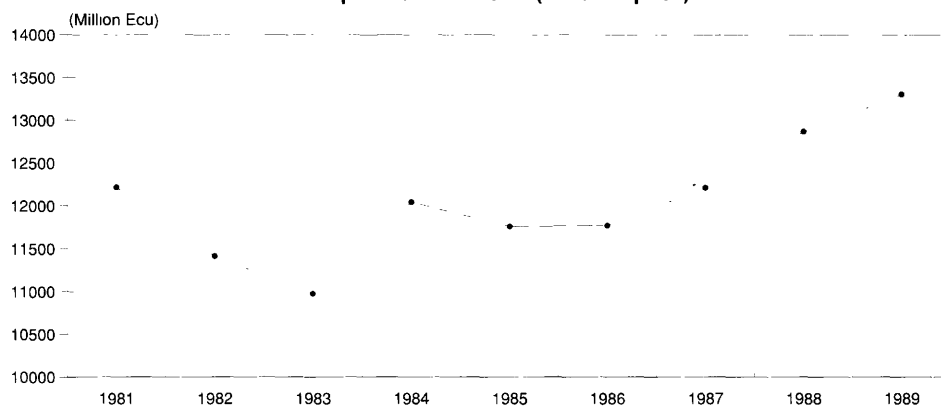
(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Apparent consumption (1)	7 245	7 538	7 482	7 292	8 630	8 720	10 442	11 159	11 898	12 747
Net exports (1)	1 015	1 152	1 198	1 464	1 543	1 645	1 649	1 594	1 923	2 263
Production (1)	8 260	8 690	8 680	8 756	10 173	10 365	12 091	12 753	13 821	15 010
Employment (thousands)	319	299	280	262	266	257	256	255	255	264

(1) 1980 : EC 9; 191-85 : EC 10.
Source: Eurostat (Inde, Bise, Comext)

In 1989, production reached a level of 15 000 million ECU (13 309 million ECU in constant prices), an average annual growth rate of 6,9% since 1980 (0,8% in constant price). Production almost follows the same pattern as turnover in current value, but in constant terms production remained stagnant until 1986, but increased thereafter.

The external balance of trade in the EC has been positive throughout the 1980s and after a slight slowdown in 1986 and 1987, reached a record level of 2 363 million ECU in 1989. Total exports amounted to 3 220 million ECU in 1989, while im-

Figure 1
Ceramic goods
EC production 1980-89 (constant price)



Source: Eurostat (Inde)

ports, though increasing compared to 1988, were only 919 million ECU. Since 1985, export growth has been

higher than that of imports (respectively 4.8% and 1.4% as an average annual growth rate).

Table 2
Ceramic goods
Production, value added and investment

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production in current prices										
EC	9 501	10 007	9 964	9 920	11 552	11 759	12 091	12 753	13 821	15 010
Index	80.8	85.1	84.7	84.4	98.2	100.0	102.8	108.5	117.5	127.6
USA (1)	2 794	3 697	3 603	4 146	5 314	5 375	4 234	3 711	3 830	4 320
Index	52.0	68.8	67.0	77.1	98.9	100.0	78.8	69.0	71.3	80.4
Japan (1)	3 511	4 597	4 595	5 456	6 741	6 927	7 179	7 780	9 532	10 250
Index	50.7	66.4	66.3	78.8	97.3	100.0	103.6	112.3	137.6	148.0
Value added in current prices (2)	4 734	4 854	4 759	4 778	5 411	5 467	5 880	6 344	6 761	7 333
Index	86.7	88.8	87.0	87.4	99.0	100.0	107.6	116.0	123.7	134.1
Productivity (2)	21	20	20	21	22	22	24	25	26	26
Index	92.0	91.0	89.6	94.2	99.4	100.0	105.6	113.2	116.8	117.4
Investment in current prices (2)	503	532	399	421	510	514	494	602	N/A	N/A
Index	97.9	103.5	77.6	81.9	99.2	100.0	96.1	117.1	N/A	N/A

(1) Census of Manufactures and Eurostat estimates

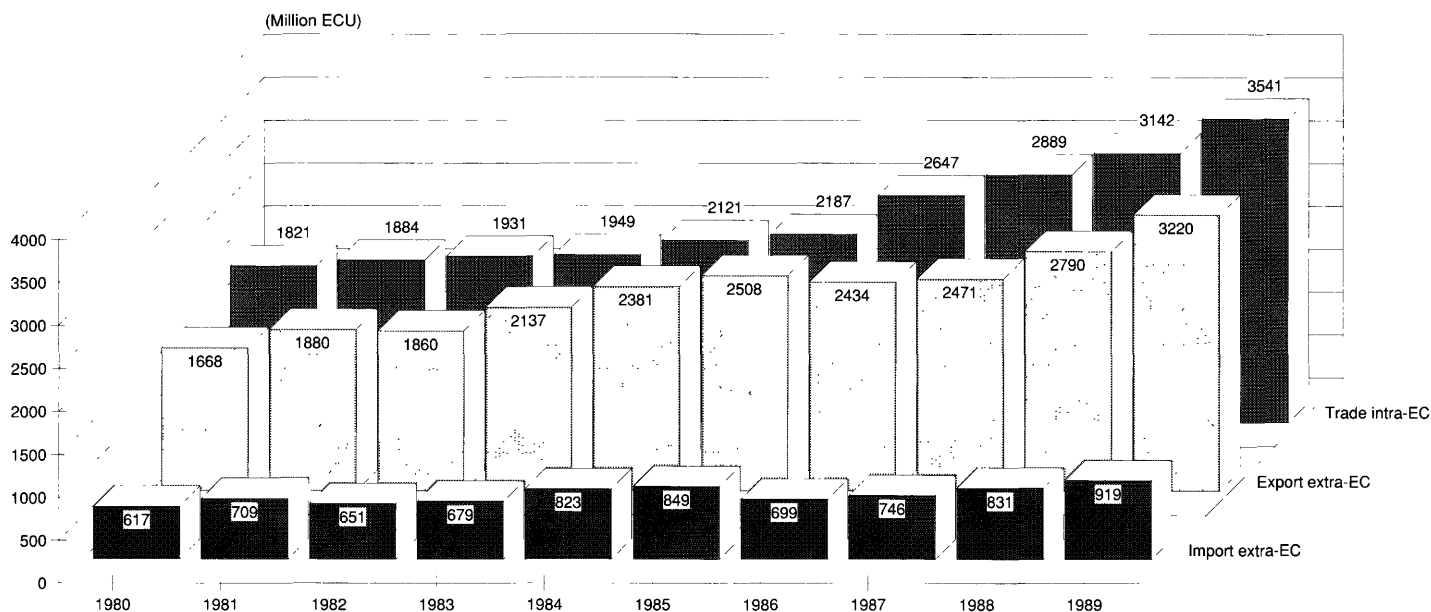
(2) excluding Luxembourg, Portugal

(3) Denmark, Germany, France, Ireland, Italy, United Kingdom.

Source : Eurostat (Inde)



Figure 2
Ceramic goods
EC trade in current value, 1980-89 (1)



(1) 1980: EC; 1981-85: EC 10
Source: Eurostat (Bise, Comext, Trend)

EC exports of ceramic goods are mostly destined for North America (45% of total exports of the EC ceramic industry) and the EFTA countries (26%) while imports originate for a large part from South East Asia (38% of EC imports) and the Pacific Rim (21%).

Trade between Member States has developed in recent years, thanks to the opening up of Community markets.

At the same time, the export penetration of EC products on world markets increased. The share of EC production which is exported also increased, from 20% in 1980 to 22% in 1989.

Again, there are large differences depending on the products considered.

Even so, the improvement of EC exports was slower than that of trade between Member States.

To improve its competitiveness, Community enterprises have, during the last few years, shifted towards an increased specialisation in the high value-added product range and in highly technical products, which require an increased effort in research and development.

They progressively gave up the lower end of the market to external competition.

On the whole, imports from third countries increased in 1989, with an average penetration rate of 10%. However, in certain subsectors, such as tableware, there were larger increases.

The rate of coverage of EC imports by corresponding exports grew from 2.7 in 1980 to 3.5 in 1989.

Table 3 shows the position of the ceramic industry in all the EC Member States in terms of production, external trade and employment. Italy and the Federal Republic of Germany are by far the largest producers of ceramic goods with respectively 30.6% and 25.0% of the total.

The other large producers are the United Kingdom (15.4%), France (10.8%) and Spain (11.5%). Only Denmark, the Netherlands, Belgium and Luxembourg have a negative balance of trade.

The ceramic industry is highly labour-intensive, with labour costs accounting for

Table 3
Ceramic goods
Production, Trade and employment by country, 1989 (constant price)

(million ECU)	B-L	DK	D	GR	E	F	IRL	I	NL	P	UK
Production	195	170	3 758	139	1 705	1 594	43	4 600	239	292	2 276
Exports extra-EC	53.8	39.2	854.6	32.5	319.6	276.3	11.8	1 074.6	38.9	61.9	456.6
Imports extra-EC	69.8	49.6	244.6	13.9	36.9	113.0	5.7	138.1	77.9	5.2	164.4
X/M	0.8	0.8	3.5	2.3	8.7	2.4	2.1	7.8	0.5	11.9	2.8
Employment (thousands)	2.8	3.4	62.9	5.7	32.8	28.0	0.5	59.4	3.9	16	48.3

Source: Eurostat (Inde, Comext)

35% to 60% of production costs, depending on the subsectors.

The EC ceramic industry provides employment for some 264 000 people.

The table and ornamental ware sector accounts for 42% of the total and tiles for 24%.

The countries contributing the most to employment are the Federal Republic of Germany (63 000 employees), Italy (59 000), the United Kingdom (48 000) and to a lesser extent, Spain (33 000).

Productivity levels vary considerably across subsectors. The industry consists of a wide range of activities which are carried out by firms of all sizes.

High-technology firms co-exist with traditional labour-intensive firms.

The more recent years have seen some meaningful innovation, leading to structural changes in the industry.

Structure of the industry

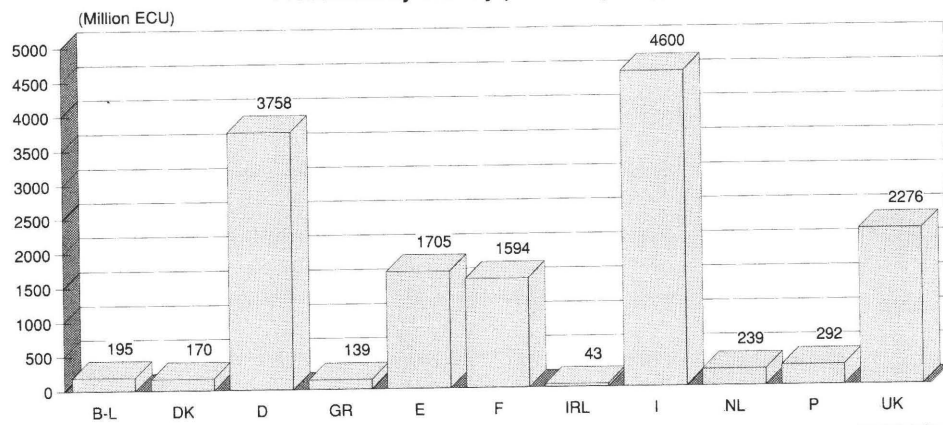
The structure of the ceramic industry shows a large number of small and medium-sized companies, particularly in the tableware and ornamental ware subsector. Technological change and the depressed economic situation during the last decade brought about a reduction in the number of enterprises and in employment. In 1980, the EC industry still comprised some 2 800 companies with about 320 000 employees.

In total, it is estimated that the Community at present includes approximately 2 300 companies employing about 264 000 people.

Ceramic enterprises are scattered throughout the Community with strong regional concentrations for some products, particularly tableware, ornamental ware and tiles.

Thanks to intense research and develop-

Figure 3
Ceramic goods
Production by country (constant price), 1989



Source: Eurostat (Inde)

ment activity and considerable investment during the last two decades, the ceramic industry has achieved a high degree of modernisation and uses advanced techniques. New user requirements have led to new higher performance compositions being produced with new technologies.

Forecast

The opening of Eastern European markets and the change in the USSR economic system represent both opportunities and threats for EC ceramic producers. Trade with these regions is still relatively low in absolute terms, but rising rapidly. Demand for ceramic products from Eastern Europe should rise rapidly, after an inevitable adjustment period to the new market regime. However, increased competition for the EC's producers from

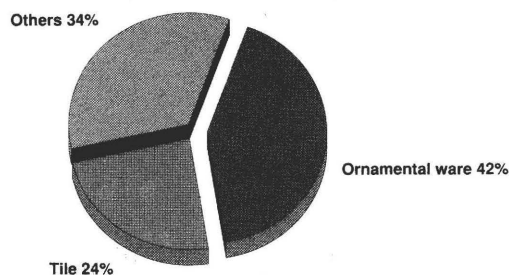
these countries may be expected.

A wide variety of new ceramic products and advanced technologies have been developed over the past decade. The market for advanced ceramics in particular is expected to expand rapidly. The investments that were made by the sector during the 1980s should thus enable the EC ceramic industry to increase its share of world trade in high value-added products. However, competition from the South East Asian countries could be reinforced by that from developing countries which may continue to diversify their production to take account of the development of advanced ceramic materials.

Outlook

The prospects for the sector as a whole for 1990 are moderately satisfactory, with

Figure 4
Ceramic goods
Employment by sector, 1989



Source: Eurostat

great variations according to the subsectors.

In the medium term, the achievement of the single European market will increase competition.

The result will be an accelerating effect on structural changes in progress in the different subsectors of the ceramic industry.

The evolution of the production will vary according to the various subsegments: 1-2% for tiles, 5% for ornamental ware

and 8% for technical ceramics (average annual growth rate 1989-1994).

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Reviewed by: Sema Group Management Consultants

The EC is world leader in the ceramic tile industry by virtue of the quality of its products as well as the volume of its production (more than 50% of the world total output). The industry provides jobs for some 63 000 people in the EC.

After the crisis in the construction industry in the early 1980s, the outlook is now brighter. 1989 saw a confirmation of the recovery of this industry, coupled with major investment efforts and the opening up of new export markets.

Sector definition

The ceramic tile industry makes a wide range of products for covering floors and walls for private, public and industrial structures/buildings.

They are produced in various shapes, sizes and decorations and can be glazed or unglazed.

Production and consumption

In the aftermath of the major decline in construction activity that was experienced in particular by the housing sector in 1981-85, ceramic tile consumption went through a period of stagnation and reduction.

A fundamental improvement began in 1986 and continued in 1987 and 1988 when the construction industry increased by 2.5% and the total turnover and consumption of ceramic tiles for the first time exceeded the levels reached in 1980. However, overall consumption rose in 1989 at a slower rate, due to the unsatisfactory situation in the building industry.

Renovation of older buildings is still providing market opportunities.

Total turnover for the tile industry grew by 14% in 1989, with deliveries on the domestic market increasing by only 6.4% due to a strong progression of imports.

In the unglazed tiles sub-sector, which constitutes about 10% of total turnover, demand had shown a fundamental downward trend for many years, with total sales increasing by only 5% in volume and 12% in value, while glazed tile production progressed by 9% in volume and 15% in value. Appreciable differences between countries can be seen if one looks at consumption per capita. It is highest in Italy, with 2 square metres per capita and lowest in the United Kingdom with about 0.5 square metre per capita.

With an annual production of about 790 million square metres, the Community tile industry ranks the first among world producers, whose total production is estimated at 1,4 billion square metres.

Table 1
Ceramic tiles
Main indicators, 1980-89 (1)

(million m ²)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Apparent consumption	493	455	445	462	448	448	472	534	610	649
Net exports	104	103	104	120	146	126	112	113	112	134
Production	597	558	549	582	594	574	584	647	722	783
Employment (thousands)	83	82	74	68	64	60	63	65	62	63

(1) Excluding Denmark and Ireland.
Source: Cerame-Unie, Eurostat (Comext)

Table 2
Ceramic tiles
National indicators, 1989

	B-L	D	GR	E	F	I	NL	P	UK
Production (million m ²)	3	71	5	212	36	415	17	N/A	15
Exports extra-EC (million ECU)	3	114	1	233	34	806	8	19	10
Imports extra-EC (million ECU)	3	37	2	1	13	8	12	2	25
X/M	1.0	3.1	0.5	233.0	2.6	100.8	0.7	9.5	0.4
Employment (thousands)	0.5	8.3	0.7	N/A	4.3	30.5	1.4	4.5	N/A

Source: Cerame-Unie, Eurostat (Comext)

Table 3
Ceramic tiles
Production and external trade (1)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production (million m ²)	597	558	549	582	594	574	584	647	722	783
Index	104.0	97.2	95.6	101.4	103.5	100.0	101.7	112.7	125.8	136.4
Exports extra-EC million ECU	638	721	712	843	1 039	954	855	904	1 025	1 229
Index	66.9	75.6	74.6	88.4	108.9	100.0	89.6	94.8	107.4	128.8
Imports extra-EC million ECU	64	78	64	75	71	62	62	61	85	101
Index	103.2	125.8	103.2	121.0	114.5	100.0	100.0	98.4	137.1	162.9
X/M	10.0	9.2	11.1	11.2	14.6	15.4	13.8	14.8	12.1	12.2

(1) Excluding Denmark and Ireland.
Source: Cerame-Unie, Eurostat (Comext)

Structure

The tile industry, which comprises about 610 enterprises employing 63 000 workers, is dispersed throughout the Community, with two strong regional concentrations: the Italian region of Sassuolo (province of Modena and Reggio Emilia), where about 55% of EC production is located and the Spanish region of Onda (Castellon), which accounts for 27% of total EC production.

Thanks to large investment in research and development and to their intrinsic quality and design, Community products have achieved a worldwide reputation. Dimensional and qualitative standardisation and the development of rational methods for the fixing of tiles have greatly facilitated their distribution. The introduction of new technologies in the past few years, notably single firing and the installation of automated lines and rationalisation have

led to a deep transformation in the process and organisation of enterprises which have reached a high degree of modernisation and competitiveness.

Trade

EC industry is exporting about 21% of its production outside the Community, of which a large proportion (20%) is sold on the American market. Asian markets account for 25% of extra-EC exports. In total, extra-EC exports increased strongly (19%)

Table 4
Ceramic tiles
90-92 production forecast

(million m ²)	1989	1990	91/90	92/91
Production	783	795	+1.5	+2.5

Source: Sema Group Management Consultants

in 1989. Imports from third countries, particularly from Brazil, Asia and Eastern Europe increased strongly. The ratio of extra-EC exports to corresponding imports still remained very high in 1989 at 12.2.

Situation in the non-EC countries

The tile industry has developed rapidly in a number of countries during the past years, particularly in South-East Asia (Republic of Korea, Thailand, Brazil and Turkey). The Brazilian ceramic tiles industry claims to be second in importance among world producers, with an estimated output of 220 million square metres and about 52 000 employees. Brazilian exports have developed strongly in recent years. Production capacity has also expanded rapidly in the Eastern European countries, particularly in Yugoslavia.

Outlook for 1992

Global demand for tiles benefited in 1989 from a further increase in 1988 in the

volume of construction work undertaken and the number of building permits issued, particularly residential. However, overall activity will increase at a slower rate due to the reduction in state-subsidised houses and non-residential public buildings, although private non-residential construction and renovation of older properties will continue to grow.

Globally, construction in the EC has not yet regained pre-1980 levels and activity is still far below those levels in several countries. The achievement of the internal market will provide a harmonised framework at Community level in respect of the production and distribution of ceramics tiles.

Developments in the long run will be influenced by structural changes: the quality and way of life and changes in the purchasing power of the tile consumers will have a great influence on the development of the sector.

The creativity of the Community industry

and the development of new technologies are major assets in the penetration of markets where demand is growing for improved security, comfort and product design. Owners and designers attach more importance to the idea of life-cycle costs of the materials, in which, among other things, maintenance is taken into account. In addition, better equipped and larger dwellings are increasingly in demand.

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The sanitaryware industry covers a wide range of china and fireclay sanitaryware for bathroom, lavatory and kitchen fittings.

Over the past ten years the industry has been heavily influenced by two factors: the recovery in housing construction since 1986, which helps to boost demand, and the increasing development of non-ceramic products (stainless steel, plastic) which act as a substitute for ceramics and have an adverse effect on demand.

Definition

The ceramic sanitaryware industry produces sanitaryware for both private and public use (hospitals, hotels...): the products are used to fit out bathrooms, public conveniences and kitchens and are made from sanitary china or sandstone. In both instances, the block is coated with a thin layer of enamel; this enamel, vitrified at high temperatures of around 1200°, displays excellent characteristics and comes in a vast range of colours. The supports are made from cast-iron or steel.

Firms use specialist designers to design new models and ensure optimum shape and performance. At present, a larger share of production is geared towards bigger, more intricately shaped products in more elaborate colours. Manufacturers are keeping a close eye on the development of prefabrication and the industrialisation of the construction industry.

The manufacture of sandstone, earthenware and china sanitaryware comes under NACE 248.5.

Table 1
Sanitaryware
External trade, 1980-89 (*)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC										
Value (million ECU)	116.6	148.2	136.8	168.8	205.9	177.4	145.5	145.6	150.3	176.3
Quantity (tonnes)	71.7	76.9	66	75.7	89.9	75.1	66.3	63.4	62.1	67.5
Imports extra-EC										
Value (million ECU)	23.3	22.9	22.5	25.5	31.5	38.2	43.5	47.7	51.6	60.6
Quantity (tonnes)	11.9	11.9	10.6	12	13.9	17.5	20	24	28.1	34.3
X/M (flows in value)	5.0	6.5	6.1	6.6	6.5	4.6	3.3	3.1	2.9	2.9
X/M (flows in tonnes)	6.0	6.4	6.2	6.3	6.5	4.3	3.3	2.6	2.2	2.0
Imports Intra-EC										
Value (million ECU)	106.4	109.7	111.1	123.1	143.3	145.5	160.1	177.5	192.5	227
Quantity (tonnes)	70.5	70.4	64.5	71.4	79.7	80.3	80.8	87.9	90.4	104.8
Share of total (%)	45.8	41.7	44.7	41.3	40.7	44.9	52.1	54.8	56.7	55.8

(*) 1980 ECU; 1981-83 EC10
Source: Eurostat (Comext)

Current situation

By its very nature, the ceramic sanitaryware industry is linked to the development of the construction sector, be it new construction or renovation.

Ever since 1986, the growth in the number of construction projects involving offices, industrial, commercial and leisure buildings has stimulated demand for sanitaryware, as indeed have changing lifestyles which attach increasing importance to the bathroom. Many apartments today have more than one bathroom.

Competition from other materials (plastics, stainless steel) on the other hand, has hindered the use of ceramic products. Plastic baths which were initially intended as a bottom-of-the-range product are now moving into the top end of the range, thanks to the wide choice of shapes and colours. They are particularly widespread in the United Kingdom although less popular in France and Germany.

Total output of ceramic sanitaryware within the EC was approximately 600,000 tonnes in 1989. Imports amounted to 34 000 tonnes and exports 68 000.

Production

The manufacture of sanitaryware, which is a fairly heavy product, has undergone extensive changes over the past few years: investments in the implementation of new pressure techniques, productivity investments based on the greater use of robotics, electronics and data processing (labour is an important factor in the production cost), energy saving, increasing production rates, research and development involving new synthetic materials (acrylic) particularly for baths.

Efforts have also been made to rationalise the definition of European dimensional standards in co-operation with users, installers and tap manufacturers. Much of the development work has focused on design (shapes, colours, materials).

All the major firms are seeking to establish themselves in all the various product sectors and markets, so as to offer wholesalers a wide choice of products in keeping with the colour schemes for ceramic tiles or bathroom and kitchen furniture.

Structure

Over the past few years, the industry has become concentrated around leading firms

such as Ideal Standards, a subsidiary of American Standard, Villeroy & Boch, Grohe (West Germany), Porcher, Jacob Delafon (France), Roca (Spain), Ariston (Italy).

The leading firms are often present in a number of sectors of the ceramics industry.

Small and medium-sized firms have practically disappeared, taken over by large EC or non-EC companies. Wartsila-Lohja (Finland), for example, has just acquired the 75% stake held by Lafarge Coppee (France) in Allia (turnover of FF 916 million). Allia operates in a number of countries (including Portugal) and has acquired stakes in what was formerly East Germany, through the purchase of Keramische Werke Halsdensleben. The remaining 25% are now in the hands of the Japanese group Toto.

Over the past few years, several leading companies have set up plants in countries with cheaper labour (Portugal, Spain as well as North Africa).

The trend towards concentration and internationalisation is expected to continue in the years ahead.

External trade

The foreign trade figures for the sanitary-ware sector have deteriorated since 1980: the exports/imports ratio in terms of volume fell from 6.0 in 1980 to 2.0 in 1989. Over the past two years however, the ratio has remained stable.

The decline in external trade is due to a number of reasons:

- ❖ the EC has concentrated on satisfying a growing internal market and is responding to competition by developing top-of-the-range products;
- ❖ the developing countries are now acquiring competitive industrial units and developing an export-orientated policy.

Imports increased from 12 tonnes in 1980 to 34 tonnes in 1989. Exports on the other hand, decreased from 72 tonnes in 1980 to 68 tonnes in 1989.

Intra-EC trade has continued to grow, from 70.5 tonnes in 1980 to 104.8 tonnes in 1989 and is linked to the growing concentration of supply.

Prospects

Besides the dynamic growth of the construction industry, consumption of sanitary-ware should be stimulated by a number of other factors, not least the trend towards more spacious housing, entailing the installation of a larger number of sanitaryware items.

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The tableware and ceramic ornamental ware industry experienced a period of relative stability between 1980 and 1986, and an upturn in activities in 1988 and 1989. In 1989 the industry provided 110,000 jobs and the value of its outputs attained 3 billion ECU. The Community's industry is facing increasing competition.

Description of the sector

The sector encompasses a broad range of equipment and decorative articles for the household, the hotel industry and public institutions. Depending on the blend of raw materials used, the finished products are made of porcelain, earthenware or stoneware.

Consumption The EC ceramics sector produces mainly consumer goods and is dependent on the principal industrial user sectors. It was better able to resist the economic depression of the crisis years than most other sub-sectors of the ceramics industry. However it has been subjected to grow-

ing competition from non-EC manufacturers.

The figures for visible consumption for the years 1988 and 1989 show a substantial growth which could be due in part to the erratic statistics gathered within the ornamentals sector.

In the ornamental ceramics sector we find a continued tendency towards improvement in the volume of consumption from 1980 onwards and even an acceleration in the growth rate in 1988. During the same period, the consumption of ceramic tableware was virtually static but in 1988 it experienced a lively upturn. This trend was sustained into 1989.

Table 1
Tableware and ornamentalware
Main indicators, 1980-88 (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988
Apparent consumption	2 086	2 164	1 999	2 059	1 993	1 947	2 029	2 188	2 527
Net exports	173	157	222	278	299	443	375	292	270
Production	2 259	2 321	2 221	2 337	2 292	2 390	2 404	2 480	2 797
Employment (thousands) (2)	183	179	175	134	127	127	115	113	110

(1) Excluding Ireland
(2) 1988 estimated
Source: Cerame-Unie, Eurostat (Comext)

In recent years the earthenware sector has lost heavily in important markets with inroads being made by vitrified products (porcelain, stoneware) and a process of restructuring has proven necessary.

Competition from alternative products such as glass and plastics continues to be limited to specific outlets. Thanks to their intrinsic qualities however, especially their strength, hygiene and decorative and aesthetic appeal, ceramic products have generally succeeded in staving off the competition.

Production The industry encompasses the entire Community with some regional concentrations, however.

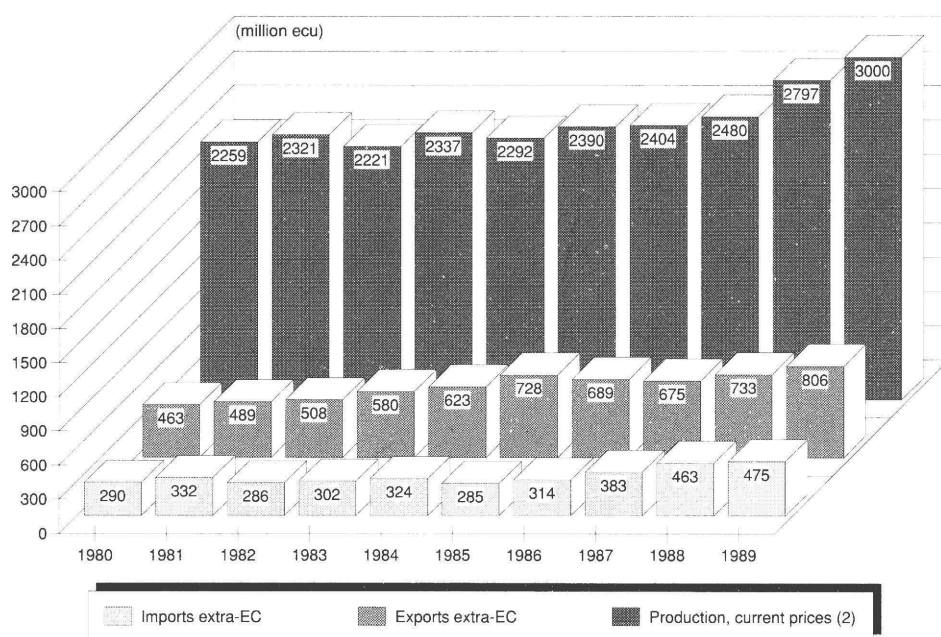
It currently includes some 665 companies, most of whom are small or medium in size, employing 110 000 people in all. Aside from large-scale industrial production there are a great number of small regional manufacturers of decorative articles and pottery. The statistical data available continues to be very fragmented owing to the high level of dispersion of manufacturers in the southern regions of the Community. Thanks to the substantial investments approved for research and technological innovation, the domestic ceramics industry has achieved some considerable success in mechanising various stages in the production process and in im-

proving the quality of its products. The introduction of rapid firing at high temperature in particular, and improvements in colourings and varnishes have led to the creation of products with a greater resistance to wear. This rationalisation in the production process has brought about changes to the structure of the industry, changes that are reflected in increased concentration in this sector.

External trade

The EC is a net exporter, the ratio of exports to imports increasing from 1.6 in 1980 to 1.7 in 1989. An important percentage of the industry's income is generated by exports. Despite the keen competition and customs or other trade barriers, exports of tableware and ornamental articles to non-EC countries expanded strongly between 1980 and 1989: 74% by value and 36% by volume. The percentage of exports in production stood at 20% in 1980, and reached 27% in 1989. The excellent market penetration by exports of non-EC markets between 1980 and 1989 is due in large part to the top-of-the-range products whose quality and aesthetic attraction were determining factors. The markets of North America, in particular the United States, are the primary outlets of the Community's industry. Exports of tableware have continued to stagnate in terms of volume over the past six years and yet have grown in value. In the ornamental sub-sector, the

Figure 1
Tableware and ornamental
Production and external trade (1)



(1) Excluding Ireland
(2) 1989 estimated
Source: Cerame-Unie, Eurostat (Comext)

Table 2
Tableware and ornamentalware
Breakdown by product and country, 1989

(million ECU)	B-L	DK	D	H	E	F	I	NL	P	UK
Production										
Tableware	52	N/A	704	26	N/A	188	263	N/A	53	N/A
Ornamentalware	3	N/A	154	N/A	N/A	20	558	N/A	50	N/A
Total	55	N/A	858	N/A	N/A	208	821	24	103	529
Exports extra-EC										
Tableware	17	18.4	123.2	N/A	8.1	40.9	44.2	2.1	11.4	194.5
Ornamentalware	2.3	11.4	55.6	N/A	54.1	13.3	64.8	8.6	23.4	28.8
Total	19.3	29.8	178.8	N/A	62.2	54.2	109	10.7	34.8	223.3
Imports extra-EC										
Tableware	17.8	20.7	51.6	N/A	7.5	27.7	33.6	21.8	2	46.2
Ornamentalware	7.5	4.7	42.7	N/A	6.2	24.5	26	25.4	1.7	52.8
Total	25.3	25.4	94.3	N/A	13.7	52.2	59.6	47.2	3.7	99
X/M										
Tableware	1	0.9	2.4	N/A	1.1	1.5	1.3	0.1	5.7	4.2
Ornamentalware	0.3	2.4	1.3	N/A	8.7	0.5	2.5	0.3	13.8	0.5
Total	0.8	1.2	1.9	N/A	4.5	1	1.8	0.2	9.4	2.3
Employment										
Tableware	1 353	N/A	N/A	N/A	N/A	5 174	9 000	N/A	N/A	N/A
Ornamentalware	143	N/A	N/A	N/A	N/A	588	12 000	N/A	N/A	N/A
Total	1 496	N/A	26 762	930	N/A	5 742	21 000	978	7 680	11 171

Source: Cerame-Unie, Eurostat (Comext)

volumes of exports have grown considerably. Since 1986, third countries have strengthened their position in the Community market to an appreciable degree after experiencing a period of stable imports in the first half of the decade. As regards the rate of penetration by extra-Community imports, percentages increased from 13% of production in 1980 to 16% in 1989, being 475 million ECU. In the porcelain tableware sub-sector the changes in 1989 were even more significant with a growth in volume of extra-EC imports of 1% (and stable value), whilst intra-EC imports fell by 3% in volume and grew by 6% in value.

So far as volumes are concerned, China is by far the largest external supplier to the Community of porcelain tableware. In the sub-sector of earthenware and stoneware the extra-EC imports of tableware have gone up by 10% in volume and 19% in value. Volume imports from Japan increased by over 12% in 1989, whilst the

position of South Korea fell back by 24% and that of Taiwan advanced by 6%.

In the ornamental sector imports from China grew by almost 24% while those from Taiwan, the most important supplier of the EC, decreased by 12% in 1989.

Structure of production in the EC

Two countries dominate production in the EC: the Federal Republic of Germany and Italy. The Federal Republic of Germany accounted for 29% of EC production with an output of 858 million ECU in 1989. Tableware represents 82% of production, and more than 26,000 people are employed in this sector. In 1989 Italian production represented 27% of EC production, attaining 821 millions ECU. Tableware accounted for 32% of this total and ornamentalware represented the balance. The sector provides work for 21 000 employees in Italy. The United Kingdom occupies third place with 529 million ECU followed by France with 208 million ECU.

Situation in non-EC countries

Japan occupies the first place with 600 factories and a production of 600 000 tonnes in 1985, including approximately 70% for porcelain tableware. Nearly 60% of this figure was exported, a large proportion of it to the United States.

- China's ceramics industry is highly developed and modernised. In recent years the production and exportation not only of porcelain but also of earthenware articles has expanded considerably.
- South Korea has been able to develop its ceramics industry at a sustained pace with the help of Japanese know-how and investments. Korea succeeded in becoming the principal supplier of stoneware articles to the EC between 1981 and 1983.
- Substantial capacities also exist in Central and Eastern Europe where the ceramics industry has traditionally been an important contributor to industrial output. There are 22 factories in Czechoslovakia

and 16 in former East Germany.

The past few years have seen a growing number of takeovers and share purchases in companies in this sector.

Outlook

In 1990 production should increase by over 5%. The countries of Asia and Eastern Europe will continue to expand their share of the Community's ceramics market. However commercial negotiations at GATT level within the industry should open up world markets to a greater degree, and with this in mind we can expect an improvement in the competitive position of

the EC's industry on the export markets.

Substantial efforts have been initiated at both quality and at marketing and productivity levels.

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The vast range of products embraced under the title of technical ceramics includes, besides a number of electro-ceramic products like insulators and insulating pieces, a wide range of materials and ceramic products for electronic, mechanical and various other applications.

The latter group includes, together with the more traditional products for laboratories and chemical industries, the whole field of materials and new ceramic products, called collectively advanced ceramics or new ceramics. The European ceramic insulator industry has declined and undergone sweeping restructuring since the early 1980s.

On the contrary, the sector of advanced ceramics covering a large and constantly growing number of highly technical applications, the operational basis of the EC industry is undergoing considerable restructuring and development.

Current situation

Ceramic insulators The production capacity of the sector for high-tension ceramics has been considerably increased in order to meet the large increase in demand after the first oil crisis, when important extensions to electrical distribution networks were carried out or planned throughout the world. Later, with the slowdown in industrial activity, these programmes suffered big cutbacks, especially in the nuclear energy field, and this led to a considerable reduction in the EC insulator industry's activity.

The situation has deteriorated still further

due to the effects of widespread new capacity investments in countries with planned economies, particularly Yugoslavia, whilst Japan, has consolidated its leading position on world markets with a production capacity of about 140 000 tonnes. The industry also suffers from the growing competition from substitute materials (toughened glass, composites and synthetic materials). The European Community industry undertook an in-depth restructuring process. Thus, of 16 companies existing in 1977 there remained no more than 10 in 1988. Production, which reached about 48 000 tonnes in 1977 and

35 000 tonnes in 1981 should not exceed 25 000 tonnes in 1989.

Advanced ceramics Advanced ceramics (also frequently called "high performance ceramics") are made from pure microscopic powders consolidated at high temperatures. They are based on materials like nitride, oxides, silicon carbides, aluminum zirconium, etc., and have performance characteristics enabling them to be used in very tough conditions of corrosion and temperatures.

The market for advanced ceramics covers a growing number of applications.

It is possible to differentiate between advanced ceramics used in electronic applications which form the largest part of the market (consumer electronics, computer applications, automotive, telecommunications), and those used in mechanical/engineering construction or in other fields such as optical, chemical, biological and nuclear.

Electronics is the largest market for high performance ceramics, but structural applications now account for a significant amount of consumption.

Statistical data relating to the structure, activity and markets of the main subsectors in this rapidly changing industry are not available. However, in 1989, the world market of advanced ceramics was estimated at 5 billion US\$, with electronics applications accounting for 75% and structural applications for 25%.

In the electronics industry, the largest current applications are ceramic-based capacitors, followed by integrated circuits (IC), packaging, including packages and hybrid circuit substrate.

The tendency to horizontal and vertical concentration continues at Community

Table 1
Industrial/technical ceramics
Production trends in F.R. Germany, France and the United Kingdom

(million ECU)	1980	1981	1982	1983	1984	1987
BR Deutschland						
Insulators	36	38	44	45	42	N/A
Insulating pieces	69	61	66	70	89	N/A
Total	105	99	110	115	131	145
France						
Insulators	25	22	24	N/A	N/A	N/A
Insulating pieces	13	12	13	N/A	N/A	N/A
Total	38	34	37	N/A	N/A	N/A
United Kingdom						
Insulators	27	27	27	26	26	N/A
Insulating pieces	18	21	18	24	24	N/A
Total	45	48	45	50	50	N/A

Source: Cerame-Unie

level, particularly by the inclusion in large industrial groups of both producers and users of ceramic materials and products. This is especially true in the chemical sector which produces powders for advanced ceramics.

In most Member States as well as in third

countries, a growing number of new enterprises are emerging in the field of new ceramics. At the same time existing companies are enlarging their production programmes. This process is requiring very high investment.

Table 2
Industrial ceramics
Electronic and structural applications for high-performance ceramics

Market	Application	
	Current	Emerging
Semiconductors	Packages Substrates Evaporator boats	
Electronic devices	Capacitors	
Instrumentation and controls	Varistors Thermistors Piezoelectrics	Motion sensors
Industrial	Wear parts Thread guides Pump and valve components Tools and dies Filtration	Bearings Molds Heat exchangers
Biomedical	Dental restoration Braces	Bone replacement Drug administration
Energy	Solid electrolyte	
Transportation	Oxygen sensors Diesel glow plugs	Energy components
Military/aerospace	Radomes Armor IR windows Heat tiles	Turbine components Structural components

Source: Sema Group Management Consultants

Foreign trade

During the last five years, total exports have increased rapidly while imports were quite stagnant.

In consequence, the export/import ratio improved to 2.22 in 1989 from 1.62 in 1985.

This general evolution of foreign trade is the result of very contrasted situations according to the type of products: foreign trade of insulators and insulating pieces has been very flat.

On the contrary, foreign trade of technical ceramics for technical and chemical uses (including the advanced ceramics) increased very quickly between 1983 and 1989, respectively 33% for imports and 66% for exports.

Production structure

The EC industry is faced with very keen competition from the American and Japanese industries which, at present dominate this market.

Although there are no proper statistical figures available to analyse the main trade flows, the breakdown of world production of advanced ceramics is around 60% for Japan, 20% for the United-States and 10% for Europe.

Strongly supported by public subsidies, the Japanese market of advanced ceramics was about 600 billion Yen in 1988. This market is dominated at 95% by electronic applications, against 5% for structural applications.

In the sector of ceramics for electronic components, the Japanese largely predominate, as they do for the supply of powders for advanced ceramics.

The USA holds a very strong position in ceramics for mechanics/engineering construction.

The US market in this field reached an es-

Table 3
Industrial ceramics
Trends in external trade

(million ECU)	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC							
Insulators	36	34	45	48	34	31	30
Insulating pieces	13	14	18	17	17	18	21
Products for technical and chemical uses	46	56	63	63	73	95	107
Total	95	104	126	128	124	144	158
Imports extra-EC							
Insulators	18	13	21	17	17	17	22
Insulating pieces	18	19	22	18	15	13	16
Products for technical and chemical uses	17	14	35	31	35	33	33
Total	53	46	78	66	67	63	71
X/M							
Insulators	2.0	2.6	2.1	2.8	2.0	1.8	1.4
Insulating pieces	0.7	0.7	0.8	0.9	1.1	1.4	1.3
Products for technical and chemical uses	2.7	4.0	1.8	2.0	2.1	2.9	3.2
Total	1.8	2.3	1.6	1.9	1.9	2.3	2.2

Source: Cerame-Unie, Eurostat (Comext)

timated level of 117 million dollars in

1987 and is expected to increase to 5 billion dollars by the year 2000.

In spite of considerable technological progress in the production of advanced ceramics, the latter still requires a large amount of research and development - a situation which bears heavily on costs and profitability needed for larger investments.

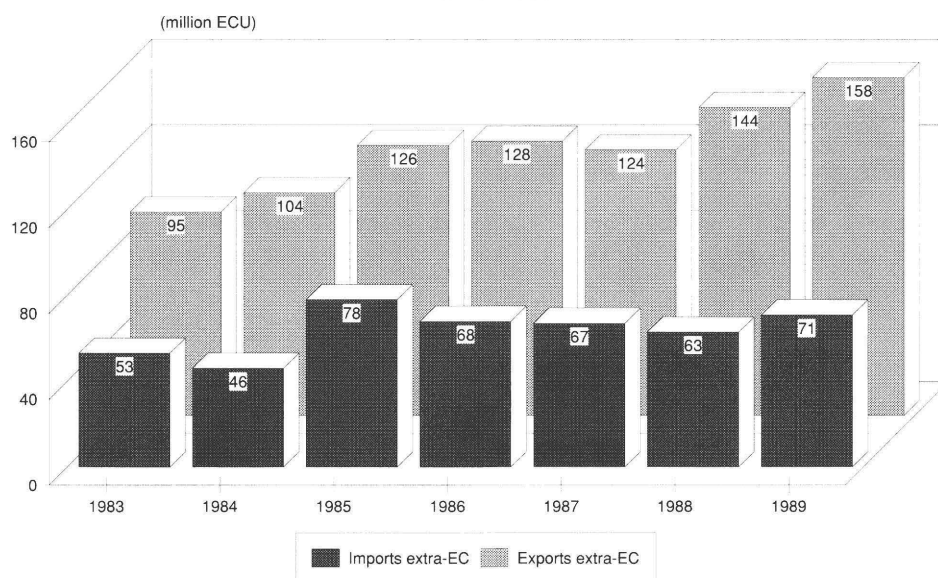
Outlook

As concerns the electro-ceramic sector, the uncertainty concerning development and modernisation of electricity distribution systems make it difficult to evaluate future needs for high-tension insulators.

However, the opening up of public markets in Europe will have a positive effect.

On the other hand, user industries are

Figure 1
Industrial/technical ceramics
External trade



Source: Cerame-Unie, Eurostat (Comext)

forced to devote a larger part of their investment to environmental protection, notably in the field of nuclear energy production.

Technical evolution also lowers the specific consumption of insulators. Changes in the user sectors create a constant challenge to the new industry of advanced ceramics, many of them being still in developmental stages. The world market growth is expected to accelerate at an average annual rate of 8% up to the year 2000. The highest rate is expected for structural applications and superconductors.

Table 4
Industrial/technical ceramics (*)
Import/export: values by geographical zones

(%)	1983	1984	1985	1986
Exports				
Non-EC Europe	36	38	34	33
North America	10	14	13	11
Latin America	6	3	4	3
Asia	27	14	27	16
Africa	10	8	7	3
Other	11	23	15	34
Total extra-EC	100	100	100	100
Imports				
Non-EC Europe	22	23	20	19
Eastern Bloc	10	6	5	5
North America	43	41	50	44
Japan	24	27	22	22
Other	1	3	3	10
Total extra-EC	100	100	100	100

(*) Insulators, insulating pieces and products for technical and chemical uses
Source: Cerame-Unie

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Reviewed by: Sema Group Management Consultants

Refractory products

Following a sharp decline in the EC as well as in the United States and Japan which lasted until 1983, consumption of refractory products has recovered over the past four years as a result of the upturn in the iron and steel industry. Improvements in the technical performance of the various products, technological advances in iron and steel and the foreseeable slowdown in the growth of the iron and steel industry will bring about a gradual reduction in the amount of refractory products consumed, although the reduction in terms of value will be somewhat less marked.

Description of the sector

Refractory products are materials which can withstand high temperatures and hot or cold physical or chemical action. They come in the form of shaped materials (bricks and miscellaneous products) or non-shaped materials (concrete and miscellaneous compounds).

The main consumer of these products is the iron and steel industry which accounts for around half of total consumption. The other sectors consume between 2 and 10% of production and include: ceramics,

lime and cement, glass, chemical/petro-chemical products, non-ferrous metals, energy and heating.

External trade

Between 1980 and 1988, the drop in world consumption of refractory products was accompanied by a reduction in exports and imports in real terms. The imports/exports cover ratio remained stable, which proves that the EC refractory products industry is relatively competitive. In 1988, exports represented 20% of production and imports 7%.

Table 1
Shaped refractory products
Main indicators, 1980-88⁽¹⁾

(thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988
Apparent consumption	2 995	2 710	2 330	2 250	2 315	2 390	2 135	2 095	2 275
Net exports	395	360	360	350	395	405	375	340	330
Production	3 390	3 070	2 690	2 600	2 710	2 795	2 510	2 435	2 605

(¹) CE9
Source: PRE-Fédération Européenne des Fabricants de Produits Réfractaires and national export statistics

Table 2
Shaped refractory products
Production; international comparisons 1980-1988

(thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988
Production (¹)	3 390	3 070	2 690	2 600	2 710	2 795	2 510	2 435	2 605
Index	121	110	96	93	97	100	90	87	93
USA production	2 217	2 180	1 320	1 350	1 375	1 214	1 016	1 068	N/A
Index	183	180	109	111	113	100	84	88	N/A
Japanese production	1 710	1 565	1 368	1 217	1 199	1 160	1 044	918	961
Index	147	135	118	105	103	100	90	79	83

(¹) EC9
Source: PRE, US Department of Commerce, Japan Refractories Association and national export statistics

Technology

The rapid technical progress achieved by the user industries has given rise to a corresponding improvement in production capacity and the various processes involved in the manufacture of refractory products. Modern furnaces and other installations now have a much greater output. One of the main reasons for the decrease in specific consumption of refractory products by the iron and steel industry is the growing proportion of steel-works with continuous casting facilities, which use fewer refractory bricks. Taking the EC as a whole, the proportion of steel manufactured by means of continuous casting rose from 38.9% of the total amount of steel produced in 1980 to 84.2% in 1988. In addition, the pouring ladles are manufactured using refractory products whose resistance to wear and thermal and mechanical shocks has been greatly improved. These improvements have led to the gradual replacement of clay, which is

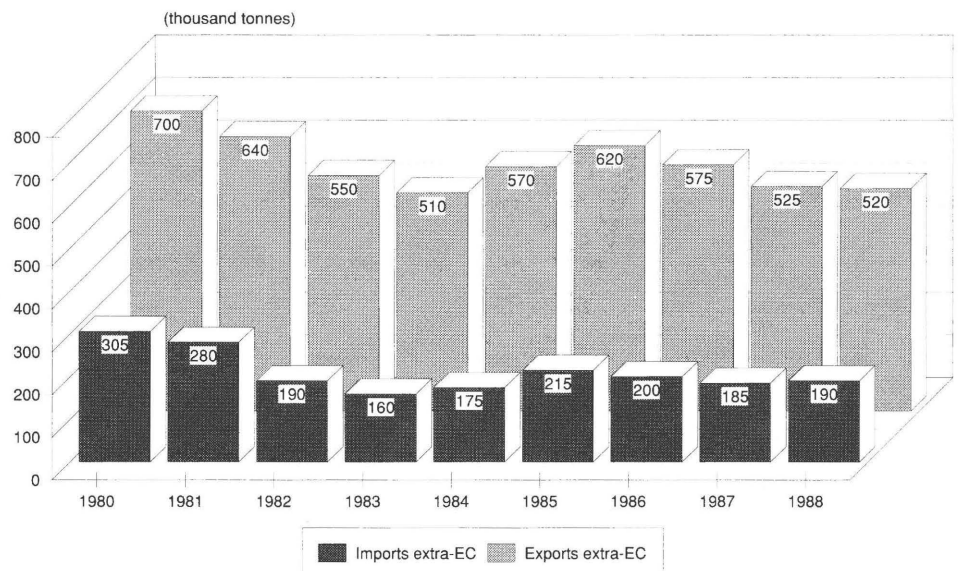
available in its natural state in EC countries, by raw materials such as quartzite, magnesia, chromite, silicon carbide, extra-aluminous materials, zircon, etc. many of which come from countries outside the EC. The development of highly technical products has created a need for greater investment in research and equipment.

These changes have hastened the disappearance of small firms, causing the industry to become more concentrated.

Third countries

Among third countries, the United States have a highly developed refractory products industry, characterised by large-scale installations which tend to specialise.

Figure 1
Refractory products
External trade 1980-88, EC 9



Source: PRE, US Department of Commerce, Association for refractory products and national export statistics

The industry is well developed in Japan.

Where high-performance products are concerned, the Japanese often compete with EC producers on export markets. In the case of the Comecon countries, the competition is mainly confined to very low price ranges. China is making large-scale investments aimed at modernising its facilities and developing a refractory products industry within the framework of the current industrial expansion programme, in which the refractory products sector forms an important part of the industrial infrastructure. In 1988, neither the United States nor Japan had yet managed to match the crude steel production levels achieved in 1980. EC production is greater than that of Japan and the United States (2.5 to 3 times more).

Outlook

In the early 1990s, the EC iron and steel industry will use less than 8 kg of refractory products per tonne of crude steel produced, compared with 13 kg in 1983.

This, together with the less promising medium-term prospects for the iron and steel industry, should bring about a market drop in consumption of refractory products within the EC.

The value-added content of these products will increase markedly however, and even though the total quantities used by the iron and steel industry may well decline, the drop in production in terms of value will occur much more slowly. In the other consumption sectors, demand is flat and we can expect an increase in specific demand similar to that observed in the iron

and steel industry. Unless there is a fundamental change in the thermal manufacturing process in the steel, glass, non-ferrous metals and cement industries - the main users of refractory products - the structural reorganisation that has been taking place in the refractory products industry for so many years will probably continue until the mid-1990s.

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